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Masteroppgave

USE OF

AGILE METHODOLOGIES IN DIGITAL TRANSFORMATION

BARRIERS

BRUK AV AGILE METODE(R) I DIGITAL TRANSFORMASJON

BARRIERER

Master i økonomi og ledelse - siviløkonom - hovedprofil

digital ledelse og business analytics

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Abstract

We are living in a global world and this feeling of living globally connected digitalization has brought this concept clearer to every member of society. The rapid increase in technological advancement & innovation with increasing use of digital tools, like wise internet, social media and IOT compel organisational top manager to revise their business model from traditional to digital business model. To remain competitive globally, leaders start thinking on this new paradigm shift so that they can survive in global market with competitive edge by providing best value proposition to its stakeholders. Future lies in digitalization; therefore, the only option is the adoption of technological advancement, that's going for digital transformation. The process of digital transformation is not so easy, rather most of the organization are facing different challenges while implementing technological change. Earlier literature has highlighted barriers and challenges could be addressed with the help of agile methodologies. Our study therefore mainly focuses to find out those key factors that considered as or challenges in the process of digital transformation by using agile methodologies.

This study aims to collect information from the real world regarding the barriers to agile digital transformation and discuss them how these key barriers in digital transformation could be resolve while using agile methodologies. The finding of this thesis is based on information collected during interviews by using qualitative approach. The list of most critical barriers was categorized and discussed in detail with their respective theory and Kotter´s model for change management. Based on the results this thesis can conclude that agile methodologies provide a better tool for the implementation of digital transformation in an organisation.

Preface

First, we would like to admit that writing thesis gave us lots of inspiration and in-depth knowledge about the practical implication of our studies “Master i økonomi og ledelse - siviløkonom - Digital Ledelse og Business Analytics”. The scope of the study is to work full time semester that’s consist of 30 ECTS credits.

It was not so easy task for us as we both are living in Oslo and must drive to back and forth to attend each class at Rena campus during 1st semester, while during 2nd semester classes were in Kongsvinger campus. This programme itself was very attractive and got very hype during the first year as we are the student of first badge. Although we have learnt lots of new business analytics and programming language with respect to data analytics and AI, machine learning etc. It was very demanding, and we used most of time in studying, here We would like to thank to our family for their support.

We also would like to thank to all the participant who have devoted their previous time and knowledge to this study. Without their help it would have not been possible, I hereby specially would like to thank to *Gunn Mari* from digital Innland, for extending her precious support in getting connected with protentional respondent.

A very big thank to our supervisor *Prof. Tore Mysen* for his support, help, and precious guideline that make us able to complete this thesis. He has been always available to extend his instruction and writing feedback during the writing process.

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1. INTRODUCTION

1.1. Background for the Study

In the digitalization world, organizations and companies are confronted with various challenges like an increase in market dynamics, volatility in the customers' demands & consistent emergence of novel advancements in IT (Rachinger et al., 2019). As result organizations are asked to undergo &adopt a technological transformation that enables them to bring sparks for the entire organization. According to(Bharadwaj et al., 2013) information technology-based organizational business transformation include digital processing, offerings digital services according to digital business models.

Organizations are striving to become agile, which they believe will assist them to master the process of organizational digital transformation(Rogers & Marres, 2000). Agile methodologies have gained popularity to both firms listed in the IT and software industry and in addition to expanding beyond the limits of their regular application fields like new product development (Rigby et al., 2016). However, agile transformation in large scale is not trivial and is faced by different challenges and result to substantial consequences for the entire organization (Kasauli et al., 2017). The transformation process, which entails the interplay of occurring challenges based on scaling and coping actions is of much importance for practices and research.

(Dikert et al., 2016) posit that agile project management continues being deployed and gain popularity in large scale organizations. According to (Laanti et al., 2011) both digital transformation and agile deployment processes are unique to different organizations. As a result, limited study has been done on large-scale organisational reform. (Bharadwaj et al., 2013). Although most organizations see benefits associated with the use of agile methodologies (Kenneth S Rubin, 2012) but on the other hand organizations lack the necessity to change their corporate culture favourable for agile technology.

Most prior researches discuss the aspect of agile methodology basing their arguments on the changing role of the Information technology function (Kasauli et al., 2017; Tüzün et al., 2019).

(Scheerer et al., 2014) posits that the application of the agile methodology on large scale discusses topics in a multi-agile setting such as inter-team coordination or various issues resulting due to agile transformation. However, there are very few pertinent articles on agile methodology and digital transformation. The study of agile methodology in digital transformation appears particularly fruitful because such a viewpoint provides knowledge on organizational change processes, fostering an in-depth grasp of digital transformation(Poole et al., 2000). Further this argument that use of agile can be effectively utilized other than software development (Rising & Janoff, 2000) posit *"Agile project management is not limited to the functioning of project management instead it encompasses all aspects of development that includes business requirement analysis, planning, development, quality assurance, testing, change management and delivery"*.

According to (Boehm & Turner, 2005)agile environment failing forward and failing fast is a common term, but project failure is not allowed in the organizations. Therefore, for a true and successful digital transformation, it is extremely important to identify challenges / barriers & obstacles associated with digital transformation pertaining to agile methodologies. Our study will therefore intend to identify barriers / challenges and obstacles related to digital transformation where agile is implementing tool.

1.2. Motivations, Aims and Objectives

When I took this master study was very much clear in my mind that *future lies in digitalization*, this was the fast thought that strike in my mind. We got theoretical understanding of the subject matter during studying one of the courses "*KMMF250-1 19H Digitalization& Change Management*". We thought it better to apply that knowledge to found out how digitalization process take place in real world, what sort of challenges & barriers come across in the process of digital transformation. To equip ourselves with contemporary skills and knowledge, we therefore decided to explore the new way that's using of agile methodologies in the process of digital transformation. According to (Williams & Cockburn, 2003) agile methodologies provide hands on tolls by having direct communication with customers, manager and stakeholders with the flexibility to cope with the change occurring inner or outside of the environment.

The primary goal is to identify barriers related toagile methodologies in digital transformation. The specific objective of the study is to evaluate the process of agile methodologies in the

context of digital transformation. Second, the study examined how different challenges of agile methodologies as well as related solutions shape the digital transformation process. This research will, therefore, add knowledge on the literature about agile and digital transformation, which will be valuable for management and senior executive of an organization in agile and digital transformation process with less time, cost, and effort. It also assists senior executives and management in improving performance by proactively addressing potential barriers, challenges, and issues in consideration to digitalization.

1.3. Limitation of the thesis

In every study research must work with in limitation, in our case of the most important limitation is availability of the respondent technical experts in IT filed with understanding & implication of agile methodologies. In our thesis, first and main limitation is that we have only 5 respondents for our data collection. Although it may raise the question of reliability and validity, but we tried our best to dig out as much as information we can from our respondent during interview.

One thing that also we think to mentioned that is language barriers, one of us has Norwegian as first language while one is not native Norwegian speaker, there we decided to write out thesis in bilingual. Our thesis is written in English and last two chapter are written in Norwegian. Here we would like to say it's good teamwork and add the diversity component during study.

1.4. Structure of Thesis

The followed chapter will provide a related work that involves the investigation for relevant literature, an overview with illustration of relevant literature; agile and agile methodology, digitalization, change management, relevance finding (barriers) and summary of the articles. The third chapter provides an

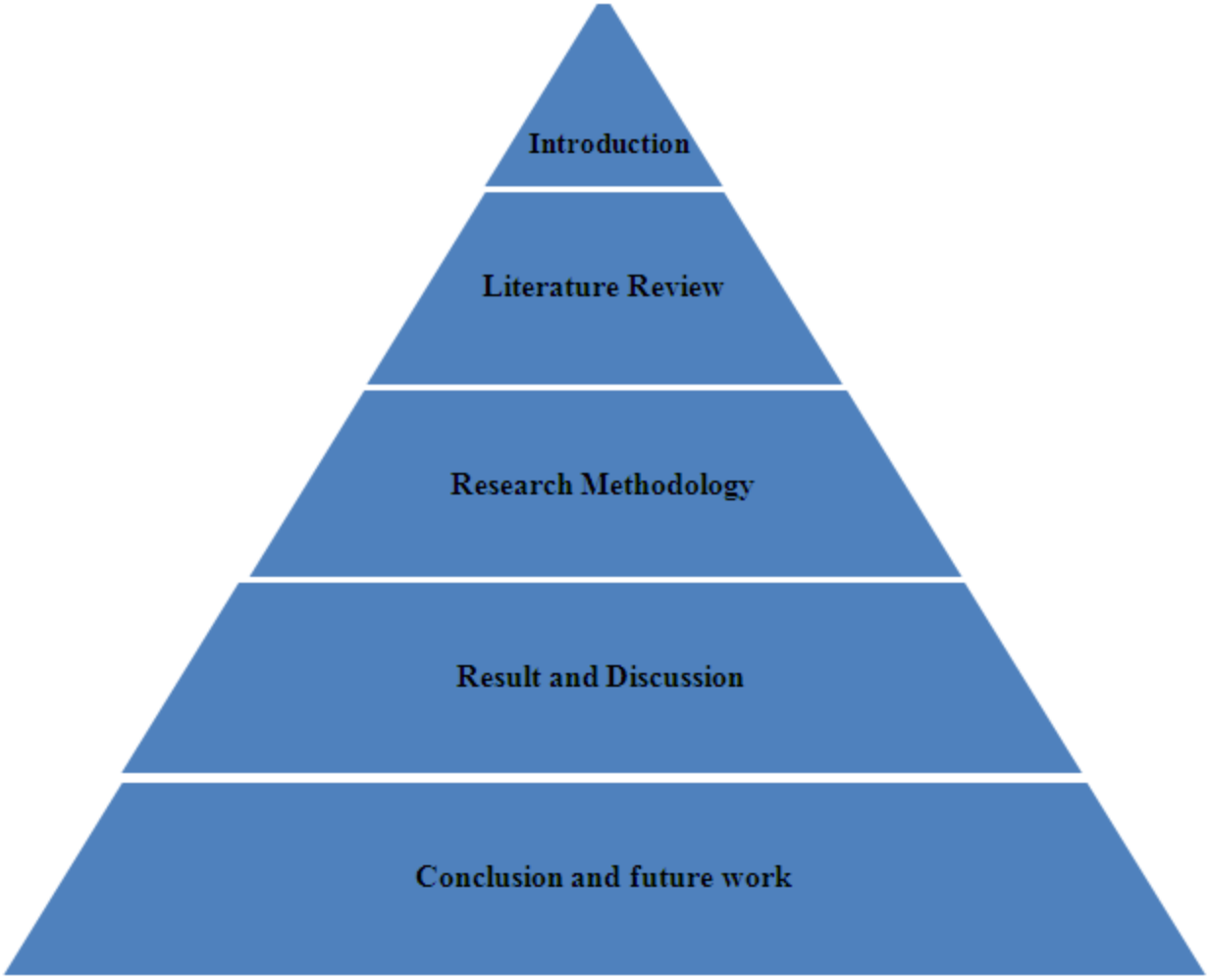

Fig 1: The structure of this thesis

2. LITERATURE REVIEW

This part contains search for relevant literature, an overview of the literature with an article summary. Furthermore, this section provides list on the barriers, challenges, and issues in process of organizational digital transformation.

We have been reviewing the relevant literature during the duration of this study that deals both the topic of our thesis and meeting the requirement for laying the down theoretical framework of the thesis. We have initiated our search by searching articles, books, information magazine and thesis etc by using google scholar, Oria and database business resource complete. The focus to found out literature that has been previously carried out by different researcher in the field of digitalization and the problem under consideration. We have managed to find research material and literature from different search engines but in our case, we must find out most relevant literature that has been previously written in academic journals by highlighting barriers in the process of digital transformation. Our topic under investigation is also related to implementation of agile methodologies in digital transformation so we have two further narrow down our research to find out literature on the letter topic that can provide solid foundation &support our problem statement of the thesis.

Key words always play very critical role to search the most relevant literature therefore we used, digital transformation, with sub criteria as barriers/ obstacles and challenges which result in 224 articles. We were mainly interested in articles with good quality published in academic journal from dated between year 2000 till year 2021.We have mainly used English during the search process as this gives a greater range of possible matches and there is a greater amount of literature which had been written in English. To narrow down our research we other key words, like agile, agile methodologies, agile transformation, we have also searched articles related to theoretical framework our thesis.

The most important articles have been listed in tabulated format table 2 and have shown in graphical view. We have used Endnote for citation, which is computable with the Oria, and google scholar and provide easy way to import citation directly, though in some case where

importing citation is not possible, we therefore added citation manually. Search engines used for searching relevant literature during our study are as follow,

1. *Google Scholar:* *https://scholar.google.com*
2. *Oria:* *https://www.inn.no/bibliotekk*
3. *Ebscohost:* *https://web-p-ebscohost-com.ezproxy.inn.no/*

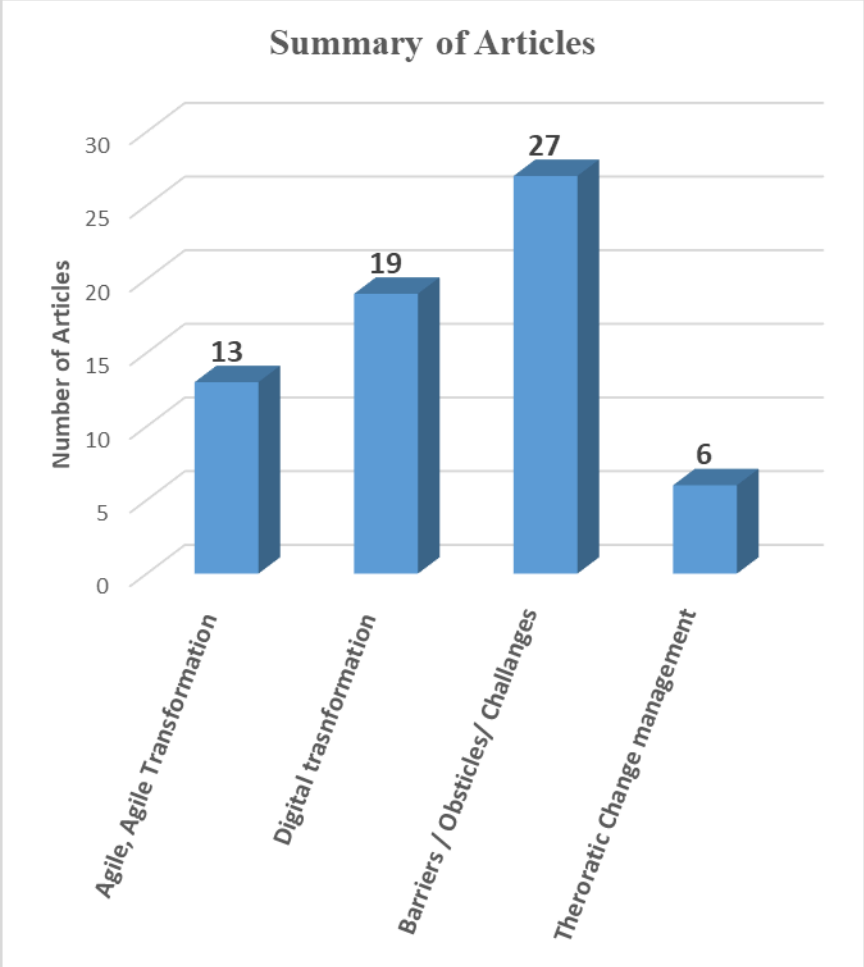

Fig: 1

2.1. Agile

Agile is defined as “fast-paced people-centric, business-value centred, change-adaptive, learning-driven, lightweight, management methods, tool and technique” that enables to improve performance of the project, self-driven teams and products (Yordanova & Toshkov, 2019). Agile development seeks to address both the difficulties identified with traditional work and future challenges such as the rising velocity of change and the amount of complexity during the process. The goal of an agile technique is to achieve the sensitive, self-adapting process that technological quality and collaborative processes (Peitl & de Oliveira Baptista, 2017).In another definition by (Goh et al., 2013) agile transformation as the period of transition to agile project methodologies from traditional project methodologies, which is a concern to a variety of organization's areas.

According to (VersionOne, 2016, p. 2)*"A survey shows that 94% of organizations stated that they used Agile methods, 60% of their teams did not use Agile, and 80% said that their organization was in process to continued theirs initiative up to maturity level".*

Agile Model-driven Engineering is a well-known programming development paradigm that provides many sustainability benefits and can also be used as a framework for developing appropriate solutions(Cuadrado et al., 2014).Agile Methodology, which is seen as more flexible and customized &suitable for adapting customers at every-changing circumstances. Pertaining to software engineering & technology, Agile Methodologies are considered to be flexible in nature and highly efficient for problem solving, since they involve the end user throughout the process (Campanelli & Parreiras, 2015).Agile Methodology relies more on simplicity and will develop things with time, development in society as well as in technology and together get the best out of it (Campanelli & Parreiras, 2015).

2.2. Different Agile Methods.

The most popular Agile project management method used by development companies to improve their management processes while developing systems and products are Scrum and Kanban (Yordanova & Toshkov, 2019). Furthermore, agile methodologies like “extreme programming” (XP) and Scrum due to their good qualities in dealing with extreme circumstances and changes have been well practiced by the professional (Campanelli & Parreiras, 2015). There are many types of methodologies that an expert agile master can use for different task in different originations based on their agility. In another study (Abrahamsson et al., 2009; Abrahamsson et al., 2010) describe 10 different agile methodologies as “ASD, AM, CRYSTAL, DSDM, XP, FDD, ASP, PP, SCRUM & KANBAN. These different types of agile methodologies provide effective tools for IT practitioner and technology expert. *«Many authors suggest that hybrid methods, by combining the plan-driven and agile methods, could represent a solution for applying agile in large organizations seeking to improve software quality and product functionality”* (Dumitriu et al., 2019). In another study by (Shankarmani et al., 2012, p. 2) type of agile methodologies used was 52 % scrum and 14 % XP or hybrid. Therefore, keeping this in view we are going throw more lights and will further elaborate some of mostly used agile methodologies.

2.2.1 Scrum

Scrum is a framework for developing information systems. It is mainly used to develop software-based systems and is often used in combination with Extreme Programming (XP), rather its equally good to handle all kinds of tasks of extremely complex nature. Scrum helps to address the various issues that software developers experience may be solved. For example, complicated production processes can be reduced to agile project management, and the manufacturing of a particular item can be rescheduled. (Yordanova & Toshkov, 2019).

Organizations may use Scrum's framework to resolve their most complicated customized challenges while still delivering products that have the greatest potential value. (Sutherland & Schwaber, 2016). In another definition (James & Walter, 2010)posit Scrum as a management framework for software development system that employs "self-organizing, cross-functional teams of seven persons or less".

"Scrum principle is collaboration within teams (2 to 9) members that break down project into task completed within given periods of time"sprints"ranging from 2 weeks to 1 month with daily assessment and planning by 15 minutes meetings"(Vlaanderen et al., 2011).

2.2.2 (XP) Extreme programming

Extreme programming is a system development method also popular due to its extremely flexibly. The method was first formulated by "Kent Beck" and the first book on the method came in 1999 called Extreme Programming posit by(Yordanova & Toshkov, 2019).

2.2.3 Kanban

Kanbanis an agile methodology with origin goes back 1940 Toyota Japan but nowadays Kanban is used to to describe different stages of software developmentstages by emphasising its role as work in progress(Yordanova & Toshkov, 2019, p. 78) ."*In contrast to scrum Kanban does not prescribe roles rather it uses visual charts, boards or billboards, signalling system to label the work process limited in work in progress"*(Yordanova & Toshkov, 2019, p. 78).

2.3. Agile Manifesto in Different Literatures

Agile Methodology is a composition of principles and guidelines that helps development of systems by providing four most important values with 12 agile principles are followed in software development called Agile Methods(Boehm, 2006).These principles of Agile Methodology are the opposite of those in traditional IT development systems, as there is less reliance on documenting and increased acceptance of change.

Important characteristics of Agile *"The Agile Manifesto"*(https://agilemanifesto.org)&(Beck et al., 2001; Highsmith & Cockburn, 2001) are

2.3.1Values of Agile

1. *"Individuals and interactions take precedence over processes and instruments.*
2. *Working software over comprehensive documentation.*
3. *Customer collaboration is preferred above contract negotiation.*
4. *Responding to a change by sticking to a plan"(Beck et al., 2001).*

2.3.2 Principles of Agile

1. *"Satisfying customers through early and continuous delivery of valuable work.*
2. *Breaking big work down into smaller tasks that can be completed quickly.*
3. *Recognizing that the best work emerges from self-organized teams.*
4. *Providing motivated individuals with the environment and support they need and trusting them to get the job done.*
5. *Creating processes that promote sustainable efforts.*
6. *Maintaining a constant pace for completed work.*
7. *Welcoming changing requirements, even late in a project.*
8. *Assembling the project team and business owners daily throughout the project.*
9. *Having the team reflect at regular intervals on how to become more effective, then tuning and adjusting behaviour accordingly.*
10. *Measuring progress by the amount of completed work.*
11. *Continually seeking excellence.*
12. *Harnessing change for a competitive advantage"*(Beck et al., 2001).

2.4. Agile Methodologies.

(Meso & Jain, 2006)posit that the agile transformation process's complexity is attributed to organizational changes requiring localization, tailoring, and adoption in companies dealing with large projects. With the scalability of challenges facing the agile transition process, a lot of efforts are required to synchronize changes in the organization units(Appelbaum et al., 2017)further author describe agile methodologies application aim at providing agility feature to the organization; which boost the ability of the organization to respond proactively, and rapidly to an unexpected change in demands while controlling associated risks. Besides, it enables the organization to efficiently innovate, adapt and shrink the feedback loop (Appelbaum et al., 2012). (Cegarra-Navarro, 2016) posit that agility also enables organizations to quickly respond to market competitions, thus helps organization in relevant knowledge acquisition to innovate high tech product and services.

(Denning, 2011) investigated the importance of the adoption of agile methodologies in an organization& according to the finding, agility enables the company to deliver new value to customer expectations and demand. In organizations with continuous learning and growth,

agility enables them to maximum utilize the available opportunities. According to this study application of agile methodologies is more important compared to any other management methodologies(Denning, 2012).Most companies have started applying agile methodologies to maintain and gain market competitiveness, especially in unpredictable and dynamic markets places. (Dikert et al., 2016)posit that agile transformation requires lots of efforts to synchronize all changes at different organization units' interfaces. With the long period of observation and complexity of the process, there is little work of research based on agile transformation, especially in large-scale organizations.

Agile transformation's parental goal is to provide the company with agility features; the ability to respond to volatile customers and stakeholder's demands proactively, rapidly and intentionally(Appelbaum et al., 2017). Agile methodology is an iterative technique that requires constant improvement, linearity in speed, and efficiency such that organizational objectives can accelerate. So agile provides learning experiences that promote progressive improvements with creativity, in transparency & efficiency of an organization. Whereas unlike situational methodologies, agile methodologies have no relationship with situational mentality (Augosto, 2018).

Currently most of the organization requires a rapidly changing multitude of technical and cultural norms to cope the pace with digital era therefore leaders must be trained and guide on the transition to digital norms that will lead to maximum productivity in the organization(K.S Rubin, 2012). Collaborative working promotes intensive interaction among employees which in the end acts as a motivating factor (Laanti, 2011). Agile methodology focuses on the way people are productive and the strength from innovative interaction rather than the new technology as far as digital transformation is concerned(Ambler, 2012). Partnership in a business environment tends to enhance the need for value-seeking as well as a habit of seeking values which inflow agile setup, customer segmentation, value proposal to break down into small loop(Jeff, 2016). In short agile provides stability and flexibility to employees in a dynamic environment and enables them to develop product and services more effective way, which is true spirit of digital transformation as world of technology is changing with the enamours pace as ever before in the history (Gupta, 2019).

2.5. Digitization, Digitalization & Digital Transformation

We are living in the era of digitalization that has completely changed customer´s value proposition such as digital connectivity, big data analysis using digital tools provide enormous opportunities to organization and bringing the challenges to the managers. The cope with the fast pace of the digitalization only organization with ability to adopt the changes are likely to have ripen fruit of only with the help of digital transformation. In an research study on average, data-driven digital companies are 5% more productive and 6% more profitable (McAfee et al., 2012) and (Westerman et al., 2014) believes that digital organizations under "digital masters" visionary leadership are 26% more profitable than their competitors and can generate 9% higher revenue from their physical assets.

A very precise definition of digitalization by (Șerban, 2017, p. 74)*"business models and processes that take advantage is of little opportunities".* Another definition refer to *"digitalization as transcoding and a log information into digital information pick me until further control and value creation"* (Luz Martín-Peña et al., 2018).

Digitalization according to (Martín-Peña et al., 2018)

> *"Impacts entire business models & refers to new practices, activities which result from the incorporation of digital technologies into operations, the most common technologies in digital business settings are mobile devices and apps, analytical tools, capacity-sharing platforms, & IoT".*

Digitalization can be defined as the process of restructuring various domains of social life, in and around digital communicating as well as infrastructures with social media. Digitalization is also defined as the process of creating value in the forefront of global business as well as creating value in the stages programs the vision through customers experiences(Scott Brennen, 2016).

According to (Remane et al., 2017)for adopting digital change in any organization a well-defined systematic approach with following three step is needed,

1. Identify exciting products and services:

   Exciting products, goods and services, researching markets to map where your competitors already are and which way to choose.

2. Revising the business model:

   See if these product portfolios differ in terms of the digital business model, how many different dimensions and characteristics are possible.

3. Discovering new configurations:

In another study regarding digital transformation (Ross, 2017)*"argue that if leaders don'tmake the difference between digital, digitization and digital transformation, this could result in a very costly mistake*".For better understanding of the digitalization here we would like to describe proposed digital framework by (Unruh, 2017).

Fig 2: Digital Framework (Șerban, 2017, p. 184; Unruh, 2017).

2.5.1 Digitization

Digitization is first stage that's refer to process where product and services transformed in to digital format for example streams of information such as text, pictures& sounds send and processed by a digital tools (Unruh, 2017). The main purpose of digitization lies in the process of processing, storing, and transmitting data since it allows diverse ways of formatting information's to be carried with the same efficiency. It also over's an increment in economic growth that positively improves access to public services thus creating more job opportunities for the young generation(McQuail, 2000).

2.5.2 Digitalization

The digitalization is to reshaping of the business model in various roles including improving the real-time management information systems and decision making at over all organizational level (Unruh, 2017). Further growth that's intakes seamless integration into third parties, embedded automation in controls, multichannel experience, digital marketing by innovating overall automation that redefine organizational business model (Waldfogel, 2017).

Digitalization lies within various distributive technologies such as "mobile internet, automation of knowledge work, Internet of things, cloud, advanced robotics, renewable energy, next-generation genomics,3-D printing, advanced materials, energy storage, advanced oil and gas exploration, recovery, autonomous and near-autonomous vehicles"(Brennen, 2016).

2.5.3 Digital Transformation

The 3rd stage as mentioned in (Unruh, 2017)*"is final stage where digital transformation happened to new digital business model and processes restructure economies as a result technology is integrated by people in their life»*. Digital transformation is the process of assigning a task to an organization to deal with overall changes giving priority to the competency-based initiatives that orient customers, products by reconsidering the organizational value proposition (Ross, 2017). Digital transformation is on-going continuing process with different understanding of digital maturity level for organizational context (Cichosz, 2018; Morakanyane et al., 2017).

According to (Kavadias et al., 2016) the main key factors for transformation or implementation of digitization are, more personalized products and services, close loop process, asset sharing, user-based pricing, collaboration ecosystem and Agile and adoptive organization that is open and receptive to new changes. True digital transformation can only be recognized in an organization when overall process of the organization has been fully transformed. The organization should adopt new digital models to achieve the aim of innovation by delivering products to its valuable stakeholders (Rachinger, 2019).Through the adoption of advanced technology, product transformation, employee training, customer integration, and process optimization have been used as integral parts in the transformation and digitalization(Gupta, 2020).

2.6. Agile Digital Transformation

The traditional organisation often refers as well-defined hierarchy structure, separate functional unit an employee whereas in contrast traditional organization, a giant organisation are built on open structured network of self-organising team of highly professional technical people who shared knowledge skills and motivated energy between the teams members (Brosseau, 2019; Ferreira et al., 2020). Infect traditional organization with tight structural control hierarchy seems rigid towards any change and innovation. Contrary to this agile organization where agile culture exist or it can be incorporated with little effort making them very volatile with their organic in nature can better way create value for its stakeholders.

The foundation of agile digital transformation is the fact that effective digital transformations are the result of consistent innovation. When companies radically change their business approach and potential which measured in steps over time, they are empowered to launch, learn, and re-launch digital initiatives rapidly responding to market changes and customer needs. Agile strategy that incorporates digitalization projects making the organization productive and sufficient. In the digital age, digital agility is the most prudent key to innovation. Technology is growing with superfluous speed which has also led to an increase in business outcomes(Amorim, 2018). Digital transformation involves implementing digital technology to transform business by replacing and modifying manual processes with digital processes. In fact, this kind of transformation is geared towards streamlining internal processes and elevating the customer experience.

Agile methodology is the strategy that will contribute to leveraging on this transformation and revolutionising the whole organisation. Digital transformation is surely changing the way companies' function. Even with the multiple problems associated in propagating this change, Agile Methodology can prioritise the transformation and decrease any past losses in business. Agile Methodology regarded as a key factor in establishing a digital transformation. (Gupta, 2019). As part of digital transformation, organisations must use technologies to create significant and long-term changes to the fundamental principles of management. Agile simplifies the way technology is used to manage the operation of your organization and thus act agile

methodology as an exceptional tool to prevail digital transformation. This has strengthened the need to adopt agility in line with digital transformation such that services can be of high standards and quality(Verhoef, 2019).

Agile entails a company's operational operations being adapted to new technologies as they emerge. There are many components to a company, such as people, operations, goods and services. In order to simplify change, agile provides a framework that allows business to provide better goods and a seamless customer experience, which makes the transformation smoother.(Bostrom et al., 2009). Agile enables that firms may give higher value and enhance visibility with digital technologies by enabling groups to engage efficiently. When it comes to building successful goods for clients throughout the world, Agile approach can alter traditional operations digitally.(Gupta, 2019).

(Paasivaara et al., 2012)argued that large-scale agile methodologies application represents specific actions like communities of practices that support the transformation to agile methods. However, (Paasivaara et al., 2008), posits that these frameworks cannot explain agile transformation process, rather than providing pertinent insights on the manifestation of large-scale approaches. Research based on large-scale adoption of agile methodologies argued in the context of means and how agile development in large-scale can be conceptualized(Rolland, 2016). Large-scale adoption of agile methodologies like the use of these methods at large-scale organizational level(Rolland et al., 2016). A study conducted by (Dikert et al., 2016) asserts that large-scale adoption of agile methodologies is a situation where these methods are applied by large teams/ multi-teams setting or in large projects. More so, (Dingsøyr & Moe, 2014)argued it is the application of the agile methodology in the entire organization. In this study, the researcher argued that the adoption of agile methodology is the application of agile methods with multi-team settings and on an organizational level.

Organization adopting agile methodologies, deepening the application of the agile methods like integration of agile practices from different agile methods, or extending agile methods applications within the organization like business units' transformation (Dikert et al., 2016). Application of agile methodologies at large scale digital transformation is attributed by in-depth

single case studies that investigate the association/ interaction within the team/ inter-team coordination approaches (Scheerer et al., 2014).

2.7. Barriers / Obstacles / Challenges

Agile methods' research is mostly based on challenges and actions of large-scale agile methodology application. The study carried by(Ramesh et al., 2010) to investigate the agile methodologies application in the novel context of digital transformation was built on basis of the development process, organization challenges, customers, and developers to better comprehend the motivation of the organizations to modify agile methods. Investigated the application of agile methodologies in the context of digital transformation. The study found that the organizations are faced with a problem of lack of competencies among developers. The organizational implementation of agile methods has a negative association with a lack of competencies among developers. The study also revealed that there is a significant influence on the organizational implementation of agile methods (Nerur et al., 2005).

(Abrahamsson, 2009)conducted a study on the information systems development team with its association to the application of agile methodologies. Using the data from various firms, the study found that misunderstanding agile practices have a negative influence on agile transformation. According to this study, most of the most information systems development team in firms have inadequate knowledge about agile methodologies which pause a challenge in agile transformation. More so, the study found that amongst others, some organizational structures significantly influence the application of agile methodologies in the organization. They posit that the application of agile methodologies was hard for some organizations that have unsuitable organizational structures.

Likewise, (Hennel & Rosenkranz, 2021)studied the challenges facing the organization in the application of agile methodologies. Using the data from 150 firms from Information and technology sector, the study revealed that organizational structure has a substantial impact on the adoption of agile methodologies. They revealed that hierarchical organizational structure adversely influenced agile transformation. On the other hand, they revealed that organizations with a chameleon organization structure showed a significant difference in the application of agile methodologies, which was also directly connected to digital transformation. The study

concluded that organization structure is a challenge to the adoption of agile methods and to digital transformation (Hennel & Rosenkranz, 2021).

A prior study by (Joshi, 2007)to investigate the application of agile methods in digital transformation revealed that unsuitable firms' structures for agile values and principles being in place are a challenge to agile transformation. This study used a case study analysis using firms from the manufacturing industry. They revealed that coordination issues between agile teams influenced the application of agile methods in digital transformation. More so, the coordination issues between agile and non-agile teams were also a challenge in the application of agile methodologies, which was also directly connected to digital transformation. (Scheerer, 2014)found a consistent finding by stating that coordination between agile teams significantly determines the successful agile transformation in an organization. This study concluded that for a successful large-scale agile methodology application, there must be good coordination between agile teams and between agile and non-agile teams.

"The implementation of agile methods in these contexts encounters various challenges, in the field of applying agile at large-scale, a clear classification of the existing streams of research is difficult to recognize"(Dumitriu et al., 2019).Large scale agile transformations entail unique challenges that go beyond the introduction of agile methods and initial agile transition in a small-scale setting. Variety work literature comprises empirical investigations and comprehensive summaries of barriers /challenges shown in table 1 involved in the application of agile methods (Cichosz et al., 2020; Dikert et al., 2016; Dumitriu et al., 2019; Ghobadi & Mathiassen, 2016; Hekkala et al., 2017; Pawel, 2017; Shankarmani et al., 2012; Siddique & Hussein, 2017; Sindhwani et al., 2019). Our aim not to revise, extend or validate work done by in previous studies (literature/knowledge) but to build on comprehensive findings on the existing knowledge and capture a variety of issues related implication of agile methodology at large scale organizational level beyond software development. Our study, therefore, focused on carving out in-depth insights into their nature and their influence on the agile transformation process while digging more information from the real world. More specifically, our focus will be to highlight barriers, challenges to interplay with a solution to these challenges and action scaling the entire agile transformation in context of digital transformation.

Table: 1

Author, Year	Barriers / Obstacles / Challenges	Source
(Cichosz et al., 2020) (Dikert et al., 2016) (Dumitriu et al., 2019) (Ghobadi & Mathiassen, 2016) (Hekkala et al., 2017) (Pawel, 2017) (Shankarmani et al., 2012) (Sindhwani et al., 2019) (Siddique & Hussein, 2017) (Vogelsang et al., 2019) (Vogelsang et al., 2018)	"*scalability, complexity, reliability scope of the change, communication, dependency, lack of manual support, lack of knowledge and expertise about agile, lack of training monitoring and coaching, inadequate and dysfunctional training, rigid organisational culture, resistance to change, wrong agile mindset, lack of effective collaboration and cooperation, customer attitude, lack of budget investment or resources, lack of trust lack of commitment, time taking reverting to old way of working, cooperation in multi team environment, hierarchy of management, old bureaucracy, organisational structure, rewarding model not teamwork, self-organising team, conflicting in priorities, lack of taking ownership or decision , lack of equipment, Lack of understanding of the customer, People without the right skills, Lack of communication, lack of upfront planning, tight management control, middle level management opposition, lack of documentation lack of predictability lack of engineering discipline, inability to scale, quality issue and compliance, coordination of agile teams, inadequate knowledge about agile principles and practise, knowledge sharing with stakeholders, culture and leadership, balancing between individual versus organisational agility, competency trap, fear to change, lack of experimentation and iteration, ambiguity and constant change, organisational support, lack of training and developing employees skills, right technology, technology project, IT people lacking skill, fear of job loss, transparency, loss of control, organisational culture, resistance to change, lack of time environmental barriers, gobbet rules management believe an identity, unwilling to outsource, security and privacy issues, team diversity, perceptions and the abilities barrier, project communication, organisation and technical barriers plus project as a target setting barrier, fear and resistance to change, financial constraint, lack of management commitment, training and education, government support communication gap, planning of strategies poor layout of infrastructure and mutual trust, lack of motivation,sceptics 2 words the new way of working lack of coaching lack of training, misunderstanding agile concept, agile customise properly lack guidance autonomous team model challenging, global distribution challenges*"	(Denning, 2011, 2012, 2019),(Dikert et al., 2016),(Fry & Greene, 2007),(Gandomani & Nafchi, 2015, 2016; Gandomani et al., 2014; Gandomani et al., 2013; Gandomani et al., 2015), (Gregory et al., 2016), (Laanti et al., 2011), (Olszewska et al., 2016), (Chan & Thong, 2009), (Chau & Maurer, 2004; Chau et al., 2003), (Augustine et al., 2005), (Boehm, 2002, 2006; Boehm & Turner, 2005), (Cockburn, 2006), (Conboy et al., 2011), (Levina, 2005), (Dingsøyr et al., 2019; Dingsøyr & Moe, 2013, 2014), (Levy & Hazzan, 2009), (Oshri et al., 2008), (Pee et al., 2010), (Persson et al., 2016), (Pikkarainen et al., 2008), (Ramesh et al., 2010), (Turk et al., 2005), (Cohn & Ford, 2003), (Elshamy & Elssamadisy, 2006), (Federoff & Courage, 2009), (Fowler, 2000),(Rolland et al., 2016),(Paasivaara & Lassenius, 2016),(Karvonen et al., 2018),(Chow & Cao, 2008),(Fry & Greene, 2007),(Miller & Haddad, 2012),(Maranzato et al., 2012), (Nerur et al., 2005), (Sreedharan V & Sunder M, 2018), (Netland, 2016), (McLean & Antony, 2014), (Albliwi et al., 2014), (Almeida Marodin & Saurin, 2015), (Kwak & Anbari, 2006)

2.8. Summary of Articles

Table: 2

Author, Year	Contribution to Research	Benefits used for thesis
Digital Transformation		
Aymeric Dussart, (2021)	An airport approach to digital transformation	Digital Transformation
Sameer S. Paradkar, (2020)	Evaluate and digitally transform an organization to provide sufficient impetus	Acceleration for its digital future
Saul J. Berman, (2011)	Digital Transformation, Opportunities to create New Business Model	New Business Model by Digital Transformation
Fouad A. B. Kazim, (2019)	Digital Transformation and Leadership Style	Addresses the inability of executives and managers to successfully meet the challenges of digitalization
Gerrit Remane, Andre Hanelt, Robert C. Nickerson and Lutz M. Kolbe, (2016)	Discovering digital business models in traditional industries.	Advances in digital technologies, comprising information, computing, communication and connectivity, have led to new opportunities for business model innovation
Tobias Kretschmer1 and Pooyan Khashabi, (2020)	Digital Transformation and Organization Design: An Integrated Approach	Digital transformation, organization design, organizational structure, aggregation
Alaa Ahmad, Muhammad Alshurideh, Barween Al Kurdi, Ahmad Aburayya and Samer Hamadneh, (2021)	Digital Transformation Metrics: A Conceptual View	Develop a comprehensive understanding of the required distributions and barriers
Radhakrishnan Balakrishnan and Satyasiba Das, (2016)	How do firms reorganize to implement digital transformation	Explorative approach to digital transformation
Spencer Li, (2021)	How Does COVID-19 Speed the Digital Transformation of Business Processes and Customer Experiences?	How organizations speedup the digital trans-formation in Covid
Patricia J. Guinan, Salvatore Parise, Nan Langowitz, (2019)	Creating an innovative digital project team: Levers to enable digital transformation	Encompasses an organization's ability to adapt, respond, and position itself for success
Carmelo Cennamo, Giovanni Battista Dagnino, Alberto Di Minin and Gianvito Lanzolla, (2020)	Managing Digital Transformation	Scope of Transformation and Modalities of Value Co-Generation and Delivery
Valery Anshin and Alla Bobyleva, (2019)	The Digital Transformation Program Management In Medium-Sized Businesses	Process management's issues of digital transformation
Paul Mugge, Haroon Abbu, Timothy L. Michaelis, Alexander Kwiatkowski, and Gerhard Gudergan, (2020)	Patterns of Digitization : A Practical Guide to Digital Transformation	Reshaping entire segments and industries by Digital Transformation
María Luz Martín□Peña, Eloísa Díaz□Garrido and José María Sánchez□López, (2018)	The digitalization and servitization of manufacturing: A review on digital business models	competitive advantages through innovative digital business models
Sascha Alavi and Johannes Habel, (2021)	The human side of digital transformation in sales: review & future paths	The human side of digital transformation
Loana Borcan, (2021)	The Path from Digitization to Digital Transformation: The Case of Two Traditional Organizations	Considerable challenges for organizations

Stelios Kavadias, Kostas Ladas, And Christoph Loch, (2016)	The Transformative Business Model	How Business Models Work
Sabrina Schneider and Olga Kokshagina, (2018)	Digital transformation: What we have learned (thus far) and what is next	Disruptive impact on business and society
David Terrar, (2015)	8 Strategic Building Blocks to enable Digital Transformation	Explain the digital business landscape
Change Management		
Andrés B. Raineri, (2011)	Change management practices: Impact on perceived change results	Frequent, diverse and intense change through practices
Roland Gareis, (2010)	Changes of organizations by projects	Change definition and reasons for change
Henry A. Hornstein, (2015)	The integration of project management and organizational change management is now a necessity	Project management processes and the training
Jorisvan der Voet, (2014)	The effectiveness and specificity of change management in a public organization	Transformational leadership and a bureaucratic organizational structure
Jacqueline Auguste, (2013)	Applying Kotter's 8-Step Process for Leading Change to the Digital Transformation	Reasonable and practical threshold for Kotter Model
(Appelbaum et al., 2012)	Back to the future: revisiting Kotter's 1996 change model	Application of the Kotter`s model
Agile and Digital Transformation		
Maija Ylinen, (2021)	Incorporating agile practices in public sector it management	A nudge toward adaptive governance
Paterek Pawel, (2017)	Agile Transformation in Project Organization Issues, Conditions and Challenges	Advanced business services
Kieran Conboy, Sharon Coyle, Xiaofeng Wang and Minna Pikkarainen, (2010)	People Over Process: Key People Challenges in Agile Development	Agile adoption, Methodologies and People factors
Rashina Hoda, Norsaremah Salleh , John Grundy and Hui Mien Tee, (2017)	Systematic literature reviews in agile software development: A tertiary study	Four core values and twelve principles, laid out in the "Agile Manifesto" for Transformation
Ilia Bider and Amin Jalali, (2016)	Agile business process development	Why, how and when applying Nonaka's theory of knowledge transformation to business process development
Stephen Denning, (2010)	Agile's ten implementation challenges	Collection of radical practices
Elin Brekkan and Eystein Mathisen, (2010)	Agile methods	System development processes.
Haydn Shaughnessy and Fin Goulding, (2020)	Sprinting to digital transformation: a time boxed, Agile approach	Degree of dysfunction to a new operating model
Balasubramaniam Ramesh, Lan Cao† & Richard Baskerville, (2010)	Agile requirements engineering practices and challenges: an empirical study	Requirements engineering risks and agile practices
Maarit Laanti, Outi Salo and Pekka Abrahamsson, (2011)	Agile methods rapidly replacing traditional methods at Nokia	Agile transformation
Fernando Salvetti and Barbara Bertagni, (2020)	An Agile Mindset for a Digital Future	Agile mindset in young corporate leaders
Christoph Fuchs and Thomas Hess, (2019)	Becoming Agile in the Digital Transformation	Process of a Large-Scale Agile Transformation
Ludovica Moi and Francesca Cabiddu, (2020)	Leading digital transformation	Agile Marketing Capability

Barriers		
Lubna Siddique; Bassam Hussein, (2009)	Agile Methodology Adoption: Benefits and Constraints	Agile philosophy is to deliver Success Factors
(Shankarmani et al., 2012)	Barriers and Solutions	Large-Scale Agile at Organizational Level
Florin Dumitriu, Gabriela Meșniță, Laura-Diana, (2019)	Barriers success factors and leading practices	Barriers Solution
(Cichosz et al., 2020)	Challenges and success factors for large-scale agile transformations	A systematic literature review
Shahla Ghobadi & Lars Mathiassen, (2015)	Perceived barriers to effective knowledge	Sharing in agile software teams
Cao, T. C. (2008)	Study of critical success factors in agile software	Defining System Software
Leau Y B, L. W. (2012)	Agile development life cycle	AGILE vs traditional Digitalization
Khan, M. A. (2012)	A Method for the Selection of Agile Digital Development	Life Cycle Models for Digitalization AHP
D. Stankovic, V. N. (2013)	Critical success factors in Agile software	Systems and Software in IT Companies
A. A. (2014)	Agile Adoption Experiences	Issues in order of difficulty
S. Sultana, Y. H. (2014)	A Hybrid Model by Integrating Agile Practices	Digital Hybridization
Authors, F. (2015)	Digital Transformation	Enterprise Information Management
Vrhovec, T. H. (2015)	Diagnosing organizational Barriers	Solutions for diagnosed Barriers
Pinto, P. S. (2015)	Agile Algorithm	Process of Digitalization
Linke, K. (2015)	Traditional and Agile Comparison	Management Approaches for Digitalization
Juneja, P. (2015)	Kotter's 8 step Model of Change	Management Study Guide for Change
T. A. El Hameed, M. A. (2016)	Identify and Classify Critical Success Factor	Agile Methodology Using Mind Map.
G. H. Pourhanifeh, M. M. (2016)	Identifying the critical success factors of Agile	Analytic Hierarchy Process success factors
Grigorii, L. (2017)	A Quantitative Analysis of the Success of Agile IT	Rated Agile Success Rate
Indonesia, U. (2017)	Critical success factors of development	Digitization for Development
Liu, D. (2017)	An empirical study of Agile planning	Critical Success Factors Digitalization
Peitl, K. C. (2017)	Agile Methodology: Benefits and Barriers	Solutions to Barriers
R. Head, P. S. (2017)	Running Head: Success in Agile Development	Multi- Agile Dimensional Success Factors
Kaleel, S. B. (2018)	Agile Methodology in Mobile Software Engineering	Android Application Development and its Challenges
Lee, J. Y. (2020)	Agile Transformation	Advanced Culture Technology
Al-saqqa, S. (2020)	Agile Digitalizaion Development	Methodologies and Trends
Patel, C. (2020)	Agile for Digital Transformation	Digital Transformation

2.9. Research Gap

It's very important to search for some of the relevant literatures in the light of our problem statement used to generate the research gap. (Chow & Cao, 2008)studied the critical success factors of the agile methodologies lacking in digital transformation further the same study related to success factors for scaling if agile found in (Shameem et al., 2020; Shameem et al., 2017). (Leau et al., 2012)found a life cycle of agile development and the rules utilized in an organization.(Khan et al., 2014)highlighted the method of agile selection which will be beneficial for transformation process. (Stankovic et al., 2013)discussed the critical success factors of agile that makes them successful for using in company. In another study (Gandomani et al., 2014)highlight human aspect related barriers while adopting and transition of the agile in software development. In (Vrhovec et al., 2015) studies organizational risk factors involved discussed barriers related to agile algorithm transformation by comparing with traditional methods. (Abd El Hameed et al., 2016)identify the CSFs of agile and classify them to overcome barriers for their successful implementation. Most of the work done was in 2017 by (Grigorii, 2017; Kasayu et al., 2017; Liu & Zhai, 2017; Peitl & de Oliveira Baptista, 2017; Veiga, 2017) all have discussed the success of agile and it has been rated on the basis of barriers to some extent. (Dikert et al., 2016; Ghobadi & Mathiassen, 2016; Kaleel & Harishankar, 2013) discussed the challenges/barriers to implement agile in mobile application methodologies for succession. In last year 2020, (Al-Saqqa et al., 2020; Lee, 2020; Patel et al., 2020)spotted a light upon agile transformation for development however there is very limited work has done in the direction of agile being used and tool for digital transformation.

After gone through the literature we hereby see the research gap in the literature where none of the author have discussed barriers while implementing or using agile as tool for digital transformation. This is also evident during literature review where (Pawel, 2017, p. 197)*"the majority of the agile transformation deployment (31%) took place in the IT software (17 %) and telecommunication industries (14 %)"*.Further there is very little literature found in previous studies related to agile digital transformation specially by using college digital library search engine data base "Business Source Complete" and looking for academic journal we could not see any study related to our problem statement for this thesis. Therefore, we decided to further

explore and to write this thesis. We decided to further explore the role of agile methodologies, challenges, barriers related to in specific context of digital transformation.

2.10. Problem Statement and Research Question

Success or failure of digital transformation using agile depends upon the different factors/criteria discussed above as highlighted Literature review. Researchers have already identified barriers in different dimensions which is our top objective (like project, people, process etc.) which influence the industry when successful digitalization takes place. There is limited research on the classification barriers based on agile methodologies in specific to digital transformation. By knowing ranking, grouping of factors (barriers) and then classifying them under agile methodology will provide roadmap to adopt agile methodology for digital transformation. Which is also challenging for and proposing a model for adopt agile methodologies to remove these barriers. So, mandatory factors to ADT to address these barriers and to focus on them by giving priority to these factors important in the process of digital transformation. It is challenging for agile practitioner to decide and adopt the agile for a specific project based on different factors and criteria(Liu, 2017). Agile techniques were introduced to the market officially in 2001 to address these issues, and the market data shows that agile approaches outperform existing ones. (VersionOne, 2016). Multiple variables have been identified in the literature as contributing to the success of agile projects in relation to the following areas: organisation, people, process, project scope, and technical. There is a critical need to examine such issues, with the goal of identifying the most important ones. To determine the effectiveness of software projects, experts have previously characterized them based on a variety of factors (including "time, cost, scope, and quality").

Problem statement:

Use of agile methodologies in digital transformation – barriers.

To found out the barriers we further narrow down in following research questions:

- **RQ1: What are the main barriers for agile digital transformation?**
- **RQ2: How can agile methodology help to reduce the impact of these barriers?**

3. THEORETICAL FRAMEWORK

The theoretical framework we are going to use in context of contingency theory and Kotter's model for change management by exploring empirical literature for barriers /challenges in the process of digital transformation and thus with potential implication for smooth flow of technological shift in this digital era.

3.1. Contingency Theory

Various organization theorists have identified various organizational characteristics and define performance in the organization in different ways. The main assumption of the contingency theory is the application of the contingency approach due to the lack of universal management methods in organization management(Nita, 2013b, p. 195). According to author, each organization is influenced by miscellaneous contingency factors due to a unique profile, operating in a different environment with different conditions, and contexts. This theory also assumes that there are no available universal management methods, where the existing ones are influenced by contextual variables and contingency factors, which are determined by the unique conditions and situations of the organization in which it operate (Otley, 1980).

Previous researchers have presented the contingency concept using to universalistic view approach and situation-specific view approach (Fisher, 1995) and (Hambrick & Lei, 1985). In the contingency view, the operability and management decisions of an organization are influenced by both the distant and proximal environment of the organization. (Nita, 2013a, 2013b)posits that the contingency theory aims at recognizing universal properties and features of organization management methods and how they apply to a specific organization in a specific context and situations of contingency factors.

(Burns & Stalker, 1961)assert that prior researchers used the contingency approach to establish the difference between the organic and mechanistic forms of management and organization. These researchers associated the routine technology stable environment and mechanism form. According to the organic form strongly correlated with turbulent and unstable changing technology, However, they(Burns & Stalker, 1961) suggested a continuum with mechanistic and organic, where the organization extremes were falling somewhere in between. (Child,

1972)posits found that there is a significant association between an organization's size and characteristics of its structure.

In the digitalization world, agile methodologies are applied to respond to different contingency conditions and factors in each organization's operational environment, which are triggered not only by the volatility of customer expectations but competitor's movement as well(Pawel, 2017). The application of agile methodologies is an example of management method changes triggered by the transition of contextual variables. Various internal and external contingency factors are associated with the application of agile methodologies(Tavani et al., 2014). Contingency theory plays a substantial role in understanding challenges, issues, and potential solutions in the agile transformation process(Yang, 2017).There is a need for contingent leaders with adaptive capability and flexibility to ensure productivity in an organization as posit by (Tavani et al., 2014) contingency theory is a behavioral theory that strongly suggests no specific way that an organization can be led in a more precise manner.

According to(Fiedler, 1964), leadership style is fixed and can be measured using the least preferred co-worker (LPC) scale. This scale advocates the need to think and appreciate the person whose working habits have least been enjoyed. Author in his research determines three (leader-member relationship, degree of task structure, leader's positional power)situational and empirically dimensional variables used to strengthen contingency theory.

(Simon, 2007) used the contingency context in his study to relate effective leadership, adaptive organization structure, project management accounting, project management, and effective incentive systems. According to (Paterek, 2017, p. 194) "*contingency theory play an important role in agile transformation process by facilitating & understanding issues, challenges and conditions, process nature itself and result of change introduced in project management".*According to (Nita, 2013b) main focus of empirical study in the context of contingency theory is to identify both internal and external contingency factors influencing the development, innovation in applied management context. In our study we also going to identify these hindering factors in process of agile digital transformation.

3.2. Change Management & Kotter's Model

Organizational change management is subdivided into four main changes; managing change, resistance to change, change approaches and conclusion(By, 2005). It is the modifying and transforming of the organizational structure, process, or products for desired future growth(Cameron & Green, 2019). Organizational changes can be reactive or proactive in organization structure, work force size, technology, ways roles are carried out and in environment. *"Change management practices include a variety of organizational interventions that, when executed properly and in consistency with internal and external organizational events, facilitate the enactment of organizational change processes"* (Raineri, 2011).

"In order to cope with the complexity of the environment organization have to undergone change management which allows building up and reducing complexity as well as dealing with the dynamics of organizations" (Gareis, 2010). Change is of different intensity and speed and can occur in different levels such as individual, group, organizational and social level (Lueger et al., 2002). In fact change is continual process with strategic objective and therefor it is *"the movement of a company away from its present state toward some desired future state to increase its competitive advantage"*(Hill & Jones, 2001, p. 486). Organizations can survive in dynamic environments only if they manage to learn and change at a speed that fits the dynamics of their surroundings (Gareis, 2010).

In the framework of the present paradigm, first order modifications are performed, which may readily and undetectably impact organisational views, processes and practices. (Levy & Merry, 1986). While a "change" of the second order involves a fundamental shift, it is a "qualitative, multi-level, multi-level change" in the organisation. The company has a new look and spirit. In contrast to "1st order change," "2nd order change" is considered as a non-continuous and significant structural and cultural shift in the organisation. (Levy & Merry, 1986).

A three-phase model created by Kurt Lewin in 1947 defined the stages of change management. There should be a three-step approach to "release, move, and freeze" your company throughout this transition (change). Identifying and strengthening the forces driving change begins with defrosting current structures and processes. The next phase is to look for new patterns, evaluate them, and make the appropriate adjustments. The chosen structures, processes, and behaviour

patterns are then fixed in the third stage. These three processes have a significant impact on academics' and practitioners' current perceptions of transformation. (Lewin, 1947).

According to Kotter (1996) model, following phases are involved: creating a sense of urgency and need for action; building an effective coalition; formulating and communicating an overall plan; planning; and achieving short-term successes before moving on to the next phase. According to Kotter (1996), effective change is impacted by the right kind of motivation to overcome opposition to it, as well as the right kind of management. J. Kotter (1996).

It is a simple model with step-by-step instructions. a clear and concise description and guidance on the change process which is easy to implement. It insists on accepting and involving employees in the achievement of the process. The major emphasis is on building up and accepting employees for a change instead of the actual change process(Jacqueline Auguste, 2013).

Through creating a sense of urgency, having a goal and effective communication, removing obstacles, and creating bigger wins, you may make change part of organizational culture. Through resistance, organizational change is met especially in long-existing organizations. As a leader or employee in an organization, implementing changes can be intimidating especially when given a list of duties that has already be done. When big changes occur, leadership can make difference between successful companies and those that are not successful(Aldemir).

By finding and developing excellent change in the leadership that directly helps to create a powerful team connection that work together to accomplish their goals. Also, identifying weak areas in the team and making sure they work under influential people(Neumeier, 2013). Developing a vision can be determined by change leaders in the organization who can explain the vision effectively and in a manner that people can easily understand. Communicating the change in the vision every time to convince people, it should be done powerfully while handling the concerns of people and involving them. Removing obstacles as you ensure the organizational culture and process is in place with organizational vision. By creating short-term wins, you can enjoy the early stages of change. These short-term wins are achievable and less expensive than long-term wins.

The importance and validity of Kotter's model remain recommendable, and it been very widely used by academic and professional leaders, having said that though model has some limitation but no evidence is found against this model (Appelbaum et al., 2012). Another study shows that where8-step Kotter's model is used for the implementation of digitalization in of an "*Orthopaedic Surgical Practice Group in Toronto with finding (lack of knowledge, habit, lack of motivation, fear of the consequence) as barriers"* (J Auguste, 2013).

3.3. Research Model and Framework

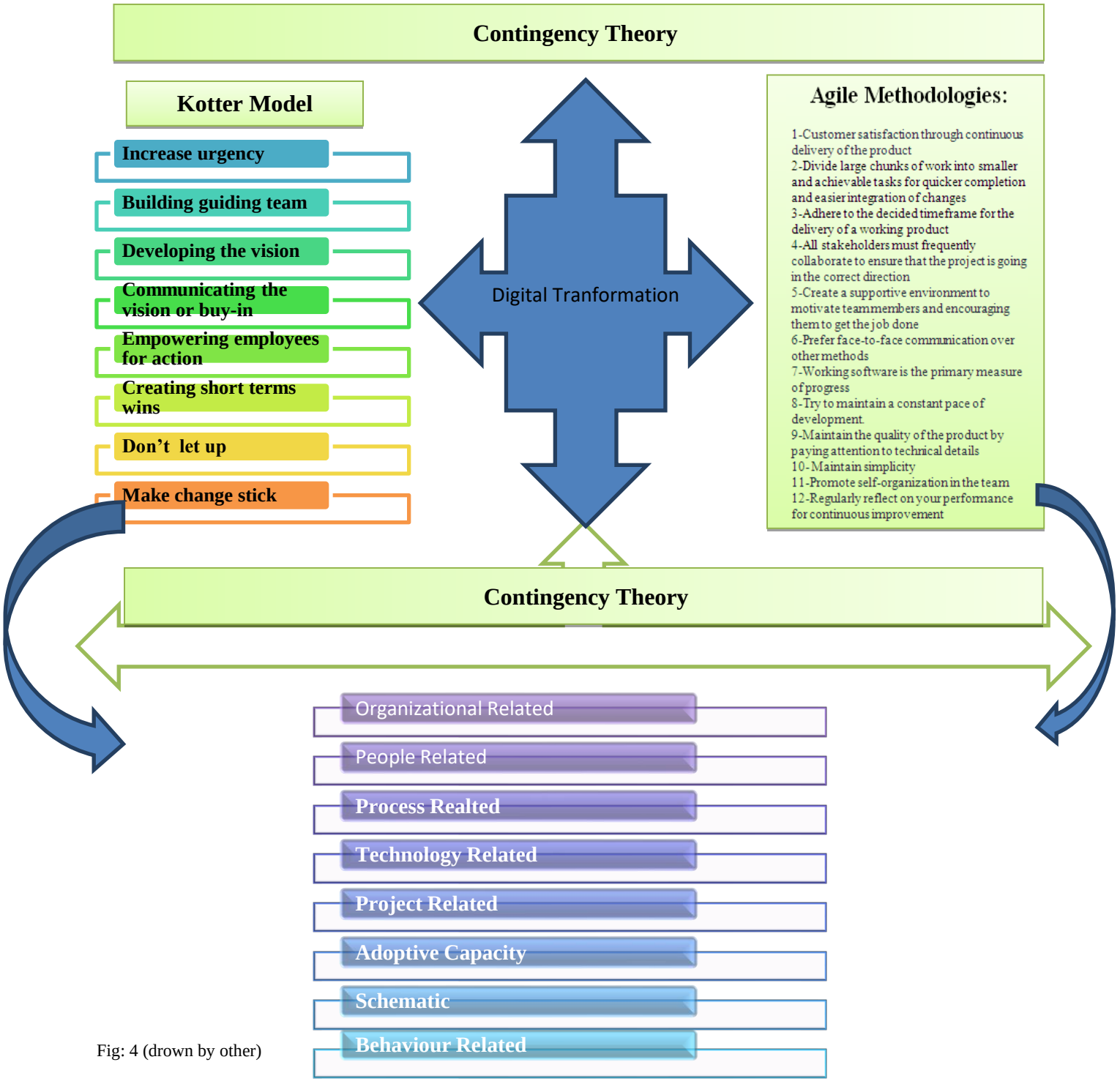

Fig: 4 (drown by other)

3.4. Justification of the Model

We have designed this model which is most suitable for our research objective. The conceptual framework of our research designed was to find out barriers in the process of digital transformation using agile methodologies. We are going to use contingency theory and Kotter´s model while describing and discussing various barrier, and what previous researcher has informed us regarding these barriers. We will try to create linkage for the applicability of old theory and Kotter´s model relevance. Further we will be discussing distinguish key factors with respect to which we have divided in Barriers groups, “BG1” till “BG7”. Similarly, we have coded 8 point of Kotter’s model like K1 till K8, and then Agile values as AV1 till AV4, and agile principle as AP1 till AP12. When its comes to respondent as we have opportunity to have interview of only 5 respondent which we have also coded them as R1 till R5.

4. RESEARCH METHODOLOGY

The main objective of our study is to present challenging factors (barriers) in the process of digital transformation as organizational change by introducing the agile methodologies. In our study we will try to find out how these new agile methods relate to the Kotter's model of change management& will further throw a spotlight in context of contingency theory.

In order to find desired research objective both quantitative and qualitative approach are used (Mehmetoglu, 2004). The choice of data collection tool whether it should be quantitative or qualitative depends upon nature of research, availability of data. In our case we found qualitative approach a best suitable fit to our problem statement of the thesis. We have limited available access to target group, which is in our case very small.

We have divided the qualitative research process into 3 phases. Research phase, Data collection phase and the phase of data analysis as (Mehmetoglu, 2004)mentioned. The first phase of research we described mainly in first to chapters. That is background of the study, the structure of thesis, the review of literature, definition of the problem, principles, and models.

In the second phase, we have been looking for all the relevant companies and experts who have worked with agile system development in IT and digitalization and especially with the methods we are interested in. We are two students who work on this assignment and are in full-time work which in turn leads us to limit our use of time and choose the area with care. In addition, the corona pandemic has made it very difficult to meet people physically and therefor it is important to have an opportunity to perform digital interviews. In addition, our opportunities to find the relevant respondents are very few. Therefore, we were open to execute the interviews both digitally and in person. Here we have used SSI as described in section 4.3 of our thesis. We have managed to find 5 respondents in the end, which give a broad representation of the target group that we were not sure if was possible to achieve at the beginning. We have interviewed the respondents through physical meetings and through digital interviews that are stored in recordings for processing later. The presence of so many respondents in the required group leads us to believe that the principle of objective purpose selection has been taken care of (Seawright & Gerring, 2008).

The final stage of the process is analysis where data is obtained, categorized, and answers the problem. We have chosen to use the circular qualitative research process where, unlike the waterfall method, agile itself is used in the research process as well. Here it is possible to use a circular approach as a research method for qualitative research. This allows us to adjust and replenish information after you have received initial information by, for example, returning to the respondents to supplement the information and data collection (Mehmetoglu, 2004). The reason for this may be many. This can be done by needing additional information, replenishment of information, clarification of previous information and deficiencies in the first attempts.

Using qualitative methods, one tries to arrive at the best description of the course of events. We are trying to find out which barrier one encounters using Agile mythology in digital transformation. To arrive at the final solutions, we need the help of the respondents who help us find that answer. We put together that information to achieve the final answer. Thus, we see that we must adopt qualitative methodology as we need detailed and specific information to arrive at the real answer and we can only get that from experts working on this field and especially on this issue. That experience will lead us to our solution. Here it will not be of great help to gather unnecessary and a lot of information in quantitative surveys and thus be less suitable since we seek insight into the problem. There is not an easy way to carry out qualitative research as it is a multi-armed research strategy. Over time, it has become an innovative and free form for common research methods with several opportunities to attack the problem that can be easily adapted from situation to situation (Mehmetoglu, 2004).

We have chosen to establish a framework for research model that can be called research design as well. Research design will be used to tell how to shed light on the problem. There are several research designs to choose from such as descriptive, exploratory, and causal (Sreejesh et al., 2014) . We have mainly chosen to use the exploratory design for our task. Because it is a completely new issue that we choose to write about, it has been difficult to have all the answers to methods and procedures ready in advance.

4.1. Selection

As described earlier, the qualitative method has been used to carry out our research and thus it is open to an exploratory research design. We need to collect information that is specific to our needs and can serve our purpose. We have therefore chosen to speak to the right respondents who provide us with information that is "to the point" & can contribute to our research work. We therefore selected IT researchers and IT experts in Agile, Leane, Scram and KANBAN users in those companies and agencies who have direct contact and experience with the development of systems that lead to the digital transformation using Agile mythology.

It is the same as the Purpose selection Principle adopted in practice. This is a direct criteria-based and experience-based sample. We have thus pre-selected and defined our target group before we have initiated the data collection. This provides an almost perfect sample of respondents in Norway with the current situation in the field and developments with limited target group to choose from.
We focused on that respondent must be working in the management of companies and projects so that we can get the right information with a focus on the changing effect in the companies and the real problem that is more related to Agile use of change management and digital transformation.

In this research, we have chosen to lean solely on companies that had Agile transformation during digital development as one of the methods they used for IT and application development. We were aware that there are different types of challenges that meet companies of different sizes, therefore it is important to choose projects and companies of different sizes. Our dilemma was the lack of enough respondents and respondents. This topic and issue are so new in relation to societal developments and developments in general in the IT-world globally that it was almost impossible to get the right respondents in the market.

Digital transformation with the use of Agile methodology has come a long way worldwide during this year compared to what it was before the corona outbreak. But in Norway development is still in infant mode. This creates challenges in finding companies and people who

may have experience in this field. We were unsure whether we could find some respondents who could belong to different companies of different magnitudes. The goal was to find more than one simple informant and respondent. This issue with too little choice has also made us even more confident that it is the subject we must work on to shed light on. Thus, this research becomes even more important for the development of a society and technology in the future (Esaiasson et al., 2007).

In order to find respondents and interviewees, we have used different mediums to contact the companies and those we believed could be experts in the field. We obtained information through different channels and IT companies to arrive at the right resources. In this experiment, we also received help from our supervisors about choking who have encountered similar developmental problems. We contacted our respondents through email, internet, social media and telephone (Esaiasson et al., 2007).

Because there are a very small number of respondents, we will have detailed information to go into a specific issue. Thus, there will actually be reinforcement of the information if it is repeated and gives similar results through several interviews (Sreejesh et al., 2014). As mentioned, this issue is new in society. And our hope of finding more respondents were small. But after researching and scrutinizing the market for a long time and carefully, we managed to reach a total number of 5 respondents. This was a big improvement and increase compared to what we had estimated as the real number of respondents. This was due to little access to expertise in the field among Norwegian developers, and we assumed that samples that can provide us with the specific and correct information with full quality could be substitutes for several respondents. This means that we expected a theoretical saturation within 2 respondents. As we have told, we were lucky enough to reach up to 5 respondents for our research and interview.

We faced a new challenge in the performance of the interviews and the procurement of good respondents. This challenge was the shutdown of the country itself and the corona restrictions. This meant that we had to postpone a lot of the work and interviews even though we had the opportunity to take those interviews through digital media. This shutdown also led to high demand for digital media and new developers and the development of systems that could be

adapted to consumption in society in different aspects of life. This led to great pressure on developers and companies working on the modern development with the use of Agile transformation. This demand has improved much of the world's IT development and use, but at the same time we were unable to conduct our scheduled interviews on time. Afterwards, we see a great advantage from the fact that it was somewhat delayed, and the advantage here was that several of the people we spoke to had gained even more information and experience in the field (Esaiasson et al., 2007).

4.2. Conducting interviews and guidelines

Our outmost objective to conduct interview from the expert is to get as much as insight knowledge regarding agile methodologies with respect to digital transformation and barriers associated with them. We actually planned to conduct interview up to 60 minutes from each of the respondents. We were lucky enough to find two respondents in the same company in our first interview and that was very effective. The first interview was very constructive, and we spent 1 hour and 17 minutes. R1 with his expertise and knowledge explained his answers and further elaborated them with the help of using whiteboard. In this way we got better understanding about the agile methodologies and there use in various contacts. That we will further explain in detail in next analysis and discussion chapter. In the second interview, we were only able to conduct the interview only for 29, but the respondent has grate knowledge about different agile methodologies and d their utility for different companies, different organizations, and different projects. Both interviews were conducted physically in their office. We observed that both the respondents were very engaged, and eager to contribute their role for collecting information which was very helpful for our thesis. They were also very keen to talk about other aspects that they thought were important for agile change processes.

As mentioned earlier, we recorded all the interviews. These were saved on mobile and on PC. We chose two different saving options so that we could have backup if one recording does not work or gets corrupted. We chose to link the recordings up to our cloud-based storage in Teams so we could download it as needed if the recordings were defected. We have been very careful with storage and safety. We asked our respondents if they agreed that we recorded the interviews

before we started recording. Furthermore, we chose to save the recordings with code security so that no outsider could access the interviews without security codes. This is to take precautions for information security and GDPR.
We chose to write down and proofread all the interviews almost immediately after the interviews were conducted. This gave us the opportunity to have the whole information fresh in mind while we got it down in written format. To find the answers to the problem, we have analyzed and taken information from the interviews through the transcription carried out by the interviews.

We conducted our interview by following the guideline as per (Mehmetoglu, 2004)that is make an interview in a conducive environment first one have to ask very generic introductory question two break ice. After breaking the ice, we asked theoretical question about the actual problem statement, that is in our case generation of digital transformation and agile methodologies. further to get deep insight understanding of use of agile in digital transformation and what sort of barrier managers and technologist are facing. At the final stage of interview, we try to sum up and asked ask question about the main topic for better comprehension.

4.3. Data collection

We have chosen to use SSI (Semi-Structured Interviews) for data collection. In that setting, we chose to have interview that is more open and more like a conversation. It is important to gain insight information into the different perspectives of the respondent and more importantly to ask similar questions to all the respondent so that one has comparable information collected(Johannessen, 2011). After reviewing the subject and the details of our problem, we carefully examined the information we needed to collect and found that there is a great lack of information on this topic in society today. This in turn meant that we had to settle for getting very few respondents. We were therefore aware that we need to make a great deal of arrangements for the few respondents who allow themselves to be interviewed. An even more important aspect of planning the interviews was to ensure that we could carry out our interviews in different ways as the limitations in society around the corona outbreak will mean that we will not be able to carry out all data collection in the same way as normal. We foresaw and predicted

that we must adapt different methods of collecting information. In this case, the easiest should turn out to be digital interviews through Zoom and Teams. We planned digital interviews in addition to being able to conduct physical meetings with the interviewees, when and where it would be possible for them.

We had planned to share the assignments between both of us interviewers. One of us should note and follow that all the questions were included and the other should have direct contact with the respondents and engage them in the conversations and interviews. The questions were set up so that one could easily compare the answers of the respondents with each other, and one could use themes to go into depth for the information needed by digging further around the topic. We often used simple methods to let respondents to elaborate their expert opinion regarding the question we posed during the interview. This helped us to dig out in-depth insight about the topic that could generate leading questions without interrupting the respondent. For our better understanding where we thought it was a vouge answer according to our understanding, we request them to further elaborate.

4.4. Research quality an ethics

The main criteria for any qualitative research normally gaged by two main factors, validity and reliability (Mehmetoglu, 2004). These both concepts are used 2 evaluate how good searches another word the quality of the research. it is basically indication how well selected method, technique or any test measure the desired output. When it comes to reliability it's basically the consistency of the result, which is in our case, we can say that most of the respondent have provided not exactly 100% same but very near to similar response during their interview. As far as validity is concerned, we have learn through the literature and our finding after conducting the interviews it support our research objective that is a lot of barriers in while applying agile methodologies in the process of digital transformation.

While conducting research it's important to be aware of the ethics off research Methods. It's important that respondent is aware off the interview, and researcher have to respect respondents free will to choose to give or not give the information. At the same time the researcher must take care og the information and protect it.

4.5. Coding of data

In most of the academic research coding play very important role while segregation of variables in data collection and data analysis phase. Therefore, for better understanding to bringing ease factor analysis part we also introduced coding of the major variables. We have divided our research model with help of coding for each of the 8 Kotter´s model point, 12 agile principles, 4 agile values and most important out of all is the barriers what divided in to 7 barriers group as follow.

Table: 3

Code	Agile Values
AV1	Individuals and interactions over processes and tools
AV2	Working software over comprehensive documentation
AV3	Customer collaboration over contract negotiation
AV4	Responding to change over following a plan.
Code	**Agile Principles**
AP1	Satisfying customers through early and continuous delivery of valuable work
AP2	Breaking big work down into smaller tasks that can be completed quickly
AP3	Recognizing that the best work emerges from self-organized teams
AP4	Providing motivated individuals with the environment and support they need and trusting them to get the job done
AP5	Creating processes that promote sustainable efforts
AP6	Maintaining a constant pace for completed work
AP7	Welcoming changing requirements, even late in a project
AP8	Assembling the project team and business owners daily throughout the project
AP9	Having the team reflect at regular intervals on how to become more effective, then tuning and adjusting behaviour accordingly
AP10	Measuring progress by the amount of completed work
AP11	Continually seeking excellence
AP12	Harnessing change for a competitive advantage

Source: (Beck et al., 2001)

Table: 4

Code	Kotter Model	Code	Barrier Grouping
K1	Create Urgency.	BG1	Organizational Related
K2	Form a Powerful Coalition.	BG2	PeopleRelated
K3	Create a Vision for Change.	BG3	ProcessRelated
K4	Communicate the Vision.	BG4	Technology Related
K5	Remove Obstacles.	BG5	Project Related
K6	Create Short-Term Wins.	BG6	Adoptive capacity
K7	Build on the Change.	BG8	Behavioral Related
K8	Corporate Culture.		

Table: 5

Code	Categories	Barriers
BG1	Organizational Related	• Management Commitment • Organizational size • Organizational culture • Corporate social structure • leadership dynamics • lack of Coordination • Engagement Cross functional area • Structure of the Organization
BG2	People Related	• Necessary Knowledge • Necessary skill • Project management competence • Team - work • Team player • Product owner relationship • Product owner effectiveness • Training &learning culture • Tuner, Age, Experience • Autonomous team • Reward model not teamwork
BG3	Process Related	• Defined project scope • Defined project requirements • Defined project planning • Agile progress tracking • Customer participation
		• Set of appropriate agile practice • Right tech with right tool

BG4	Technical Related	• Complexity • Technical knowledge and skill • Inappropriate IT infrastructure • Technological equipment
BG5	Project Related	• Project specification • Dynamic nature of the project • Size of the project n team size
BG6	Adoptive capacity	• Lack of adequate knowledge • Organizational size • Financial constraints
BG7	Behavioral Related	• General resistance to change • Fear of consequences • Missing agile mindset • Opinion and attitude • Trust • Motivation • Communication • Coordination • Knowledge sharing

Table 6

Respondent	Varighet intervju	Stilling
R1	**77 minutter**	**CEO og utvikler.**
R2	**29 minutter**	**Teamleder og Agile Scrum master.**
R3	**59 minutter**	**Direktør IT og leder digitaliseringsprosjekt.**
R4	**55 minutter**	**Direktør teknologi og marked.**
R5	**36 minutter**	**Direktør IT utvikling.**

5. RESULTS AND ANALYSIS

I dette kapitlet vil vi presentere våre funn og tolke svarene vi har fått fra alle de 5 respondentene, våre intervjuer og forskning.Vi har 5 respondenter som er fordelt med koding R1 til R5.Vi skal gjennomgå den grunnleggende informasjonen som er innsamlet aller først i kapitlet. Deretter skal vi dele respondentens svar etter underkapitler som er basert på 7 grupper av barrierer vi har laget etter den grundige gjennomgangen av teorien, Kotters modell og Agile prinsipper. Dette for at de som studerer denne rapporten skal forstå barrierene på en enkel måte og kan lage konkrete planer og strategier for å håndtere de utfordringene og barrierene.

Fra tidligere av så har endring og endringsledelse vært i fokus i flere tiår. Tidligere så ble Contingency teorien brukt til å komme med løsninger på utfordringene og barrierene (Otley, 1980). Senere kom Kotters med sin modell (J. P. Kotter, 1996) for å håndtere de barrierene bare i en enda mer strukturert form. Vi har fortalt kort om disse teoriene og modellen i rapporten. Selv om Kotters modell er noe eldre så er den veldig nyttig og aktuelt selv i dagens utviklede og endrende samfunn (Appelbaum et al., 2012).

For å gjøre det enklere å forstå de forskjellige barrierene har vi delt barrierene i forskjellige grupper og listet dem opp i tabell 4 og tabell 5. I beskrivelsen og diskusjonen kommer vi til å gi svar på hvilken barriere våre respondenter har indikert og fortalt om. Vi skal også sammenlikne de forskjellige barrierene til Agile prinsipper (fra tabell 3.).

Vi gikk målrettet til de respondenten som var eksperter og hadde stor innsikt i feltet innen digitalisering og bruk av agile metoder for digital produksjon og transformasjon av systemer og arbeid. Dermed hadde vi ikke behov for å spørre ytterligere om respondentene hadde samme forståelse av det agile metodene ved digital transformasjon. Alle var eksperter innen Scrum og agile utviklings metoder. Respondentene hadde erfaring innen emne mellom 7 år til 17 år. Vi går derfor rett på spørsmålene som kan lede oss til barrierene vi skal undersøke i dybden.

«Agile methods bring drastic changes regarding team hierarchies, organizational structures, planning or controlling processes»(Dumitriu et al., 2019).

5.1. Barrierer

BG1: Organisasjons relaterte barrierer:

Barrierer som rører ved «organisasjonen», kan ha med følgende underliggende punkter å gjøre: Forpliktelsene til ledelsen, selskapets størrelse, organisasjonskultur, selskapets sosiale kultur, leder dynamikk, mangel på koordinering, aktivitet på tvers av de forskjellige funksjonsområdene i selskapet og de økonomiske begrensningene.

Internt kultur og forståelsen for utvikling som en del av internt kultur er en viktig del av organisasjonen (Rajagopalan & Mathew, 2016). Hvis man har denne kulturen som en del av organisasjonens DNA og iboende del av organisasjonskultur, så vil arbeidet med å adoptere endringer bli en veldig enkel sak. Selskapene ser ofte fordelen ved å ta i bruk Agile metoder men mangler nødvendig mulighet og behov til å endre selskapets kultur for å tilpasse agile teknologier (Kenneth S Rubin, 2012).

Hvilken utfordring kan du komme på som har direkte med organisasjonen å gjøre?

R1:

«*Den tradisjonelle måten å drifte utvikling og organisasjoner fungerer fortsatt i store deler av verden. De tradisjonelle måtene å drive den økonomiske ledelsen, organisatorisk ledelse og tradisjonell endringsledelse har ikke forsvunnet helt grunnet den gir et formalisert samfunn, men det passer ikke helt inn under det digitale utviklende verden.»*

Med dette prøver respondenten gi indikasjon på at ledelsesmåte kan være en barriere i utviklingsprosesser. Det blir også nevnt at den gamle måten å lede på ikke er helt borte fra systemet enda.

«Teknologien vår endret seg fra den industrielle til det digitale, men hvordan samfunnet organiserer seg på er den dagen i dag den gamle metoden. Det brukes fremdeles industriell ledelses tankegangen, industriell planleggings tankegangen, industriell forretningstankegang. Det vi mangler i dag er dagens Henry Ford eller Tyler som kan endre metoden vi skal jobbe på etter at den digitale teknologien er kommet i samfunnet. De gutta fant ut hvordan man skal endre organisasjonen.»

R1 ser at det er behov for en drastisk endring i samfunnet som kan dytte samfunnets i den riktige retningen. Da må noen proaktive sjeler lede veien. Han savner derfor personer som kan ta det store skrittet mot moderne utvikling.

R4:

«Selskapsstruktur og kultur er begge viktige nøkkelbegreper i organisasjonen som skal utvikle agile metoder og systemer. Man velger helt nytt prinsipp hvis man skal lykkes med den agile utviklingen, og det er flat selskapsstruktur i form av utviklingsarbeid. «Welcome to flatland»

«Med en slik organisasjonsstruktur vil transformasjonsarbeid bli mye enklere og smidig. Folk beveger seg rundt i selskapet på tvers og «selger seg selv» ved å dele sin kunnskap og erfaring i bredden.»

R4 peker mot den nye ledelses strukturen i organisasjonene hvor den hierarkiske metoden begynner å bli gammel. De vil ha en mer flat struktur for utvikling.

R5:

«I de nye organisasjons strukturen skal faggrupper få lov til å samles på tvers av sine grenser for økonomi skapning og utvikling».

I svaret for dette spørsmålet kommer det klart fram at respondentene er tydelige på at organisasjonskultur, spesielt åpen kultur med muligheter for læring på tvers av organisasjonen er en viktig faktur for å lykkes i smidige digitale transformasjoner. Sammen med dette påpekes det at man må få endringer i ledelsesmåtene og ikke bare endringer i teknologi.

Holder det med at utviklingen utføres i kun IT miljøene i selskapene for å få en god og smidig transformasjon til digitalisering? Eventuelt hvor viktig er ledelsen i prosessen?

R1:

«Problemstillingen dukker opp når vi tror at kun bruk av smidig på den ene siden er nok for en god endring. For en bærekraftig og sterk utvikling må man ta tak i dette på flere ledd. Man bruker Scrum og smidig for å utvikle software som er veldig bra, men det vil ikke løse problemet og vil ikke hjelpe hvor smidig jeg er til å utvikle programmer. Vi bruker titalls milliarder på stillinger som kun jobber med IT og programutvikling. Når de andre leddene i organisasjonen bruker og går på de tradisjonelle metodene slik som budsjettering, produktutviklingen og forretningsutviklingen gjøres på den gamle måten, da hjelper det lite at man bruker smidig til kun software utvikling.»

Det er klart at respondent mener at det ikke hjelper med enkelte endringer på enkelte nivåer, endringene til de nye utviklingene burde bli tatt på flere nivåer i selskaper for at det skal gi effekt.

R2:

«Laget som tar utvikling er stort sett klare for dette da utviklingsprosjektet er som deres unge når de utfører endringer for å komme med nye systemer. Men de andre i selskapet lager alltid noe motstand imot utviklingen i selskapene. Det kan hende at denne motstanden også kan være bra for selskapene da dette kan gi dere en mulighet til å tenke at dere må begynne å finne andre løsninger og andre måter å utvikle ting på.»

Her gir R2 uttrykk for at de som jobber med utvikling og agile er oftest med på endringen, men de som er utenfor vil skape utfordringer, derfor er det viktig å ha med ledelsen i disse prosessene.

R3:

«Det vil alltid være en motstand mot endring i selskapene. Det går mye på interne kulturen i selskapet at det er for mye eller lite akseptabel med endringer. Derfor er det viktig at man har med seg toppledelse slik at de kan påvirke folk i selskapet.»

«Det er viktig å ha med hoved ledelsen med seg for å komme gjennom endringene på en Agil måte. Derfor må team ledere også være aktiv med å informer og oppdatere øverste beslutningstakere så de er med på og godkjenner det som blir utført.»

Intern kultur og ledelse er en viktig del av utviklings prosjekter havner i suksess. R3 indikerer også det samme at ledelses tilstedeværelse er viktig.

R4:

«Kultur er viktig del som må være med i utviklingen og kulturen må ha blitt bygd for å akseptere endringer i organisasjonens struktur. Det er viktig å påse at det er arbeidet med kultur enn å bare sette søkelys på Scram og Kanban.»

«Lederstil er en viktig del av utviklingen. Lederen må være åpen for endringer selv og må la sine medarbeidere jobbe fritt så de kan eksperimentere underveis gjennom utvikling. De må få friere tøyler til å jobbe med utvikling og forskning. Det må bygges en læringskultur i selskapet».

R4 påpeker at kultur for endring er en del av løsningen, men ledelse og beslutningstakere er like viktige for å skape den kulturen og for at systemene skal være mottakelige.

R5:

«Ledelsen er viktig å ha med uansett. Uten at ledelsen er med så blir prosjektene utfordrende. Ledere i dagens samfunn er tilknyttet et hierarkisk system hvor det er vant til å rapportere opp og ned i systemene. Men det er ikke vanlig i de flate strukturene. Dermed kan det bli en utfordring for noen. Ledelsen må gi friere tøyler til utviklere og medarbeider i en agil utviklings prosess.»

R5 er veldig siker på at ledelsen må være med i utvikling hvis man skal lykkes med prosessene og utviklingen. Uten at ledelsen er med så vil det skape utfordringer som ikke vil enkelt å håndtere for utviklere da det ikke er deres oppgave å rydde opp i organisasjons utfordringer.

BG2: Person relaterte barrierer:

Det menneskelige aspektet er veldig viktig i endringsprosesser og det skal også være veldig viktig i Agile transformasjon innen digitalisering.
Hva tenker du om dette og kan mennesker ses på som en barriere?

R1:

«Menneske er en av de største barrierene i et system for endring med digitalisering. Det er ikke bare grunnet det er en digital og smidig endring, men det ligger i menneske naturen. Man kan se tilbake på perioden når industrialisering kom som den nye endringen i samfunnet. Menneskene sto imot og brente ned fabrikker grunnet de var imot den nye revolusjonen og endringen.»

Dette svaret fra respondenten kan også kobles til barrierene i BG7 da det er en del av disse som kan lett kobles opp mot disse barrierene for motstand for endring. R1 gir indikasjon på at mennesker er en veldig viktig faktor som ikke kan overses i agile endringsprosesser. Den motstanden er sikker.

«Teknologien vår endret seg fra den industrielle til det digitale, men hvordan vi organiserer seg på er den dagen i dag den gamle metoden. Vi bruker fremdeles industriell ledelses tankegangen, industriell planleggings tankegangen, industriell forretningstankegang. Det vi mangler i dag er dagens Henry Ford eller Tyler som kan endre metoden vi skal jobbe på etter at den digitale teknologien er kommet i samfunnet. De gutta fant ut hvordan man skal endre organisasjonen».

R2:

«Den menneskelige faktoren er veldig viktig i den Agile utviklingsmetode og transformasjonen. Det vi gjør er at vi endrer en helt kultur i ett selskap som skal ha nye metoder de skal følge. Normalt bruker folk generasjoner for å endre seg, men her vil endringene føre til at selskapets arbeid og kultur og utvikling vil endre i løpet av kort tid som vil ha nye omstendigheter for alle i jobben.»

R2 er også veldig klar i sitt utsagn om at menneske er en viktig del av endringsprosessen og kan stå som en barriere imot den agile utviklingen. Grunnet det ser ut til at denne utviklingen vil bli veldig betydelig på en kort periode så vil det ha sine utfordringer ovenfor personer.

R3:

«Jeg har bare hatt erfaring med Agile og ikke andre metoder. Her ser jeg ikke at det kan være en hinder innad i teamet som fører til at man ikke klarer å bruke Agile. Alle som jobber med dette, er klar over metoden og hva dette fører til og alle er støttende i prosessene samt at de forstår hverandre bedre. I tillegg er det vanlig at man er tettere knyttet sammen i forhold til tillit og arbeid da man opplever ofte utfordringer fra eksterne personer og grupper under den prosessen.»

R3 har ikke hatt erfaring med andre utviklings metoder, men han er klar på at det ser ikke ut som agile utviklings metode kan være hinder internt, men han er mer opptatt av at den store motstanden kan komme fra omstendighetene og folkene rundt.

R4:

«Det menneskelige aspektet er veldig viktig i agile transformasjoner. Viktig å se på mennesker med uten fra inn syn. Og enda viktigere er empati når man skal jobbe med mennesker for å ha dem med på utvikling som allerede krever mye energi av dem».

R4 påpeker i sitt svar at omtanke og empati for det menneskelige i prosessen burde tas vare på og man må klare å se på menneskene med et støttende blikk utenifra og inn.

R5:

«En av de viktigste faktorene er jo mennesker. Utvikling og endring er en ting folk naturlig står imot i fleste tilfeller. Derfor er det viktig å ha riktig kunnskap og opplæring samt deltakelse for at menneskene skal være med på utviklingen og forståelsen av transformasjonen. Det må jobbes effektivt med å forbedre teamene samarbeidet på tvers av teamene.»

R5 er også som andre klar over den viktige faktoren som mennesker, men han samtidig fremmer kunnskaps aspektet og ivaretakelse av menneskelig utvikling i sitt svar.

Kunnskap og opplæring er viktig i alle prosesser og utviklingssammenheng. Kan mangel av kunnskap og ekspertise om agile transformasjon bli en barriere?

R1:

«Det er ikke mye kursing som skal være nok for en Agil utvikler, man må regne med en del utvikling gjennom erfaring. Derfor er det også viktig å ha mulighet til mye læring underveis. Men viktig å forstå selveste utviklings mytologien for å være på riktig kurs.»

R3:

«Det er viktig å ha riktig erfaring og opplæring blant folk som skal være med på utviklingen av selskapets systemer gjennom Agile metoder. Man kan f. eks ikke bruke 10 nye personer sammen med de 10 som allerede fantes der. Det vil bli vanskelig å få dem inn på den samme retningen med en gang. Det er en erfaring og opplæring som må erfares.»

R4:

«Ha riktig kunnskap og opplæring er veldig viktig for agile transformasjonsarbeid. Vi har valgt agile metode i opplæring også. Vi har opplæring og personlig utvikling ved å promotere læringskulturen og delt arbeidet i 2 soner. Lærings sone og utførelses sone. Fordelingen vi har valgt mellom disse er 30/70. Verdig skapning i 70% av tiden og læring 10% av tiden mens nye prosjekt gjennomgang 20% av tiden.»

«Denne agile måten å lære på er veldig lærerikt. Vi lar folk lære og feile selv i læringssonen og den kunnskapen deler de imellom seg. Dette får dem til å bli flinkere og oppfinne nye metoder å fikse og skape ting på.»

R5:

«Kunnskap og opplæring er en veldig viktig del av utvikling av agile metoder. Har folk ikke kunnskapen om det moderne systemet så vil utviklingen bli tungvint. Vi har fordelt tiden til våre teams slik at de har arbeidstid for effektivt arbeid og en bestemt tid for læring. Vi

bruker 1 dag i måneden spesielt for læring. For å få dette til må ledelsen være med på denne reisen og utviklingen. Hvis dette ikke er på plass så ser man en motsatt effekt av manglene.»

BG3: Prosess relaterte barrierer:

Oppfattes forskjellige prosesser og kunderelasjoner som barrierer i agile transformasjon?

R1:

«Da teknologien endrer seg så blir vi altså tvungen for å endre prosesser i organisasjonen.
Derfor er den digitale overgangen fra industriell til teknologisk ledelse det samme som overgangen fra industriell ledelse til smidig ledelses, så å si samme type endringer».

R2:

«Hvis prosessene ikke er planlagt ordentlig og prosjekt ikke følges opp tett underveis så kan det bli misforståelser som kan føre til forsinkelser eller feil produksjon. Det er derfor viktig at kundene også er involvert i planlegging og oppfølging underveis».

R3:

«Kundene og brukerne må være veldig tett på utviklingen og utviklere så de kan være med på å påvirke hele prosessen underveis. Tilbakemeldingene er veldig viktige. Det er et grunnleggende behov for at utviklere skal ha kunnskap om selskapets og brukernes behov og funksjonalitet.»

R5:

«Hvis ikke resultater blir vist tidlig nok så går folk tilbake på gamle modeller. Derfor det viktig å ha kundene med på laget og holde dem oppdatert underveis. Dette kan gjøre etter en fast plan. Brukeren må få være med på selveste utviklingsprosessen.

BG4: Teknologi relaterte barrierer:

Kan du fortelle om noen opplevde barrierer som er relatert til teknologi ved agile digital transformasjon?

R1:

«Systemstrukturene fremstår som ett av de største barrierene mot digitalisering.»

«Gamle systemer og sammensatte systemer som oppfører seg som blokk. Slike blokk systemer har harde koblinger som blir umulig å bryte de ned. De oppfører som en hel leverandør i et og samme system som er for stor og kronglete. Viktigheten for dette systemet i en bedrift blir så stor at det blir umulig å endre på den på en enkel måte. Derfor er det viktig å ha det utbedret og fordelt i flere komponenter. Eksempel på dette kan være altomfattende ERP systemer. Slike systemer kan ses på som en barriere for utvikling grunnet den stopper opp utvikling og nytenking. Det er så stort system at den er inngrodd i sømmene på organisasjonens detaljer og fører til for store operasjoner for å endre ting og i tillegg vil det føre til for stor bruk av ressurs og tid for å gå bort fra de og lære andre nye systemer på alt.»

Slike barrierer kan også kobles under barrierene i gruppe BG3 da det har også en sammenheng med prosesser og utviklingsprosesser samt opplæring.

«En prosess som setter noen mennesker sammen som organisert og teknologi støtter dem opp med systemjobber. Alle systemene våre er blanding av organisasjon og teknologi. Da teknologien endrer seg så blir vi altså tvungen for å endre organisasjonen. Derfor er den digitale overgangen fra industriell til teknologiske det samme som overgangen fra industriell ledelse til smidig ledelses, så å si samme type endringer.»

Svarene i denne seksjonen kan også kobles opp i BG1 med ledelses relaterte årsaker.

R2:

«Scrum er bedre for store prosjekter, men det har ikke så store forskjeller. Alle har sine sterke og svake sider. Vi ser ikke bare på programvare delen. Men vi ser på utviklingen av businessen rundt og produktene rundt for å få en riktig og perfekt tilpasning.»

BG5: Prosjekt relaterte barrierer:

Hva er den viktigste ingrediensen i et Agile prosjekt for digital transformasjon?

R3:

«Tillit er den viktigste delen som må være på plass for at man skal klare å komme seg gjennom et prosjekt. Uten tillit blant utviklere og brukere samt internt i team vil det ikke være mulig å få dette gjort.»

BG6: Adoptiv / Tilgjengelig kapasitet relaterte barrierer:

Kan størrelse på selskaper være en utfordring i agile transformasjon og kan det føre til at folk ikke får riktig informasjon gjennom endringsprosessene i Agile transformasjon?

R1:

«De store selskapene som hjelper til med konsultering og hjelp i forhold til endringsprosesser må begynne å sette mere søkelys på de viktige aspekter innen denne omdanningen. Veldig mange av de har ikke peiling på dette grunnet det er en ny metode som ikke er blitt introdusert eller akseptert i bransjene enda.»

Dette svaret kan også dekke deler av barrierer som kommer under gruppen for BG7.

R2:

«I store selskaper er det flere ting som kan ta lang tid grunnet det lange og vanskelige byråkratiet og prosesser som allerede er laget. I Agile prosesser kan man tilpasse selskapene og utviklingen, men man må huske at i dagens teknologiske samfunn endrer ting veldig fort og

endringene kan være veldig betydelige for teknologien. Derfor er det viktig og tatt raske beslutninger for å gjøre endringer underveis uten å stå fast i beslutningsprosesser.»

Tror dere økonomi, budsjett og finans kan være en barriere for utvikling av agile digital transformasjon?

R3:

«Vi har opplevd at folk er mer opptatt av utvikling og teknologi enn av økonomi. Vi lager funksjonalitet for internt bruk og optimaliserer tjenesten. Bra funksjonalitet gir tilbake gevinst ved på å bruke bedre funksjonalitet. Det må vises at man har gevinst, men det er ikke hoved fokus på dette».

R5:

«Økonomi er alltid viktig, men hvis man har en god dialog med kunden og kunden selv har kunnskap så vil økonomi aspektet bety mindre enn det utviklingsrelaterte aspektet. Kunden må se at de får igjen for de ressursene de bruker for at de skal føle at de får fordel av denne utviklingen.»

«Tid og økonomi kan være viktige barrierer for agile utvikling»

BG7: Oppførsels relaterte barrierer:

Kan kultur, oppførsel og folk i besluttende posisjoner bli årsak til barrierer i en utviklings prosjekt?

R1:

«Undervurderer kulturforståelse blant forskjellige arbeidere og utviklere i organisasjoner. Kryss kulturelle omstendigheter kan føre til en del gnisninger og kommunikasjons problemer i utviklingsarbeid. Vi håper at Agile vil løse denne problemstillingen også etter hvert.»

R2:

«Det er veldig spesielt at mellomledelsen er en av de viktigste delene eller motstandspunktet som kan bremse utviklingen. De er i en slik posisjon at de verken er i toppen av ledelsen og eller blant brukerne og utviklerne. De ser ikke den overordnede utviklingen, behovet og vinningen ved utviklingen. Det andre kan være at de mistenker at de kan miste sin makt eller deler av sin autoritet. Det er en mer politisk og makt basert punkt i selskap som kan finne utfordringer i alle nye ting. For dem vil det også være en trussel som ser ut til at de mister kontrollen og kanskje også mister jobb ved at deres behov blir redusert ved nye utviklinger.»

Dette svaret kan lett blir koblet til BG1 og BG2 også.

R3:

«Ikke bare teknisk transformasjon, men også en kulturell transformasjon. Derfor viktig å ha med den øverste ledelsen også med.
Er ikke topp ledelsen med på det selv så blir det bare en lang, vanskelig og utmattende prosess som verken vil hjelpe selskapet, brukere eller oss til å fikse det vi skal gjøre.»

Man kan enkelt koble denne barrieren til BG1 også da dette er direkte relatert til organisatoriske aspekter og til ledelsen av selskapet.

R4:

«Ja det kan bli en barriere, og kanskje den vanskeligste barrieren hvis det ikke er skapt en god intern kultur for å ivareta personene i organisasjonen. Slik fortalt tidligere så er tillit og empati en viktig del av suksessfaktorene. Ledelsen må gi de riktige mulighetene og insentiver for at folk skal selv ønske å utvikle prosjektene. Det vil føre til at folk vil bli opptatt av å gjøre god jobb som team og ikke bare tenke på personlig vinning»

Dette svaret kan fint passe sammen med barriere gruppen BG2 også.

6. Konklusjon og diskusjon

Våre funn fra forskningen viser at det har vært forskjellige typer av opplevelser for respondentene i endringsprosessen i reisen for bruk av agile verktøy for digital transformasjon. Det er klart at alle respondentene har veldig god innsikt i fagfeltet og har veldig høy grad av selvtillit og erfaring innen fagfeltet og i de forskjellige metodene av agile utvikling og system.

Vi har gjennom svarene klart å finne tydelige forklaringer på at endringer i enkelte ledd alene ikke vil være nok for en fullstendig og suksessfull overgang. En av barrierene og grunnlag for at man kan feile i utviklingen er at flere av delene i organisasjonen ikke går veien for endring sammen. Det kommer fram at forpliktelsen til organisasjonen og ledelsen er viktig å ha med seg i prosessen og samtidig så er det en utfordring at man kan ha innebygde funksjoner som er basert på ikke-utviklende systemer som kan holde utviklingen tilbake som respondenten gir inntrykk for i svarene (Dumitriu et al., 2019).
Det må være en kommunikasjon og samarbeid innad i selskapet og at motstand fra andre personer og avdelinger innad kan være en stor utfordring er en realitet. Dette bekrefter funnene våre og gir en god forklaringen på (Cichosz et al., 2020) sin beskrivelse av den interne motstanden og barrierene.

I følge (Burns & Stalker, 1961) vil struktur i organisasjon og utvikling i organisasjoner henge veldig tett sammen. Hvor det er organiske strukturer i selskaper vil det være mer åpenhet for endringer. Kotters modell beskriver i K8 om organisasjonskultur og linker det opp til at endringer er enklere å få gjennomført hvis organisasjonskultur er bygd opp til det og mottagelig for endringer i selskapet.

I AP7 fremmes det budskapet hvordan man skal ha en vellykka agil transformasjon. Det kan man få til ved å ta endringene godt imot selv om endringene kommer sent i en prosess.
(Fiedler, 1964) beskriver ledelses stilen og det sies at stilen må endres og tilpasses til variable situasjoner for at det skal være enkelt å ha en god tilpasning til endring i følge Contingency teori.

"Cultural change has is associated with a variety of failures, which executives, managers, and traditional organizations do not exhibit. They are entitled to certain targets, which they are accountable for, and their associated failure." (Kenneth S Rubin, 2012)

Når vi snakket om menneskelige aspektet og kommunikasjon så har respondentene gjennom sine svar bekreftet våre tidligere funn gjennom forskningen og gir klar indikasjon på at internt teamwork, tillit og kommunikasjon er veldig viktige faktorer i agile endrings prosesser. (Ghobadi & Mathiassen, 2016) forklarer det veldig tydelig i sin artikkel at tillit og team arbeid er alfa omega og viktigste suksess faktor for at endringsprosessen skal bli fullført med suksess. Denne prosessen er med på bygge team tilhørighet og fører til at tettere samhold fører til mere tillit. Det menneskelige aspektet ser ut til å ha den viktigste rollen i endringsprosesser og i skapelsen av barrierer.

Skal man koble de menneskelige aspektene for å sammenlikne barrierene så kan man bruke Kotters modell punkter K3 og K4 samt K8 som forklarer de samme barrierene og deres mulige løsninger gjennom organisasjons kultur og dets forbedringer, riktig kommunikasjon og skape et klart ønske og visjon for den endringen man ønsker i arbeidet.

Å skape agile læringskultur og læringsplattform er en ny og innovativ metode å utvikle læringskulturen på i moderne selskaper. (Rajagopalan & Mathew, 2016) studerer dette i sin forskning og beskriver i sin artikkel at den tette relasjonen mellom organisasjonskultur og agile metoder viser hvordan agile tilnærming danner sin egen kultur. Dette utvikler da intern lærings kultur og fører denne kulturen i til alle sidene av organisasjonen hvis implementert riktig og dermed kan nå nye høyder. Samme utviklings måte kan beskrives som en del av Kotters modellen fra K8 sammen med læring og K1 hvor det blir informasjonsdeling gjennom å skape «hype» rundt positive endringer og fornyelser gjennom læring.

(Dumitriu et al., 2019) gir forklaring på de samme viktige læringsprosessene i sin artikkel ved å nevne at deling av kunnskap blant arbeidere er viktig og ved å holde det tilbake skapes det en stor barriere. Mangel på kunnskap blant utviklere har en klar negativ sammenheng til implementeringen av agile metoder (Nerur et al., 2005).

(Vlaanderen et al., 2011) beskriver utviklingsmåten og opplæring gjennom bruk av Scrum hvor man øker opplæring og nytte funksjon ved å ha flere teams på 2-9 personer og holder små effektive møter på 15 min for å ha effektiv informasjonsdeling. Dette er av de nye metodene for å utvikle og dele kunnskapen på tvers av teamene på en effektiv og enkel måte.

Endringer i prosesser og systemer kan være utført av eksterne og interne effekter og dytt i den retningen hvor man må endre sine systemer og måter å jobbe på. Det viser at dette kan ses på som en mulighet i stedet for å se på det som en barriere. Men det er en motsatt effekt av dette hvis man kun henger seg på den eksterne påvirkningen og ikke får med seg interne krefter med på endringen, så kan det bli en tung vei å gå for endring. Men denne utviklingen er forårsaket av at eksterne påvirkninger fører til en endring (Dumitriu et al., 2019; Shankarmani et al., 2012). I følge AV1 er det en viktig verdig at personer settes høyere over prosesser og verktøy. AP5 beskriver at prosesser må skapes slik at de gir en bærekraftig utvikling i organisasjonen så det blir til en positiv rettet utvikling. (Rogers & Marres, 2000) beskriver at selskaper jobber hardt for å bli agile grunnet de tror det vil hjelpe dem i å endre til en bedre versjon gjennom prosesser av digital transformasjon.

Under spørsmål om opplevde barrierer rundt strukturer og systemer ved agile transformasjon har respondentene vist til hvor komplisert og tunge programmer kan bli og hvor mye kunnskap det teknologiske teamet må ha for å jobbe med utviklingen. Det må til riktige teknologi med riktig verktøy for å komme seg ut av en tungt inngrodd prosess og system. (Otley, 1980) og (Nita, 2013a, 2013b) beskriver at når det ikke er en universal løsning på en utfordring da kan man bruke verktøy som er situasjonsbasert verktøy som kan kalle «hybrid» verktøy som består av, i tilfellen til smidig endring, hybrid av Scrum og XP ifølge (Shankarmani et al., 2012).

Teknologiene bytter hver dag spesielt i forhold til den moderne systemutviklingen i samfunnet. Det at teknologi enders og byttes daglig kan også være en barriere for at flere ikke klarer å følge med på utviklingen og kan derfor bli stående uten den riktige teknologien hvis de ikke er med på den hurtige læringsprosessen.

Det er klart at tillit i teamet er en viktig suksess faktor i ethvert prosjekt. I agile transformasjon så er tillit like viktig og kanskje viktigere enn i de andre prosjekter da dette skal føre til store eller drastiske endringer i organisasjonene. Tillit i et team skal fungere som limet mellom deltakerne og utviklerne samt kollegaer som skal jobbe med et utviklingsprosjekt.
Kunnskapsdeling i en systemutviklings prosess er veldig viktig for å få til suksess (Ghobadi & Mathiassen, 2016). Det delingen blir ikke optimal uten tillit. Hvis tillitsfaktoren er fraværende eller veldig liten så kan dette bli en stor utfordring å få en suksessfull endring og transformasjon. Tillit er også beskrevet i BG2.

(Scheerer, 2014) går inn på detaljene om Inter-team koordinering og samarbeid og gir beskrivelsen over hvor viktig det er å bruke Inter-team koordinering gjennom agile for at kommunikasjonen skal ha en god kommunikasjon og utvikling i intern kultur og Inter-team samarbeid.

Under spørsmålene rundt økonomiske barrierer har respondenten fokusert på at mange av de selskapene som er villig til å gå inn i smidig endring for digital transformasjon mangler kunnskap og når de eventuelt leier inn kunnskap så mangler de eksterne innleide personene kunnskap om Agile prosesser innen digital transformasjon og omdanning. Dette i seg selv er ett problem som ikke er direkte relatert til selskapenes evne og vilje til å utvikle, men med eksterne som skal hjelpe til med denne utviklingen som ikke har nok kunnskap i slike tilfeller. (Siddique & Hussein, 2017) gir indikasjoner om dette og forteller at mangelen på personer med de riktige kunnskapene kan fort føre til at man sklir ut i prosesser og det kan føre til langvarige og rigide endringsprosesser. (Child, 1972) beskriver at det finnes en klar sammenheng mellom størrelsen på organisasjonene og kompleksiteten i strukturen. Jo mer komplisert struktur jo vanskeligere kan endringen virke for selskaper. Dermed blir også kunnskaps deling ressurskrevende og tidskrevende. Det økonomiske aspektet vil ved dette også øke og føre til vanskeligere og dyrere prosesser.

Ved gjennomgang med respondentene om kultur aspektet så snakker respondenten om at selv om smidig blir brukt og utviklet på samme måte nesten over hele verden så er det en del utfordringer når det gjelder måten man jobber i de forskjellige kulturer og kultur forståelse og forskjeller kan føre til at man ikke klarer å jobbe helt på samme bølgelengde hele tiden. Dette viser at Agile utvikling og system er ikke helt optimalisert selv om det er en av de beste metodene. R1 nevner i sitt intervju at vi kunne sammenlikne Agile prosesser med dagens system for demokrati, det er det beste fungerende systemet vi vet om. Men det er klart det kan bli enda bedre. Dette eksempel bruker han på agile utvikling at det er den beste metoden vi har i dag, men håper på at det kommer nye og bedre metoder i framtiden eller at dagens metoder enda bedre.

Kulturelle barrierer og stort mangfold i arbeid kan noen ganger bli en utfordring i arbeidet (Cichosz et al., 2020; Ghobadi & Mathiassen, 2016). Det er en klar indikasjon på at det finnes flere forskjellige forståelser og måter å jobbe på blant de forskjellige temaene rundt smidig prinsipper og praksis blant de forskjellige arbeidsgruppene (Dumitriu et al., 2019). (Kenneth S Rubin, 2012) gir indikasjon om at flere ser fordelen av å bruke agile, men mangler nødvendige muligheter til å endre selskaps kulturen til å tilpasse agile teknologi. (Rajagopalan & Mathew, 2016) har forklart at kultur forståelse blant ledelsen og utviklere er veldig viktig for at man skal få en effektiv og varig dra hjelp i endrings prosess og bruk av agile metoder. Denne kulturforståelsen skal inneholde detaljer om intern kultur også.

Til slutt vil vi også nevne at utvikling i dette feltet er veldig rask og den tar turen innom alle bedrifter selv om man ønsker det eller ikke. Et klart tegn til dette var under korona pandemien hvor folk ble nødt til å tilpasse de nye rutinene og gå over til ny teknologi og bruk av digitale verktøyer i hverdagen. Jo mer den digitale bruken øker jo mere behov og spredning av smidig bruk av utvikling under transformasjon vil komme i bruk.

Vi har gitt en overordnet oversikt over hvilken barriere som er de viktigste ifølge respondentene som er eksperter og forskningen innen smidig digital transformasjon. Det gir indikasjon om hvilken barriere som er de vanskeligste og vanlige i samfunnet og blant utviklere. Selskapene som ønsker agile digital transformasjon kan studere disse og finne

løsninger som passer dem og deres bedrifter på best mulig måte for å takle disse barrierene i sine omgivelser.

Below are the Barries addressed to 5 Experts who has been interviewed accordingly in different

Critical barriers	R1	R2	R3	R4	R5
Culture	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Managerial mindset	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Structure	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Knowledge	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
People	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**

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Appandex 1

Questionnaire

Interview instrument

Section 1: Background information about the respondents

1. Could you please introduce yourself and your turn position you experience with agile digitalization or as a technologist.

Male ☐ Female ☐

2. For how long have you been working in the software engineering (Tick one)?

Below 5 years | 5-10 years | Above 10 years

3. For how long have you been working in agile projects (Tick one)?

Below 5 years | Below 5 years | Above 10 years

SECTION 2:

1. How critical is the projects
2. How complex is the projects
3. The company/team is experiences in similar projects in the same area
4. Agile methodology/approach used?

Scrum XP	Scrum (current)	Scrum Kanban	Scrum Kanban, BDD, TDD	Scrum Kanban, BDD, TDD, XP

5. How experienced is your company/team in agile methodologies

	Somewhat not experienced	Experienced	Somewhat very experienced	Very experienced

SECTION 3: RESEARCH QUESTIONS

1. **The use of agile methodologies in digital transformation is an important thing**

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

2. **Challenges faced when applying agile methodologies**
   a. **Resistance to change**

There is general resistance to change in the company
There is skepticism towards the new way of working
The management are unwilling to change
There is general resistance to change in the company

   b. **Lack of investment**

Lack of coaching is a challenge in the use of agile methodology
Too high work load
Lack of coaching
Lack of commitment

   c. **Difficulties in implementing agile methodologies**

Misunderstanding agile concept
Poor customization
Reverting to old working methods
Excess enthusiasm

   d. **Challenge of coordination**

Achieving technical consistency
Autonomous team model
Interfacing between team's difficulties
Global distribution challenge

   e. **Quality assurance issue**

Accommodation of non-functional testing
Requirements ambiguity affecting quality assurance

Lack of automated testing

f. Engineering requirements challenges

High level of management requirement
Short and long plan Gap

3. Ways to overcome these challenges

Ensure management support
Make management support visible
Educate management on agile
Provide training to staff
Coach through learn by doing
Allow empowerment of grassroots level
Allow self-organization of the team
Insight gathering from a pilot
Use of pilot to gain acceptance
Show strong commitment
Communicate that change is non-negotiable

4. **Would you like to inform the most important factor, barrier challenge?**

5. **Major learning for yours organization and employee**