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**ADOPTING AGILE DEVELOPMENT IN  
BUSINESS PROCESS MANAGEMENT**  
a Case Study in an Industrial Company

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# ABSTRACT

Timo Vuojamo: Adopting Agile Development in Business Process Management – a Case Study in an Industrial Company

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Agility and agile development have been studied prominently in academic literature in various fields. Applying agile development in business process management and seeing agile projects from business point of view and in traditional industries have remained with relatively low attention. This thesis researches how traditional industrial business should adapt to agile development. The objective of this thesis is to analyse current state of agile development in the Case Company and propose improvements via analysing current agile projects.

The research was conducted as a qualitative multiple case study. The data was gathered through semi-structured interviews by interviewing 7 managers or directors from 3 selected project cases taking place within the Case Company. Agile development projects are new to the Case Company and company's recent corporate digital strategy is emphasizing on the increase of agile development initiatives and capabilities within the company.

Based on the research, the biggest challenges for businesses to adapt agile development lies on project planning, business involvement development, and roll-out operations. Adopting agile methodology requires increasing tolerance of uncertainty and continuous effort from project's stakeholders. Project planning and resourcing need to be adjusted according to agile projects, where planning is continuous, and success is primarily measured via achieved system capabilities. Shift to new roles requires new capabilities from employees combining knowledge of business and technology. In addition to staying in traditional planning, too light project core groups and combined roles of product owner and project manager were found to have negative effects on project success.

Ensuring adequate business commitment throughout agile projects was found to be a major issue. Business commitment can be improved by allocating more resources to change and expectations management work early enough. Integrating projects better to business process management activities by considering to-be processes and organizations on early stages of the system development ensures better support and input from the business representatives for the project. This also helps in planning and execution of system deployment in roll-out phase. Roll-out of an agile system development project is likely to fail due to too much complexity or lack of proper planning. It is suggested that agile projects utilize traditional plan-driven practices for meeting crucial milestones. Hybrid strategy combining both agile and plan-driven project management methodologies and deeper analysis of roll-out activities in agile projects are suggested to be studied further.

Agile development proved to be highly applicable in system development projects by enabling innovative and customer-centric solutions. It offers great variety of tools and techniques that are recommended to be shared and utilized wider outside agile projects. Workflow management, customer centricity in development work, and systematic communication pattern are examples of practical learnings from agile projects that are likely to improve quality of any daily work.

Keywords: agility, agile development, business process management, business process change, change management

The originality of this thesis has been checked using the Turnitin OriginalityCheck service.

# TIIVISTELMÄ

Timo Vuojamo: Ketterän kehittämisen omaksuminen liiketoimintaprosessien hallinnassa –  
tapaustutkimus teollisessa yrityksessä

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Ketteryyttä ja ketterää kehittämistä on tutkittu näkyvästi akateemisessa kirjallisuudessa useilla aloilla. Ketterän kehittämisen soveltaminen liiketoimintaprosessien hallinnassa ja ketterien projektien näkeminen liiketoiminnan näkökulmasta erityisesti perinteisillä toimialoilla ovat jääneet suhteellisen pienelle huomiolle. Tämä diplomityö tutkii, kuinka ketterä kehittäminen tulisi ottaa käyttöön teollisessa liiketoiminnassa. Työn tavoitteena on analysoida ketterän kehittämisen nykytilaa case-yrityksessä ja tuoda esiin kehityskohteita yrityksen nykyisistä projekteista.

Tutkimus toteutettiin laadullisena monitapaustutkimuksena. Aineisto kerättiin puolistrukturoiduilla teemahaastatteluilta, joissa haastateltiin seitsemää johtajaa kolmesta projektista. Ketterät projektit ovat uusia case-yritykselle ja sen viimeaikainen digitalisaatiostrategia korostaa ketterien kehityshankkeiden ja niitä edistävien kyvykkyyksien lisäämistä yrityksessä.

Tutkimuksen perusteella suurimmat haasteet liiketoiminnalle ketterän kehittämisen omaksumisessa ovat projektisuunnittelussa, liiketoimintaedustajien sitouttamisessa ja uusien järjestelmien käyttöönotoissa. Ketterän kehittämisen omaksuminen edellyttää projektin sidosryhmiltä aiempaa suurempaa sitoutumista ja kykyä sietää epävarmuutta. Uusiin rooleihin siirtyminen vaatii työntekijöiltä uusia kyvykkyyksiä, joissa yhdistyvät teknologiaosaaminen ja liiketoiminnan ymmärtäminen. Projektin suoriutuminen heikkenee, mikäli suunnittelussa ei oteta huomioon ketterän kehittämisen tarpeita, projektin ydinryhmä muodostuu liian kevyeksi, tai mikäli tuoteomistajan ja projektipäällikön rooleja ei ole eriytetty riittävästi.

Liiketoimintaosapuolten sitouttamista voi kehittää kohdistamalla riittävästi resursseja muutosjohtamiseen ja odotustenhallintaan aikaisessa vaiheessa. Järjestelmäkehitysprojekteissa prosessi- ja organisaatiomuutosten varhainen huomiointi varmistaa liiketoimintaosapuolten paremman tuen kehitysprojekteille. Ketterän järjestelmäkehitysprojektin käyttöönotto vaihe todennäköisesti epäonnistuu suunnittelun puuttellisuuden ja projektin kasvavan kompleksisuuden johdosta. On suositeltavaa, että ketterissä projekteissa hyödynnetään perinteisiä suunnitelmavetoisia käytäntöjä, jotta kriittiset virstanpylväät voidaan saavuttaa. Ketterien- ja suunnitelmavetoisten projektinhallintamenetelmien yhdistäminen sekä syvemmän analyysin toteuttaminen ketterien projektien tuotosten jalkauttamisesta ovat suositeltuja jatkotutkimuskohteita.

Ketterä kehittäminen osoittautui hyvin soveltuvaksi järjestelmäkehitysprojekteissa mahdollistaen innovatiiviset ja asiakaslähtöiset ratkaisut. Se tarjoaa suuren valikoiman työkaluja ja tekniikoita, joita on suositeltavaa jakaa ja ottaa käyttöön laajemmin liiketoiminnassa. Työjonojen hallinta, asiakaslähtöisyys kehitystyössä ja systemaattinen kommunikointimalli ovat esimerkkejä käytännöllisistä opeista ketteristä projekteista, jotka todennäköisesti parantavat minkä tahansa päivittäisen työn laatua.

Avainsanat: ketteryys, ketterä kehittäminen, liiketoimintaprosessien hallinta, liiketoimintaprosessin muutos, muutosjohtaminen

Tämän julkaisun alkuperäisyys on tarkastettu Turnitin OriginalityCheck –ohjelmalla.

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## LIST OF SYMBOLS AND ABBREVIATIONS

AE	Agile Enterprise
AM	Agile Manufacturing
ASC	Agile Supply Chain
ASD	Agile Software Development
APM	Agile Project Management
ATP	Agile Transition Process
BA	Business Area
BPC	Business Process Change
BPI	Business Process Innovation
BPM	Business Process Management
BPR	Business Process Re-engineering
BPT	Business Process Transformation
CPI	Continuous Process Improvement
CSF	Critical Success Factor
IoT	Internet of Things
LAVC	Lean and Agile Value Chain
MA	Market Area
NPD	New Product Development
PDCA	Plan Do Check Act
PMO	Project Management Office
PO	Product Owner
PL	Product Line
SAFe	Scaled Agile Framework
TPS	Toyota Production System
TQM	Total Quality Management

# 1. INTRODUCTION

## 1.1 Background

Companies are facing complexity in their business environments in growing pace these days. Demand variations require not only abilities to fulfill the demand but also to do it rapidly before competitors. Concept of agility is generally described as ability to adopt changes in a rapid manner. This thesis attempts to build solid base for agility discussion in industrial and manufacturing companies by analyzing different approaches to it found from literature. After this, in the empirical part the biggest interest lies on analyzing agile development methodology and its opportunities within the case organization. Before concept of agility is brought up literature review sets foundations for it and the context of the thesis by introducing terms business process management and change management.

Agility is currently referring not only to operational excellence of production or supply chain activities but also to development and project management work. Success stories of agile development methods evolved by software developing teams are telling about faster market entry, better quality, less costs, and improved employee engagement (Rigby et al. 2016). While also traditional industries are becoming more digitalized, they are likely to be more integrated and engaged with software development projects. The case organization is a good example of this development: its core purpose is to manage global material flows and develop processes to enable even better execution of demand fulfillment. To succeed in its relatively traditional core business it needs to develop even more complex solutions including software. Software development methodologies are used within application development projects with external IT service providers. In addition to that some teams within the organization have started to apply some principles from agile development in their operations mainly consisting of process and change management.

There exists clear gap in the research of business management when it comes to adopting agile development methodologies or agile project management (APM) in industries producing different products than software (Fernandez et al. 2009; Stare 2014). Also, comprehensive and comparative views to the concept of agility are relatively rare: there

are different definitions and levels of abstraction depending on the application environment and the time of introduction. Terms are usually overlapping each other and even reinvented in different disciplines. (Conforto et al. 2016; Kettunen 2009; Conboy 2009) Agility adoption outside IT has some recent literature stating it is happening and possible, but more detailed studies are proposed for further research to explain management practices and presence of agile enablers in different industries (Amaral et al. 2014).

## 1.2 Objectives and research questions

The main objective of this study is to build prerequisites for the case organization to increase its agility by analysing agility in its multidisciplinary forms and proposing improvement ideas in utilizing it in process development and change deployment work in business process management and more precisely in supply chain management context. The sub objectives are following:

1. Study theory behind agility and link it to process and change management work
2. Analyze agile development and its adoption process
3. Propose improvements in case organization's agility by analyzing lessons learnt from previous projects and current ways of working

The first sub-objective is focused on finding theory behind the case organization's operative environment by creating theoretical basis for business process management, change management, and agility. For the second sub-objective, the concept of agile development is studied further and analysed in the scope of the Case Organization's characteristics. The final objective is to propose improvement ideas to Case Organization's agility by presenting findings from the empirical part of the research. The research questions for this thesis are the following:

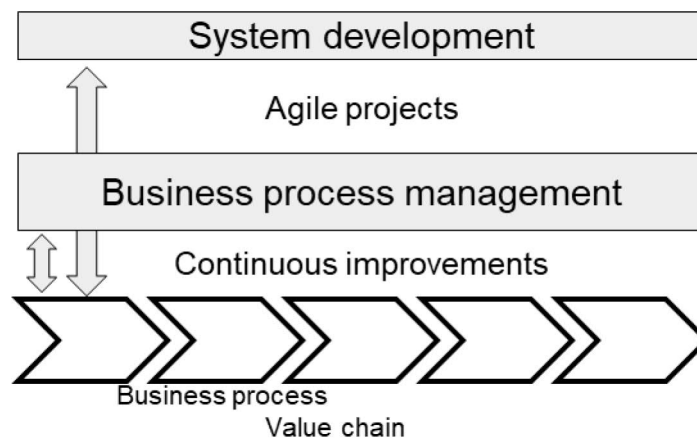
**RQ1: What agility in development work means and what changes it requires from an organization?**

**RQ2: How case organization could improve its agility by learning from its prior business cases where agile development has been utilized?**

The study tries to get more comprehensive view to agility by analysing concept from two viewpoints:

1. Case Organization as a customer and project lead in system development projects with external parties
  - How business should adapt to IT-solution development projects and what challenges and weaknesses can be found from the empirical study?
2. Case Organization as a process' owner and change driver in supply chain management
  - Is agile development something that could be applied beyond software development projects in the Case Organization?

Following figure 1 illustrates baseline of the thesis: business process management includes conducting both small and large changes in business processes. Larger change initiatives are more often conducted as “*agile projects*” and they require adopting new ways of working and acquiring new capabilities. Main motivation behind this study is to analyse those requirements and changes via studying experiences from these projects. By doing this, study aims to increase understanding of agile development more holistically among business process management in the Case Organization.



**Figure 1.** *Initial setting for the study*

The Case Organization is a global logistics organization of a big multinational manufacturing company, The Case Company. Backbone of the business lays on manufacturing of heavy equipment and machinery which require being top performer in production efficiency and quality. The Case Organization's core function is logistics and focus on maximizing service levels and optimizing stock value. Organization itself and teams within it are constantly paying more attention to improve operations via digital solutions. That requires external partnerships and IT-led approach to project management. While currently agile ways of working are getting more attention within the organization, there exists need to study further the concept of agility. Versatile operative environment might

lead to situation where people talk about agility or something being “*agile*” without common language and understanding of concept’s multidisciplinary meanings.

The scope of the study is limited within the Case Company due to limited extent of the study. Agility is primarily limited to agile development and agility in project work. To ensure adequate theoretical background and linking topic to industrial engineering setting, agility is concerned more comprehensively before narrowing down to agile development.

### **1.3 Structure**

This thesis is divided into five chapters, which are introduction, theoretical background, research methodology, results, discussion, and conclusion. Theoretical foundation of the study is built on the literature review which concentrates on topics of business process management, change management, and agile development. Overall view of adoption of agile development among business is created by combining agile development and agility literature with business process and change management theories. Finally, learnings of the literature review are synthesized.

In the research methodology chapter research strategy is explained. Multiple case study was chosen as a research approach to get real-life insights of the studied phenomenon. Chapter defines further selected data gathering methods and ways to ensure quality of the gathered data. In the results chapter results are consolidated and analysed. Results are linked to theoretical background and discussed further in discussion chapter. After that, main findings are brought up in the conclusion chapter. In the end, validity of the study is discussed, and future research options are presented.

## 2. THEORETICAL BACKGROUND

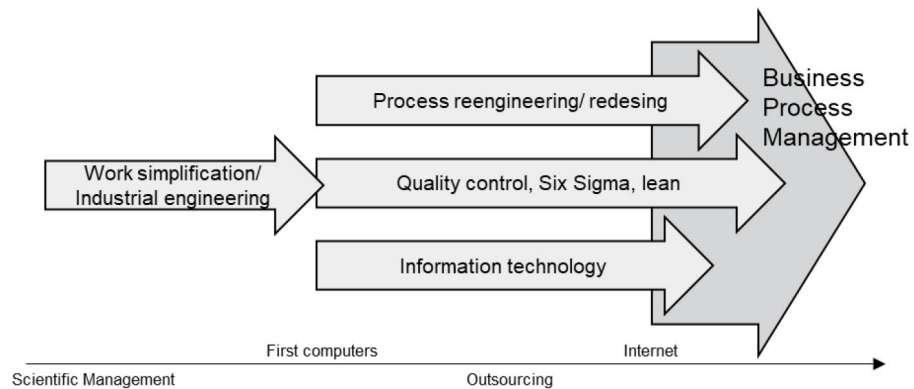
### 2.1 Business process management

Business process management (BPM) is studied to define the environment where agility is attempted to be investigated and applied. It is assumed that everything the Case Organization does can be seen as process work. BPM oversees the process work and strives to improve processes even better. These irregular improvement sprints that BPM launches can be seen as projects. Biggest interest lies in studying change as a part of BPM which is also seen as prework before getting to study agility in business context. This chapter will introduce the topic of process management by analysing its past, defining basic concepts of process work, and studying relationship of change and process management.

#### 2.1.1 Overview of business process management

Origin of business process management (BPM) date back to Taylorism and its principle ideas of overall workplace rationalizing and individual tasks efficiency improvements. Most evident drivers for implementing a systematic way to manage business processes have been the need to work smarter, better, and faster in a rapidly changing market place (Armistead et al. 1999). Business process management encompasses the discovery, modelling, monitoring, analysis and improvement of business process (Zacharias et al. 2017).

After 1990s adoption of IT raised importance of business process management and especially its form or predecessor business process re-engineering (BPR) to a new level. IT started to set new standards by enabling maximizing performance of individual processes to increase flexibility which was started to be seen more important than ever before in various industries since those days. (Davenport 1990; Garvin 1995) In addition to BPR, quality movement and Total Quality Management (TQM) from manufacturing with their lean and Six Sigma principles have been pushing forces behind development of process management and process thinking within business environment (Llewellyn 2000; Garvin 1995; Sabri et al 2010, p.40). According to Armistead et al. (1999), BPM is logical progression for those companies which have been prior involved in TQM. From the beginning of 1990s, business process management related literature have been published in management journals constantly (Palmberg 2009). Figure 2 illustrates evolution of business process management.



**Figure 2.** *Business Process traditions (adopted from Harmon 2014, p.15)*

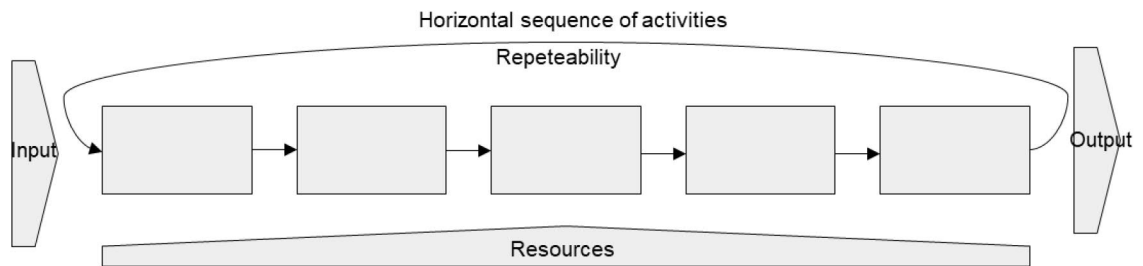
According to many authors, BPM research has remained in the fad phase and disorganized, which have led research to mainly discuss definition and leaving theoretical frameworks lacking (Trikmán 2010; Melao & Pidd 2000).

Palmberg (2009) divides existing research of business process management in two sections: one focused on systematic approach to analyse and improve individual processes continuously and second overseeing network of processes considering business process architecture and BPM more as a comprehensive management philosophy. Business process architecture refers to the organizational model that shows all the value chains and all the core business processes and major support processes that an organization relies upon (Wolf 2003). According to Garvin (1995), traditional individual process management focused thinking has severe limitations: they approach process management from heavily operational point of view and lose connection to bigger business entities by treating processes like unconnected islands. Davenport (1990) appoints that most processes result from a series of ad hoc decisions made by functional units with only little attention to intra functional efficiency of the entire process. Even though each department has optimized their performance, the entire process might underperform due to lack of overall management over the entire business process.

Coexistence of functional organizations and inter-functional processes forms business process management paradigm: processes are not aware of organizational boundaries but people managing them and doing process work are (Walsh 1995). This sets challenges to not only maintaining the process but also to implementing changes in it. Companies are currently having increasing interest in process-centric organizations where the idea of the entity of processes have been realized. (Harmon 2014, pp.24-25). While the process improvement aspect of BPM is generally seen the most known theme and object of interest inside BPM, Business process management has increasingly started

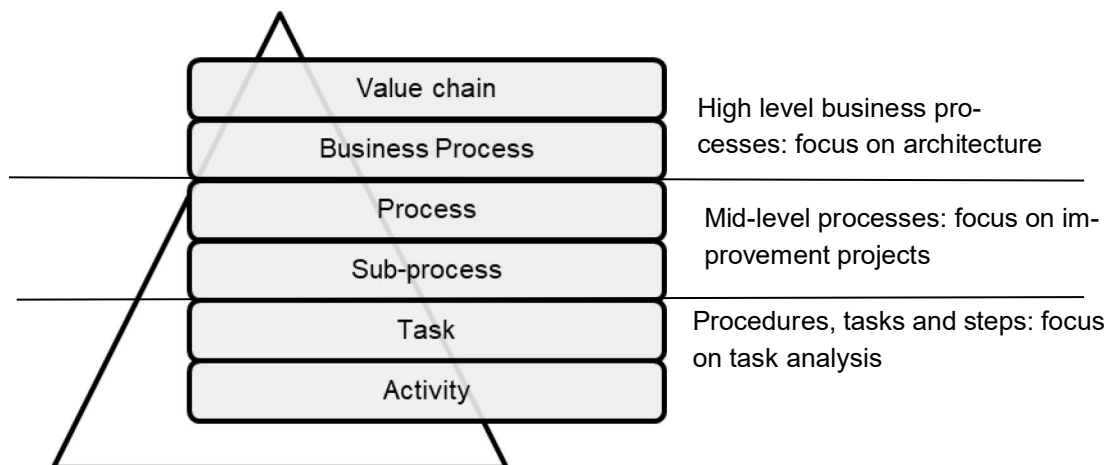
to be used in a more holistic manner to manage all aspects of the business and determine organizational effectiveness (Armistead et al 1999).

Davenport (1990) defines a business process as a set of logically related tasks performed to achieve a defined business outcome and which have customers, and which break cross organizational boundaries. In following figure 3 process definition is illustrated.



**Figure 3.** *Process definition (adopted from Palmberg 2009)*

Six common components can be found from majority of business process definitions: they have input and output, interrelated and cross-functional or cross organizational activities, purpose or value for customer, they use resources, and they are repetitive (Davenport 1990; Palmberg 2009). Processes include different hierarchies usually containing levels from main process or value chain to sub processes and finally tasks. One model of different process hierarchies is presented in figure 4. Management of business process entities has roots in value stream thinking originally presented by Porter in 1985. A value chain is the largest possible process in any organization (Wolf 2003). It is a set of activities that a firm operating in a specific industry performs in order to deliver a valuable product or service for the market.



**Figure 4.** *Hierarchy of processes and process abstract levels (adopted from Wolf 2003; Harmon 2014, p.187)*





as processes, different theoretical approaches exist. Melao & Pidd's (2000) conceptualized framework for business process management states that others consider processes as deterministic machines resembling classical scientific management approach concentrating on process structure and resources while others might rather see them as more human-centric social constructs. Other two approaches are placed between these and emphasize more dynamic nature of business process and its interactions with environment.

Palmberg (2009) gathers major objectives and approaches for process management frequently mentioned in earlier research in her systematic literature review. She proposes the following list for purposes of process management:

- Remove barriers
- Control and improve processes
- Improve quality of products and services
- Identify opportunities for use of technology
- Improve collective learning
- Align with strategic objectives
- Improve organizational effectiveness
- Improve business performance

According to her, following cycle of activities is frequently mentioned as baseline for process management:

1. Process selection
2. Process description and mapping
3. Organizing for quality
4. Process measurement
5. Process improvement

Based on this listing, process management can be proposed to mean **continuous improvement of process by constantly monitoring its performance and finding ways to improve it by increasing learning, adopting technologies and process innovations, and enhancing quality thinking**. For tools commonly used in process management Palmberg (2009) names process mapping, process measurement, process re-engineering/ re-designing, models for continuous improvement, and instruments for benchmarking. In this thesis, the greatest interest lies on the interface of process management and change deployment which is studied further in the next subchapter. To summarize findings, business process management is constant monitoring of business processes.

When improvements are made, they can either be smaller emergent and gradual continuous improvements or bigger development initiatives that are usually escalated as separate development projects.

Trikman (2010) approaches process management work from the critical success factors (CSF) point of view in his case study. He proposes a framework splitting CSFs below three organizational theories explained below (table 1).

**Table 1.** *BPM work success factors (Trikman 2010)*

<b>Theory</b>	<b>Success factors</b>
<b>Contingency</b> -Fit between the business environment and business processes	Strategic alignment Level of IT invest Performance measurement Level of employee's specialization
<b>Dynamic capabilities</b> -Continuous improvement to assure sustained benefits from bpm	Organizational changes Appointment of process owner Implementation of proposed changes Use of a continuous improvement system
<b>Task-technology fit</b> -Fit between IT and business processes	Standardization of processes Informatization Automation Training and empowerment of employees

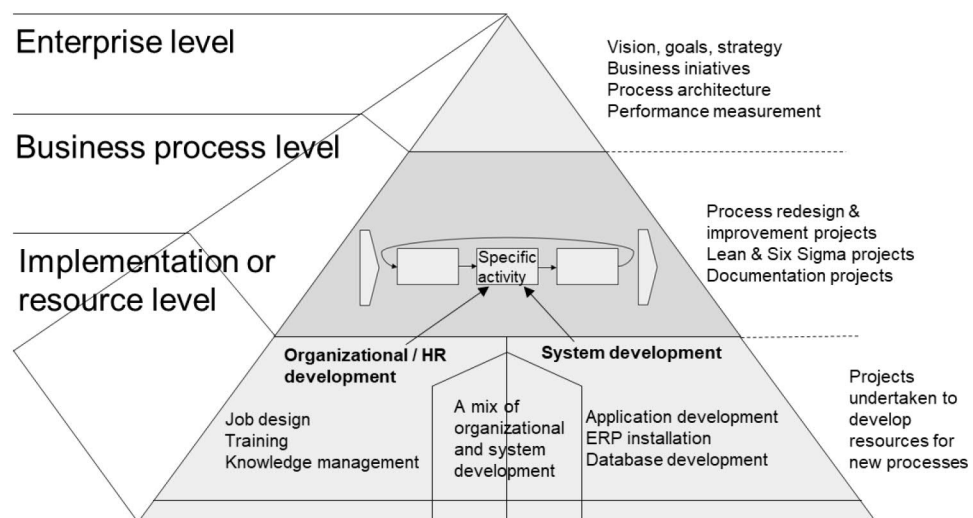
To conclude, process management shouldn't consider managed process as earlier mentioned disconnected island: as essential parts of process management as process designing itself are process' fit to its surrounding environment and usually outsourced technical competence. Both Trikman (2010) and Melao & Pidd (2000) underlined human aspect in business process management which is essential to understand in process changes and needs to be taken into account when new processes are designed and implemented. Process management CFS's such as appointment of ownership, managing knowledge, and adopting IT innovations are generally recognized and studied further in various studies. Relationship between process management and level of IT-innovation will be one core theme in empirical part of this thesis.

Succeeding in business process management requires effective governance of end-to-end processes. Appointment of process owner responsible and accountable for the process is an essential element of process governance representing organizations commitment to BPM and institutionalizing it. (Danilova 2017) Concept of process owner has been there since the early stages of business process management. Davenport (1992)

names process ownership's main objective to represent additional or alternative dimension of the formal organizational structure from where it has power and legitimacy to implement process design activities.

### 2.1.3 Change in business process management

Stoddard & Järvenpää (1995) propose a triangular model for dimension of change happening in business process. In process reengineering/ redesigning projects changes occur **not only in process but also in IT and organizational dimensions**. Traditionally, business processes are developed by creating a detailed model of such processes, acquiring an IT-system to support them, and then implementing the system in the organizational practise (Zacharias et al. 2017). BPM doesn't include organizational change management but supports it, which is required to successful roll-out leading in the end to achieving organizational efficiency (Thiemich & Puhlmann 2013). Triangular model of business process change is also explained by Harmon (2014). He proposes following idea of spitting change activities between different levels of process management:

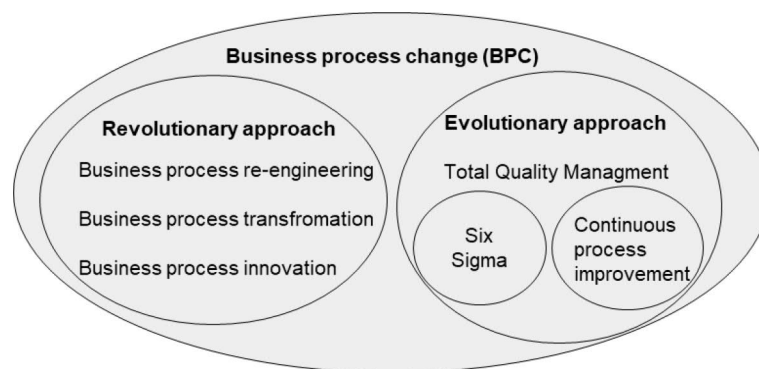


**Figure 6.** Business process change pyramid (adopted from Harmon 2014, p.25)

Business process change might be driven by system, organizational, or process change, but all dimensions need to be considered in conducting a successful change especially in more complex change initiatives.

From the late 1990s term BPR has increasingly been replaced with terms “*business process improvement*” or “*business process redesigning*”. (Harmon 2014, p.11; Sabri et al. 2010, pp.45-46) According to Davenport (1992), term “*business process innovation*” is

better in describing more radical process change initiatives within business process management because it involves process re-engineering, but also takes in to account implementation of the change in all its complex dimensions. In this study, the scope is more on implementation and understanding the change occurring in business environment rather than designing processes. Term “*business process change*” can be kept as an umbrella term for changes happening in business process context. 1990s concepts of BPR and BPI are matured and embedded in more holistic business process management and change discussions (Grover 1999; Melao & Pidd 2000). Change in business process context can be divided in two groups: **revolutionary and evolutionary approaches** (Davenport 1992). Figure 7 illustrates terms of change below business process management:

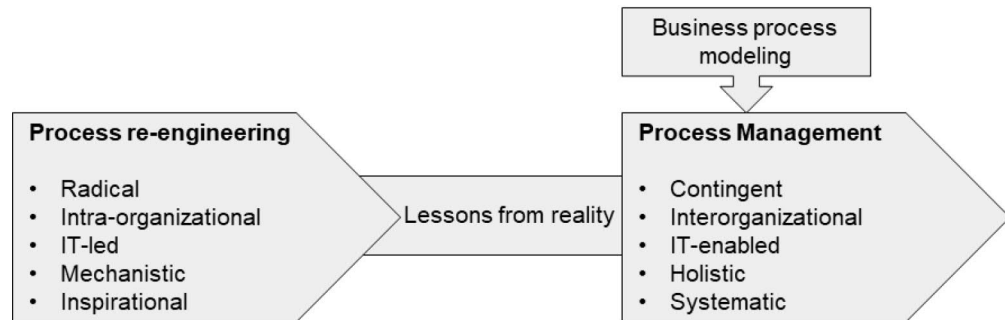


**Figure 7.** Central concepts for business process change (adopted from Kristekova et al. 2012)

Radical process change-meaning terms reengineering/ redesigning (Davenport 1990) and process innovation/ transformation (Davenport 1992) are usually seen as “*buzzwords*” of 1990s and slightly outdated in modern research. To conclude, those terms are not currently applied as they were in prior decades. Split between revolutionary and evolutionary approaches is essential. Revolutionary (radical) change begins from clean slate, is cultural and structural, and top to bottom driven while evolutionary approach means incremental modifications to existing processes from bottom to top direction. (Davenport 1992) Split is not always absolute: radical changes might end up taking more evolutionary approaches in some parts of the change in order to succeed. As a matter of fact, fixed scope and tight schedules and plans for radical changes like BPRs are often seen as key reasons why they fail (Stoddard & Järvenpää 1995; Melao & Pidd 2000). Dimensions of change are processed further later in this thesis.

It is commonly stated that earlier mentioned concepts have later embedded below term business process management meaning more comprehensive approach to process

change that combines the best of process management, redesign and process improvement (Harmon 2014, pp.15-16). Melao & Pidd's (2000) figure illustrates well the development of business process management: after process reengineering reached its maturity and proved to have major weaknesses (Grover et al. 2008, pp.42-45) it was adopted below process management by mainstream with some critical changes (figure 8):



**Figure 8.** Evolution of business process management (Melao & Pidd 2000)

Process management aims to handle changes in a systematic and holistic way and includes entity of business process change. Instead of radical, new and inspirational and “hyped” approach of BPR, process management takes more mature approach to process improvement. It promotes less radical and more incremental nature of change, IT centrality and more systematic overall approach to change. Business process modelling is a set of tools and techniques used in process designing and supporting in business change management (Melao & Pidd 2000). It is a practice used to visualize and formally describe current (as-is) and redesigned (to-be) business processes (Anastassiou et al. 2015).

Grover et al. (1995) analysed implementation of radical business process change in their early study from six different categories recognized based on existed literature of those days related to business process change processes. Following list shows categories and some examples of relevant problems:

- **Management support-** Lack of project champion, management’s insufficient understanding about reengineering, misunderstanding about common goals
- **Technological competence-** Insufficient understanding about existing data, applications and IT across the organization
- **Process delineation-** Failure in identifying process owners, focusing only easily measured and quantifiable evaluation criteria, proposed changes too incremental

- **Project planning-** Short term view and quick fix mentality, lack of strategic vision, Lack of alignment between corporate & IT planning, lack of appropriate training
- **Change management-** Failure to consider existing organizational culture, failure to anticipate and plan for the organizational resistance, difficulty in gaining cross-functional cooperation, need for change management not recognized
- **Project management-** Conflict between change team and functional responsibilities, poor communication, project performance measuring difficulties, impediments in feedback cycle in the beginning

In the same study following commonly emphasized goals for radical business process change initiative were presented: **cost reduction, cycle-time reduction, customer satisfaction level increase, worker productivity increases, and defects reduction.** Study (n=239) resulted to appoint change management as the most severe source of difficulty in process change. According to the study inability to manage organizational change will most likely lead to project failure in such a radical change as process reengineering.

As Grover et al. (1995) research pointed out it is suggested that BPM should be tied with a change management process if it is to survive. It is not unusual that change management is ignored in business process management. (Armistead et al 1999; Grover 1999) Grover (1999) proposes that term “*process change management*” is better in describing modern business process change initiatives containing the management of multiple facets of process change such as technology, people change, and strategy. Change management side of business process management is still obviously left with relatively small attention in literature.

## **2.2 Change management**

To understand change in business context more comprehensively change management is studied further in the next chapter. Basic principles of change management are brought up and agility-related change research is analysed. Chapter aims to build foundations for agile adoption discussion by bringing up more detailed issues and models related to change towards agile ways of working.

## 2.2.1 Overview of change management

Change management is extensively researched topic and huge entity itself containing number of different schools and approaches. In this study, change management is considered briefly in order to build bridge between process management and agility. Change in business context usually means change in some business process which usually requires changes in organizational structure and IT (Grover 1999; Stoddard & Järvenpää 1995). Ability to do changes in business processes can be commonly kept as an enabler for success for any company. More unpredictable operating environment is underlined repeatedly as motivation and driver for agile organizations. According to Bottani's study (2010) most crucial drivers for agility in business in descending order are: **changes in customer's need, changes in market, changes in competitors or competitive bases, technological changes, and social factors**. Change management is crucial in responding to those changes. Following measurements are used in analysing organization's change abilities:

Organizational effectiveness- *“describes how well organization achieves objectives that it has planned to achieve.” (Burnes 2017, p.6-7)*

Organizational flexibility- *“capability of an organization to move from one task to another and adapt to changes.” (Seethamraju 2009)*

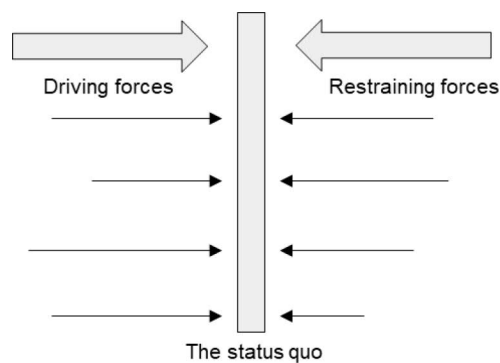
Organizational agility- *“ability of an organization to renew itself, adapt, change quickly, and succeed in a rapidly changing, ambiguous, turbulent environment. Defined also: Agility= Flexibility+ Speed.” (Ganguly et al. 2009)*

As these measurements point out, change management is hard to measure quantitatively. There exists clear analogy between these terms: organizational agility leads to better recognition and deployment of critical change opportunities and initiatives. Flexibility enables system to change and change management ensures succeeding in deployment of changes. This likely enables organization to fulfil its goals by resulting good operational effectiveness. Concept of agility is further studied in third chapter of this thesis.

Forcefield model is one widely known model for change management used in understanding the change and planning change management activities. Change has always restraining forces which prevent change and driving forces fostering it. By understanding



those factors problem owners can handle arguments of change resisting forces and adjust management plans according to them. McCalman (2008, pp.29-13) states that change management is all about softening restraining forces that impeded the change from happening. According to Kotter (1996, pp.32-35), reasons behind satisfaction towards maintaining status quo need to be understood after which change management process begins with first step of building urgency for the change. People resist change and their resistance is only overcome if someone can explain how the change will benefit them (Harmon 2014, p.330). Figure 9 illustrates forcefield model of change.

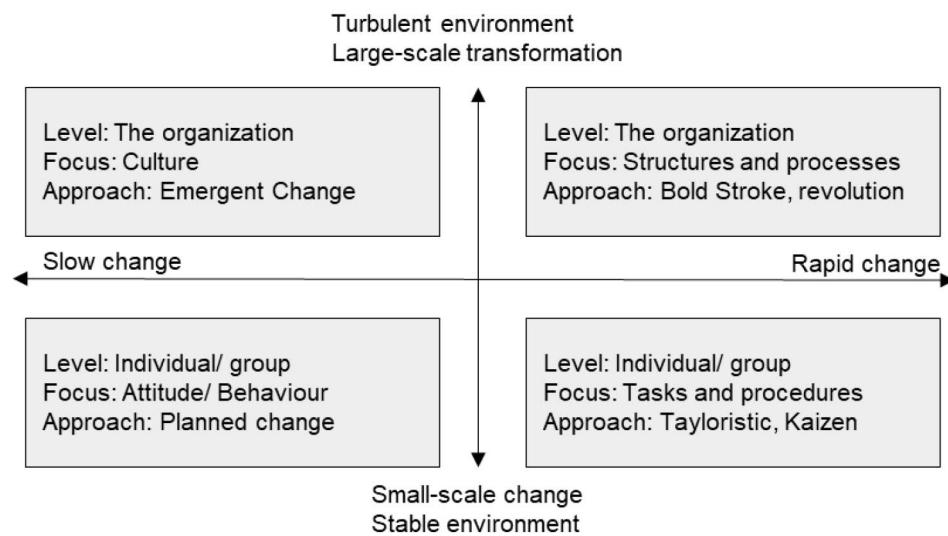


**Figure 9.** *Change management's forcefield model*

From change managers, promoters, and other people leading the change the role of change agents is worth mentioning. They are people with wide knowledge coming usually outside of the change environment. They ensure that the change takes place by taking ownership over the change initiative. Besides the management of change project/process their mission is to establish the level of readiness for change. (McCalman 2008, pp. 383-384)

Multiple different ways to classify changes exists. Scope of change defines how widely change is concerning the studied organization. Change might be organizational wide or include only a certain subsystem within an organization. Change is different depending on people it covers: individual, group, and system level changes have all their specific characteristics (Burnes 2017). Second common parameter in change classification is the nature of the change which defines whether the change is incremental or radical, similar what was brought up in the previous chapter. Nature of change can also be considered from planning point of view: planned change is kept as best developed, documented and supported approach to change while emergent or unplanned change rejects earlier mentioned BPR and TQM change approaches and underlines unpredictable nature of change.

Organizational development theorists have studied planned change a lot and proposed great variety of different techniques for organizations to ensure effective change deployment such as job enrichment, team building, quality of work life, control cycle, and sociotechnical systems approach. (Grover 1999) Emergent change is a process which unfolds through the multiple variables within an organization over time and it is rather bottom-up driven. (Burnes 2017, pp.361-365; 351) Third classification parameter is intensity. Change can happen fast and reactive or slow and anticipatory way. Figure 10 illustrates common dimensions and classifications of change management:



**Figure 10.** Framework for change classification (Burnes 2017, p. 407)

One more commonly used approach is to classify change based on the direction of change from organization's point of view: change can happen either top-down or bottom-up. Bottom-up change is rather modern approach to change where both external pressure and lack of senior management capacity to run planned top-down changes require organization's sub groups to come up with their own solutions. According to Burnes, main challenge in shifting to more agile bottom-up change culture is in roles and responsibilities: instead of directing and controlling employee management should focus on promoting employee engagement and empowerment. (Burnes 2017, pp.369-371)

There exists great amount of various change management models and processes recognizing different phases of change and proposing approaches for them. Lewin's change management model is widely known. It contains three phases (Burnes 2004):

1. **Unfreeze**- breaking down existing status quo, preparing organization to accept that change is inevitable
2. **Change/ moving**- implementation of the change, institutionalizing changes, building understanding of benefits among organization
3. **Refreeze**- after embracing new ways to work organization needs to be stabilized in order to ensuring that wanted state will not move further or face regression

Other universal model for change management is Kotter's theory. It splits change to eight phases and concentrates more on human side of the change (figure 11, Kotter 1996, pp.17-18). Clear similarity to Lewin's model can be recognized from Kotter's model.



**Figure 11.** *Kotter's eight- phase change management model*

While these two models and most of the other common ones are rather used for radical and one-time planned change there exists also strategies to deploy continuous change. One model for incremental and continuous change is PDCA-cycle, plan-do-check-act, which is generally considered as a cornerstone for Lean and originates from TPS. Models concentrating on the emotional side of change are also common. (Burnes 2017, pp.336-338)

According to Burnes (2017) determinants of successful change lies in five dimensions: **organizational structure, organizational culture, organizational training, managerial behaviour, and organizational power and politics**. McCalman et al. (2008, pp. 31-33; 383-385) proposes similar factors to successful change and underlines more the critical roles of problem ownership and change agents in change process.

### 2.2.2 Change towards agile way of working

In change management restraining forces need to be understood and then be converted to more neutral by building up sense of urgency towards the change and selling its benefits to the people it covers. Agility studied in the third theory chapter more comprehensively might require some big fundamental changes in the ways of how organization is doing work. **To become more agile requires usually adopting new ways to handle**

**workflows, new models for communication, different roles dispersing decision making power, and acquiring new technologies to enable all previous mentioned activities.** Following examples discuss how agility-related changes are commonly received in existing researches and with what change managerial implications they have come up with.

Birkenshaw (2018) made a case study about a bank adopting so called “*agile*” management methods imitated from software industry. Research states that after shifting to new management methods respecting the principles of agile development, company’s employee engagement and cost-to-income ratio improved dramatically. Study appoints five managerial key learnings of the change which company went through:

1. Decide how much power you are willing to give up
2. Prepare stakeholders for the leap
3. Build the structure around customers and keep it fluid
4. Give employees the right balance of oversight and autonomy
5. Provide employees with development and growth opportunities

There exists plenty of research related to change management and agility usually analysing shift to more agile ways of working heavily focused on software industry. It seems that agile development is currently mainly on its way to become more popular outside IT industry. This is driven by current megatrends such as digitalization which is reshaping traditional industries and jobs like in the case from banking industry (Birkenshaw 2018). While the topic is lacking scientific evidence, popular sources such as consulting companies and non-scientific journals are concerning the topic in growing pace when comparing search results between scientific database and common search engine.

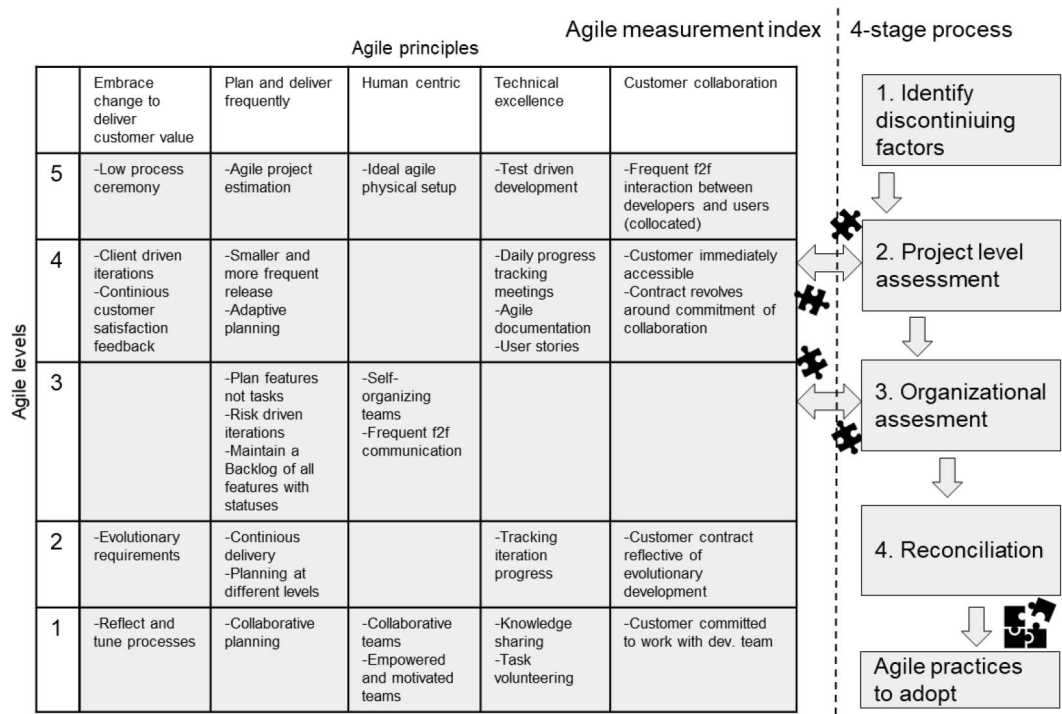
Level of adoption of agile methods has been one common research setup in software and IT engineering domains. Cram et al. (2016) divides Agile adopters to three categories: “*crusaders*” who adopt exclusively agile in its pure form, “*tailors*” who integrate agile with traditional approaches to fit it in its specific circumstances, and “*dabblers*” who adopt a few ceremonial agile activities on top of its traditional approach. Organizations and industries are different, and each organization requires customized set of tools and techniques instead of “*one size fits them all*” solution (Cram et al. 2016; West & Grant 2010). The main thing that is commonly underlined in literature is the type of change in shifting to new working habits which is incremental and should happen down-top direction. As earlier were mentioned, one cornerstone of becoming more agile is to share decision

making to bigger group which requires changes to become rather continuous and down-top generated. It is commonly stated that when a company decides to implement new ways of working it should not rush all in for new concepts proved to be working for someone else (e.g. Cram et al. 2016; West & Grant 2010; Sidky et al. 2007). Instead approach should be incremental and new features should be adopted according to genuine need and rather not top-down directed.

Structured processes and frameworks for agile adoption or agile transition (ATP) have been proposed only a few (Sidky et al. 2007; Javandi Gandomani et al. 2015). Sidky et al. (2007) consider agile adoption process in their study and propose agile adoption framework. They provide a list of issue themes that organizations need to consider when taking structured approach to agile:

1. The organization’s readiness for agility
2. The practices it should adopt
3. The potential difficulties in adopting them
4. Necessary organizational preparations for the adoption of agile practices

They propose following framework (figure 12) for systematic agile adoption process which combines categorization of agile practices and process to apply those:



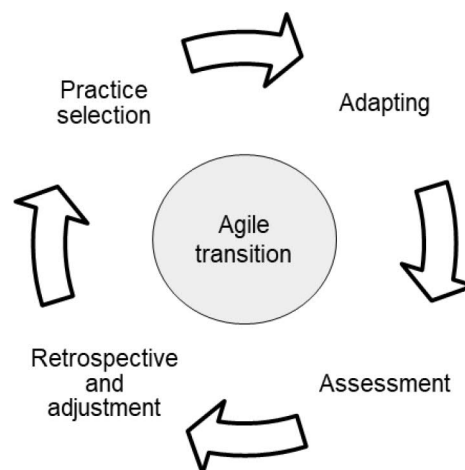
**Figure 12.** Agile adoption framework (adopted from Sidky et al. 2007)

The framework categorizes different agile practices below agile principles and levels of agility:

1. **Collaborative**- Foundation of agile development, fosters communication, and collaboration between all stakeholders
2. **Evolutionary**- Early and continuous delivery of the product
3. **Effective**- Applying engineering practices to enable production of high-quality working product
4. **Adaptive**- Feedback system allowing quick responds to change in the process
5. **Encompassing**- Culture and environment reflective and supportive for agility

According to Sidky et al. (2007), agile adoption begins with analysing factors that could prevent successful adoption, such as inappropriate need for agility, lack of inadequate resources, or absence of executive support. In the second phase, a particular project selects suitable set of practices for it to use. In the third phase, this set is compared to organizational readiness to adopt those. Final phase “*reconciliation*” determines the final set of practices which project would start using and which are supported by the organization.

Javandi Gandomani et al. (2015) criticizes framework of Sidky et al. (2007) to be too comprehensive, complex, highly-disciplined, and detailed which leads it be difficult to use and its disciplined leveling of practices is breaking the flexibility offered by agile methodologies in the first place. They propose more general level framework in their grounded theory approach which is highly similar to classic PDCA-cycle (figure 13).



**Figure 13.** Agile adoption framework (Javandi Gandomani et al. 2015)

Framework is based on their findings that agile transition should be **iterative, continuous, gradual, and value-based** which are not highlighted in Sidky et al.’s (2007) more

detailed model. Both models emphasize the bottom-up directed change in which projects are independently adopting ways of working without having them given from the management.

From change management point of view shift to agile is not just a matter of adopting one or two specific tactics or practices. Change is affecting whole organization and its individuals in all forms of change presented in figure 10. Denning (2013) names **goals, role of management, ways of coordinating work, values, and communication** as dimensions which all require radical and systemic change in order to achieve organizational-wide agility. Role of management is also present in the study of Jovanovic et al. (2017) who stated that transition to agile-enabling organization requires changes not only in multiple current organizational roles but also establishing totally new roles. They concluded that the most important changes occur in the roles of management, product owner, stakeholders (clients and users), and scrum master & development team members. Project manager's role is recommended to change from its traditional and directive role to more facilitating one where establishing relationships and involving organization by generating awareness and understanding are more emphasized. This leaves room for the new role of product owner which task is to master the development process and stay out of "organization's political games" (Waardenburg et al. 2013; Jovanovic et al. 2017)

Change barriers and change management issues are frequently considered in agile transition related literature. Following table (2) concludes change managerial issues related to agile adoption process found from 5 different studies:

**Table 2.** *Change management issues*

<b>Change management issues in shift to agile way of working</b>	<b>Literature</b>
Decision making power spread, development workers feel micromanaged, new relationships needs to be established, new employees for new practises need to be recruited	Williams & Cockburn 2003
Design phase might be left with too little attention, informal communication leads to lack of important documentation, customers can't follow development due to lack of knowledge or commitment, decentralized decision-making leads conflicts with culture	Cao et al. 2009
Methods deployment, requirements management, lack of decent planning	Laanti et al. 2011
Methods deployment, "nonplayers" disabling agile teams, stakeholders not involving enough	Boehm & Turner 2005
Missing understanding of methods, management not able to manage agile development, fear of annoying developers with unclear and irregular estimates, too many responsible persons, communication in distributed team	Hohl et al. 2016

Based on the findings, selling new tools to employees, switching management culture to be compatible with agile principles, and rebuilding project management principles are major challenges generating need for change management activities in adopting agile development methodology. Agile ways of working are likely to increase uncertainty which require different approach for planning.

Previous examples were discussing agile from change management's point of view in a relatively concrete level. All in all, agility and agile ways of working are effectively considering change. Even concept of "*agile change management*" is proposed (Paquette 2015) meaning adopting principles and practises of agility to change management itself. Change management themes are usually integrating and overlapping with agile development and agile project management literature (Conforto et al. 2016). Usual conclusions for texts considering transformation towards more agile ways of working are naming change management issues such as organizational mismatch or individual resistance as top barriers preventing the change that needs to be studied further. When comparing to change management, agility is emphasizing change enabling capability building in the organization while change management is focusing on operative change deployment. Logical continuum after gaining understanding of change and change management is to move towards this change enhancing capability development. Concept of agility and its research is further studied in the next chapter.

## **2.3 Agile development**

Agility-related research in business context includes various subfields. These different disciplines are considering agility from different abstraction levels, different levels of organization, and different industries. Next chapter will focus not only on agile development but also presents an overview of other major agile disciplines and briefly analyses the evolution of agility and relationships between different disciplines. In the latter part, agile development and agile projects are explained more precisely in the light of existing literature. Cross-functionality, project complexity, and increasing amount of collaboration with software developers are some features recognized from the case-organization why agile development and agile projects are needed to be studied further.

### **2.3.1 Overview of agility**

Mainstream agility research is developed from term flexibility in the field of economics within manufacturing industry during 1990s (Ganguly et al. 2009; Conboy 2009; Dove



1994). Agility is emphasized in turbulent environments and it means organization's degree of being proficient at change allowing organization to do anything it wants whenever it wants to (Dove 1994). Conboy (2009) states that flexibility and agility are usually not easy to separate but concludes agility to be kind of extended flexibility where rapidness and learning aspects are emphasized and flow of changes is rather continuous than discrete. Felipe et al. (2016) define agility as combination of adaptability and flexibility where coexistence of proactive and reactive aspects form agility, ability to both sense and react rapidly to changes. Agility research relevant to this thesis can be addressed in different business competence areas below disciplines of agility shown in table 3:

**Table 3.** *Disciplines of agility and literature used as references in this thesis*

<b>Business competence area</b>	<b>Literature</b>
agile enterprise (AE)	Ganguly et al. 2008; Goldman et al. 1995; Dove 1994 & 2004; Tseng et al. 2011
agile manufacturing (AM)	Gunasekaran 1998; Yusuf et al. 1999; Sharifi et al. 1999
agile supply chains (ASC, ASCM)	Christopher 2000; Agarwal et al. 2007; Ben Naylor et al. 1999; Damien & Sohal 2001
agile software development (ASD)	Agile Manifesto 2001; Dingsøyr et al. 2012 & 2008; Conboy 2009
agile business processes (ABP)	Rasche 2017; Sambamurthy et al. 2003; Seethamraju 2009

Discipline approach for agility has led agile discussion to be divided in various subfields. Others are considering agility only in certain parts of operations or industries and others trying to understand holistic view of agility as a management philosophy and business-wide concept. (Conboy 2009) These different disciplines illustrate agility's wide variety within business context: concept of agility is not exactly or uniformly defined in all these, but they are having the same goal of increasing profit by building capabilities to adopt changes better and rapidly. Each competence area is considering agility from different level and viewpoint and they are partly overlapping. (Ganguly et al. 2009)

Agility's origin lies on manufacturing and Toyota Production System (TPS) which is generally known to be as the first implementation of Lean. Concept of Lean Manufacturing was conceptualized based on TPS and was further developed only as lean, methodology or way of thinking later applied in every industry. This is how Lean, for example, was converted to software industry as Lean Software development. Term Agile Manufacturing (AM) was introduced in the beginning of 1990s when movement against traditional mass production by developing manufacturing capabilities that could cope with irregular and unpredictable demand was raised (Goldman et al. 1995; Dove 1994). That was the

first conceptualized discipline of agility. According to Yusuf et al. (1999), agile manufacturing assimilated lessons learnt from Lean manufacturing and Total Quality Management and became synthesis of well-known technologies and methods from manufacturing. Similar evolution led to agile software development ten years later in IT environment.

Goldman et al. (1995, pp. 72-120) conclude that companies must formulate their own market specific program to become agile. Despite that they name four dimensions of agile competition which are said to be universally applicable in every industry and should be tied to corporate goals:

**1. Enriching the customer**

- Products rather solutions for individual problems

**2. Cooperating to enhance competitiveness**

- Cross-functional collaboration to increase operational performance

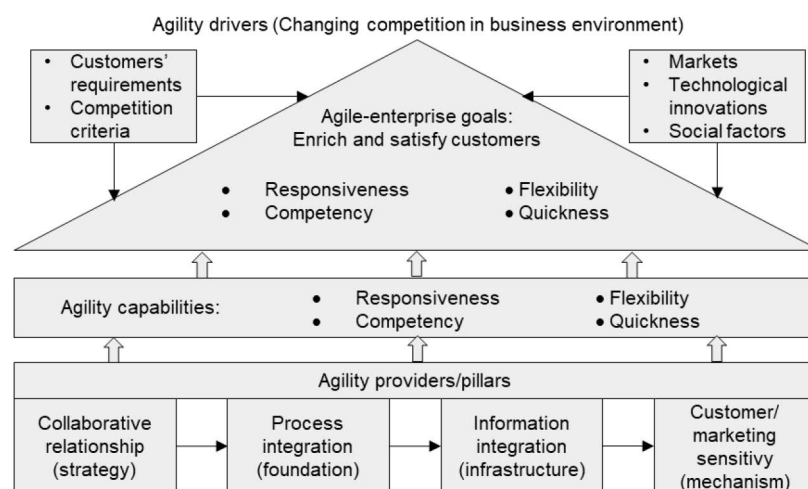
**3. Organizing to master change and uncertainty**

- Flexible organization to support change, no “right” structure or size

**4. Leveraging the impact of people and information**

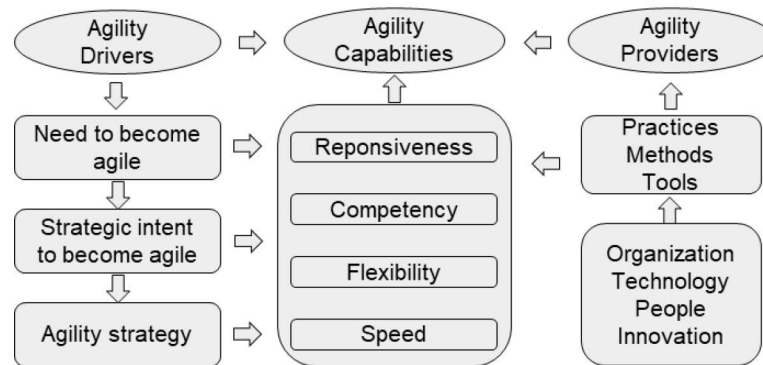
- Entrepreneurial culture drives for better results

Tseng et al (2001) process Goldman et al. (1995) work further by classifying concept of agile enterprise to drivers, capabilities, providers and goals. There exist relatively much research approaching agility in this similar format in all earlier mentioned disciplines (Yusuf et al. 1999; Vazquez-Bustelo 2007; Agarwal 2006; Gunasekaran 1998). Tseng’s et al. (2001) conceptual model for agility is presented in figure 14.



**Figure 14.** Conceptual model of an agile enterprise (Tseng et al. 2001)

Also, Sharifi et al. (1999) proposed a conceptual model for agility (figure 15). It has similar elements with the model of Tseng et al. (2001) and it has been developed from manufacturing domain:



**Figure 15.** *Conceptual model of agility (Sharifi et al. 1999)*

Both models define agility as an attribute of a system which is achieved via development of capabilities increasing responsiveness, competency, flexibility, and speed, and acquisition of providers such as technology and integrated organization.

Even though there exist great amount of different definitions for agile depending on writer and discipline, same components appear to be included in majority of them: **speed, cost, responsiveness, flexibility, quality, competence, and customer needs** (Ganguly et al. 2008; Argawal et al. 2007; Vazquez- Bustelo 2007; Tseng et al. 2001; Sharifi et al. 1999). Following table 4 consolidates proposed enablers for agility from different disciplines. Similar themes are repeated across the disciplines.

**Table 4.** *Agility enablers in different disciplines*

Author	Discipline	Enablers/ success factors
Yusuf et al. 1999	AM	Core competence management, capability for reconfiguration, knowledge driven enterprise, virtual enterprise
Vazquez-Bustelo 2007	AM	Agile human resources, agile technologies, value chain integration, concurrent engineering, knowledge management
Gunasekaran 1998	AM	Concurrent engineering & prototyping tools, agile partnerships, integrated business information systems, investments in people & information
Damien & Sohal 2001	ASC	Supplier integration, technology utilization, participative management, resource management
Christopher 2000; Van Hoek et al. 2001	ASC	Market sensitiveness, process integration, network integration, virtual enterprise
Ahimbisibwe et al. 2014	ASD	Organizational & management support, team dynamics, customer participation, project management

Chow et al. 2008	ASD	Delivery strategy, engineering techniques, team capability & dynamics, project management, customer involvement
Tseng et al. 2011	AE	Collaborative relationships, process integration, information integration, customer/ marketing sensitivity

Agility is enabled by cross-functional collaboration, customer-centric integration of value chain, and institutionalized and continuous loop between planning and execution (Ben Naylor et al 1999; Sabri et al 2010, pp.9-20). Even though different viewpoint and approaches exist, agility can generally be considered as a universal attribute and same fundamentals are present in each discipline. Table 5 summarizes studied main disciplines and their specific features:

**Table 5.** *Conclusion and comparison of disciplines of agility*

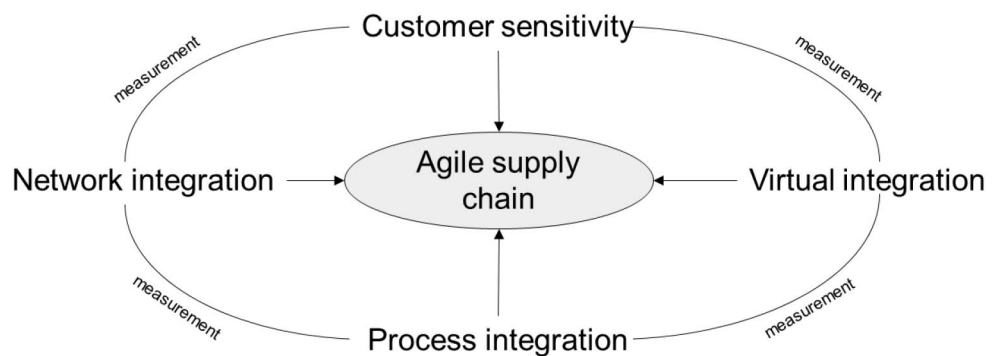
<b>Agile discipline</b>	<b>Agile Enterprise</b>	<b>Agile Manufacturing</b>	<b>Agile Supply chains</b>	<b>Agile Software Development</b>
<b>Main improvement objective</b>	Organizational effectiveness	Offering	Service level	Quality
<b>Scope</b>	Organization	Manufacturing system	Value chain	Project group
<b>Original environment</b>	Management	Manufacturing industry	Logistics & Distribution	Software industry
<b>Improvement focus</b>	Organizational learning & knowledge transfer	Production adaptability	Material & information flows	End-user/ customer collaboration
<b>Specific key feature</b>	Virtual organization	Concurrent engineering	Network integration	Iterative and incremental development

Agility is universally meaning the same thing and different disciplines are clearly linked to each other, but when studying it closer in different environments it has different level of abstractions, different set of practises, and differently weighted objectives. This finding is valuable when considering agility in the case organization of this study which operates simultaneously in all above-mentioned operative environments. It would be wrong to say that different disciplines are synonyms and they all mean the same thing, but still there exist clear analogy which ties disciplines to each other.

Agility is constantly discussed with lean in literature and seen as an extension to traditional Lean. Terms “*Leanagile*”, “*Leagility*” or “*Lean and agile value chain (LAVC)*” are describing the concept combining both Lean and Agile methodologies (Ben Naylor et al.1999; Sabri et al 2010). Lean environment honouring waste elimination principles is

not enough anymore while more focus needs to be shifted on flexibility to deal with inevitable occasions that disrupt even the best-designed systems. More volatile demand and supply require capabilities to react quickly when changes occur and even detect changes before they take place. (Ganguly et al. 2009)

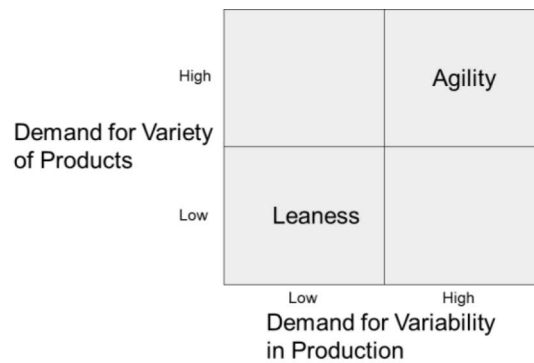
Supply chain agility considering papers and books are frequently referring to “*agile supply chain framework*” presented first by Van hoek et al. 2001. Framework (figure 16) is consolidated from various literature sources, and for example, has taken strong impact of earlier mentioned dimensions of agile enterprise presented by Goldman et al. (1995). Despite the name of the framework, it is not in conflict with other streams of agility research.



**Figure 16.** *Agile supply chain framework*

Virtual organization (also virtual company or virtual corporation) mentioned in manufacturing and supply chain disciplines refers to the idea of borderless organization utilizing comprehensively ICT allowing information and workforce move freely enabling better agility (Goldman et al. 1995, pp.201-208). IT capabilities are universally essential for agility in ensuring continuous information flow. (DeGroot & Marx 2013)

Ben Naylor et al. (1999) simplify supply chain with a concept “*decoupling point*”. This point divides material flow between upstream and downstream flows. Before decoupling point, supply chain is forecast driven, after that it is market driven and products are pulled through the rest of the supply chain by the end customer. Lean is more emphasized in upstream flow, Agile in downstream. Different needs in Lean and Agile characteristics in different parts of a value chain lead to earlier mentioned process classification: upstream processes are likely to be simpler and downstream processes more complex. Common variables for analysing Agile and lean in supply chain environment are product variety and production variability shown in figure 17 (Ben Naylor et al. 1999).



**Figure 17.** *Lean and agile framework*

Ben Naylor et al. (1999) call this “*agile and lean paradigm*” and name the best solution for it to build dynamic organization that can flexibly adopt both paradigms depending on current order winning features. Lean and agile paradigm have plenty of research, majority seems to underline the need to be aware of the difference of lean and agile and recommend “*hybrid strategies*” in which enterprise adopt lean and agile features based on its operational environment (Christopher 2000; Van Hoek et al. 2001).

Agility in business context means capability to adopt changes by usage of market knowledge to exploit profitable opportunities in volatile markets. Leaness is development of value stream to eliminate all waste and to ensure level schedule (Ben Naylor et al. 1999). Ganguly et al. (2009) state that while lean is focused on pure waste elimination agility is respecting waste elimination only to the extent where it is not harming organization’s ability to respond efficiently to changes. Lean is about doing more with less and should not be confused with agility (Christopher 2000). Lean is in its element in flow optimization where demand creates predictable pull. When demand gets turbulent and needed variety of deliverables more complex, lean cannot alone ensure successful execution of operations. Denning (2013) notes that agile and lean have similar commonalities such as small batch sizes, increased flexibility and reduced cycle times but in big picture **lean is focusing on efficiency enhancements and costs cutting while agile or agility is generally focused on adding value for customers**. Fully optimized value streams become waste if they can’t satisfy customer needs. They need intelligent input and knowledge. Virtual organization, process and network integration and customer sensitivity are all dealing with information flows.

In addition to prior mentioned major disciplines agility, field of agility research is wide and contains number of different approaches. One more relevant stream for this study is process and systems agility which is concentrating on attributes of a certain solution. Business process management agility is considered in a few studies. It underlines systems and processes customization capabilities. (Seethamraju et al. 2009; Sambamurthy et al. 2003) Raschce (2007) defines business process agility as *“the ability to add and/or reconfigure a business process by quickly adding new capabilities to the set of business process capabilities to accommodate the potential needs of the firm”*. According to Zacharias et al. (2017) in order to be agile in business process management following attributes need to be fulfilled by the system:

- **Reconfigurability-** ability to adapt changes
- **Responsiveness-** ability react changes in proper and timely manner
- **Employee adaptability-** continuous change requires knowledgeable people able of responding dynamic conditions
- **Process-centricity-** ability to understand end-to-end business process instead of breaking it to functional silos

Zacharias et al. (2017) defines business process agility as *“the ability to dynamically modify, reconfigure, deploy and control a business process to accommodate required and potential needs of the firm”*. Business process agility is highly concentrating on system side of agility and leans on IT capabilities. Rasche (2007) states that IT flexibility is prerequisite for agile processes. System and process standardization and adopting best practices are practical actions how process agility can be increased (Seethamraju et al. 2009).

### **2.3.2 Agility in development work**

Agile as development methodology is usually connected with software engineering. Agile software development (ASD) was first mentioned in *“the Agile Manifesto”* written by a group of independent software developers in 2001. Manifesto introduced the term agile software development (usually only used *“agile”*) for the first time by gathering generally known modern values and frameworks commonly used within IT industry and software development below one term *“agile development”* as a *“host of methods”* (Dingsøyr et al. 2012). Agile Manifesto highlighted the values of collaboration and communication, responsiveness and focusing on the implementation of working software. In addition to agile manufacturing discipline, agile software development has also origins in the middle

of 1980s when the idea of partial and collaborative delivery as iterative software development came up (Boehm et al. 1984).

Definition of agile is understood differently, and often incorrectly, due to lack of one universally known single and simple definition. Terms agility and agile are mixed or used as synonyms while agility is rather universal feature of a system and agile currently a concept or methodology usually linked to ASD. Concepts below agile or agility are lacking cumulative tradition since they are often “*reinvented*” and there exists no parsimony which leads everything to “*be agile*”. (Conboy et al. 2009). Dingsøyr et al. (2012) conclude agile development as a methodology in which “*motivated and empowered software developers – relying on technical excellence and simple designs – create business value by delivering working software to users at regular short intervals*” According to Cram et al (2015), Agile “*refers to a family of iterative systems development methods that value team collaboration, minimal up-front planning, and the flexibility to adapt to changing requirements*” Both these definitions are for ASD and they are already considering agile in different levels what demonstrates agile’s unsettled and variable lingua: first describes agile as a way of thinking, second agile as a set of methods.

Boehm & Turner (2003, p.17) state that a truly agile method must include all of the following attributes: **iterative** (several cycles), **incremental** (not deliver the entire product at once), **self-organizing** (teams determine the best way to handle work), and **emergence** (processes, work structures and principles are recognized during the project rather than predetermined). They divide agile practices below three themes: **communication, management, and technical**. Agile project management is also existing concept used usually as a synonym for agile development which mainly derives from ASD principles and aims to bring modern approach to project management compared to traditional ones (Paquette 2015, p.1-3; Fernandez 2009).

Many companies have discovered that it takes more than the accepted basics of high quality, low cost and differentiation to excel in today’s competitive market where speed and flexibility are even more important aspects (Takeuchi & Nonaka 1986). For that high-level purpose, iterative development methods have been used and developed in industry before agile was started to be linked primarily to software development. Takeuchi & Nonaka (1986) introduce iterative product development for tangible products in hardware industry. They called it “*rugby approach*” which was based on six characteristics resembling to those introduced seven years later in the Agile manifesto:



- **Build-in instability**- continuous readiness to adopt changes during the development
- **Self-organizing teams**- development team is planning its own agenda and ways of working
- **Autonomy**- top management enables but doesn't intervene, the team set its own direction
- **Overlapping development phases**- tasks aren't as tightly positioned as in traditional waterfall model
- **Multilearning**- learning across multiple organizational and functional levels accelerated by people with different background working in close touch and learning by doing
- **Subtle control**- management controls entity by setting checkpoints but avoid impairing creativity and spontaneity
- **Organizational transfer of learning**- spread of lessons learnt outside the development team

Development process seldom proceeds in a linear and static manner. It requires iterative and dynamic process of trial and error and capability to maintain highly adaptive style (Takeuchi 1986). Agile as an innovation methodology in new product development (NPD) has been applied also from 1980s but it has been embedded or "*reinvented*" below concept of agile development later (Takeuchi 1986; Kettunen 2009).

Agile development methodology is proved to be highly applicable with innovative products outside software industry (Takeuchi & Nonaka 1986; Conforto et al. 2016). Adoption of agile development outside software development is rare research topic and there exist only a few empirical case studies of the topic (Conforto et al. 2016; Fernandez et al. 2009). Relevant studies related to agile project management adoption outside software development are consolidated in appendix A. Research related to comparison between agile project management and traditional project management usually attempt to explain how agile approach leads to better outcomes than traditional approaches. In other management related literature agile adoption and agile project management within different industries are considered more frequently but usually without clear empirical evidence (Denning 2013). According to literature review of Vallon et al. (2018), agile development related literature is exclusively handling success stories and steady research output of approximately 20 publications per year has been published from 2008.

Hoda et al. (2018) analyze past and future of agile development research and state that agile development is getting constantly more attention and will have crucial and enabling role in development of emerging technologies during 2020s. IoT solutions require agile development teams to develop also hardware and other tangible solutions in embedded

systems for example in product management environments. Non-technical experts need to be able to run agile projects in order to improve and deploy parts of the software systems they use. They name one future trend to be that agile practitioners will be “*looked upon as the experts in agile practice by those in disciplines beyond software*” and be the key players in assisting in “*agile transformations outside of software development—e.g., in human resources, sales and marketing, project management, and R&D. They can do this by abstracting out the lessons learned from agile transformation in software teams, applying them to new contexts, and helping adapt agile to fit new contexts.*”

Still, relatively little cross-domain research exists of relationships between agile software development and other agile disciplines or agile development applications beyond software industry (Conboy et al. 2009; Kettunen 2009). Kettunen (2009) has done research about differences between AM and ASD disciplines and proposed findings for cross-domain knowledge sharing. He concludes that ASD do not have profoundly new ideas compared to AM, and there exists clear analogy in principles and working habits between these disciplines. Table 6 exemplifies analogy between AM and ASD disciplines found by Kettunen (2009).

**Table 6.** *Similarities between agile manufacturing and agile software development (Adopted from Kettunen 2009)*

<b>Agile Manufacturing</b>	<b>Agile Software Development</b>
<b>Organization</b>	
<ul style="list-style-type: none"> <li>• Core competence management</li> <li>• Knowledge driven enterprise</li> </ul>	<ul style="list-style-type: none"> <li>• Flexible product systems engineering, modular product and software architecture design</li> <li>• Market-sensitive product management, leveraging the real-time market knowledge in product design</li> </ul>
<b>Process</b>	
<ul style="list-style-type: none"> <li>• Proaction</li> <li>• Robustness</li> </ul>	<ul style="list-style-type: none"> <li>• Flexibility in design, taking into account the market trends</li> <li>• Developing future capabilities for similar change</li> </ul>
<b>Product</b>	
<ul style="list-style-type: none"> <li>• Flexible products</li> <li>• Mass customization</li> </ul>	<ul style="list-style-type: none"> <li>• Standardized hardware/ software interfaces</li> <li>• Plug-in varieties change</li> </ul>
<b>Operation</b>	
<ul style="list-style-type: none"> <li>• Concurrent engineering</li> </ul>	<ul style="list-style-type: none"> <li>• Close co-operation with the peer hardware and software designers, iterative product integration</li> </ul>
<b>People</b>	
<ul style="list-style-type: none"> <li>• Leadership</li> <li>• Worklife quality</li> </ul>	<ul style="list-style-type: none"> <li>• Cross-functional program management</li> <li>• Visible progress, no major breakages</li> </ul>

ASD practises are mostly considering teamwork and leaving larger scale organizational-level aspects open. Examples for these aspects mentioned in the paper are partner/supplier collaboration, production strategy and product portfolio/product line decision making. According to the study, ASD is lacking holistic view over business and this gap could be filled with applying practises of AM.

Software development process might have development cycles of hours and magnitude of change varies a lot, even radical changes can be conducted at a late stage of development (Kettunen 2009). Due to lighter organizations and very technology and development focused operations, agility in ASD is left to consider mainly work of small development teams. According to Boehm & Turner (2003, p.28), over forty sized group needs to adopt traditional plan-driven project management beside agile practices because complexity. Research leaves questions open for opposite setup: while ASD has focused more deeply on developing agile practices for teamwork how those could be applied in agile manufacturing and other agile disciplines? Denning (2013) studied car manufacturing and designing in his case study and stated that agile development is likely to become crucial in manufacturing setting and refreshing the concept of agile manufacturing. Study showed how usage of agile development methodology itself can enable better innovations with less resources and justified how it could be applicable in R&D work in manufacturing.

Agile development has extended to mean management philosophy and been considered in business management literature in growing pace. One reason might be digitalization and even bigger integration between software developers and traditional workers. Many conceptualized agile software development practices in people or project management do not have necessary dependency on software development, and they are usually described as "*lightweight methods*" meaning that they are simple with only few rules and easy to implement. Cram et al. (2016) entitle Agile as a "*management fashion*" which is not only adopted because of its core principles but also "*mindlessy*" because it is hot topic. Denning (2013), for example, approaches agile development from managerial perspective and defines agile development primary as a management movement: "*Agile represents a management breakthrough that has enabled software-development teams to systematically achieve both disciplined execution and continuous innovation, something that was impossible to accomplish with hierarchical bureaucracy*". Large scale agile implementation from agile development point of view is recently studied topic and there is growing interest towards it among different industries (Dikert et al. 2016).

### 2.3.3 Agile projects

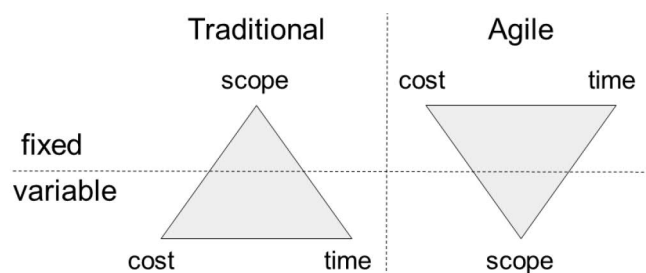
Currently, even bigger interest towards lighter and delivery focused project and process management methodologies has been aroused outside traditional IT-industry. Classic waterfall-approach to project management is not responding anymore enough to rapidly changing delivery requirements in even more turbulent market environments where agility, capability to adopt changes, has become more crucial (Rigby et al. 2016; Grant et al. 2010; Paquette 2015, pp.24-29). Even though agile development is originally designed, or at least reinvented, for software development there are useful principles and tools that are adoptable in other kind of development environments as well. The core principle in agile adoption is that each organization must itself decide which agile methods are applicable in its development procedures as was stated in the prior change management chapter. If industry is not even delivering software, it should not rush “*full agile*” by adopting all similar ways of working than true software development team. It should get knowledge what agile development is essentially about and sort out from which its principles it could start implementing agile in order to get maximum benefits out of it. (Grant et al. 2010)

Agile projects in this study refers to projects that are utilizing agile project management methodology in their management. Agile methodology is usually compared to traditional project management methodology (often “*waterfall*” or “*plan-driven*”) where scope is fixed in the beginning and delivery concentrates on the final release. Following table 7 presented by Conboy & Coyle (2011), consolidates main differences between traditional and agile project management methodologies:

**Table 7.** *Differences between traditional and agile methods (adopted from Conboy & Coyle 2011)*

Project component	Traditional	Agile
<b>Control</b>	Process centric	People centric
<b>Management style</b>	Command and control	Leadership and collaboration
<b>Knowledge management</b>	Explicit	Tacit
<b>Role assignment</b>	Individual—favors specialization	Self-organizing teams—encourages role interchangeability
<b>Communication</b>	Formal and only when necessary	Informal and continuous
<b>Customer involvement</b>	Important usually only during project analysis	Critical and continuous
<b>Project cycle</b>	Guided by tasks or activities	Guided by product features
<b>Development model</b>	Life-cycle model (waterfall, spiral, or some variation)	The evolutionary-delivery model
<b>Desired organizational form or structure</b>	Mechanistic (bureaucratic with high formalization)	Organic (flexible and participative, encouraging cooperative social action)
<b>Technology</b>	No restriction	Favors object-oriented technology
<b>Team location</b>	Predominantly distributed	Predominantly collocated
<b>Team size</b>	Often greater than 10	Usually fewer than 10
<b>Continuous learning</b>	Not frequently encouraged	Embraced
<b>Management culture</b>	Command and control	Responsive
<b>Team participation</b>	Not compulsory	Necessary
<b>Project planning</b>	Up front	Continuous
<b>Feedback mechanisms</b>	Not easily obtainable	Usually numerous mechanisms available
<b>Documentation</b>	Substantial	Minimal

Following illustration (figure 18) is commonly used in comparing traditional and agile work: agile is typically applied when outcome cannot be defined in advance, but costs and schedule at least for short-term are better known. Traditional approach relies on fixed scope but might allow costs and schedule adjustments during the project. This should be taken into account in project planning phase which has appeared to be a challenge for traditional enterprises (Waardenburg et al. 2013).



**Figure 18.** *Agile vs. Traditional approach in terms of scope, cost and time*

Most essential difference is the scope: if uncertainty is high and there is strong likelihood or need to invent new things and change directions during the progress, agile methodology supports the work better. Hybrid model combining elements from both approaches is discussed, but not systematically studied (Conforto et al. 2014; Fernandez et al. 2009; Serrador & Pinto 2015). Organizations adopting agile methodology need to consider in which ratios agile and traditional project management methodologies should be utilized (Dikert et al. 2016). Paquette 2015 summarizes advantages and disadvantages of traditional project delivery methodology in following way (table 8):

**Table 8.** *Summary of usage of traditional vs agile model (adopted from Paquette 2015, p.29)*

<b>Advantages of traditional approach</b>	<b>Disadvantages of traditional approach</b>
Defined scope easier for writing	Business must understand all requirements at beginning
Clearly defined costs limit business exposure especially in a fixed price contract	Reduced flexibility to changing circumstance
Well understood delivery metrics	Increased documentation is low value-added proposition
Better suited for vendor and outsourcing to lower cost specialized resources	Reduced opportunity for innovation
Simplified delivery (reduced communication between resources)	

He also proposes following list of most important elements in successful technology project delivery (Paquette 2015, pp.17-18):

1. Active senior management and stakeholder involvement
2. The effective identification, measurement and communication of the intended benefits of the change
3. Promotion of a change culture is addressed through mutual collaboration
4. Effective management of people through the change

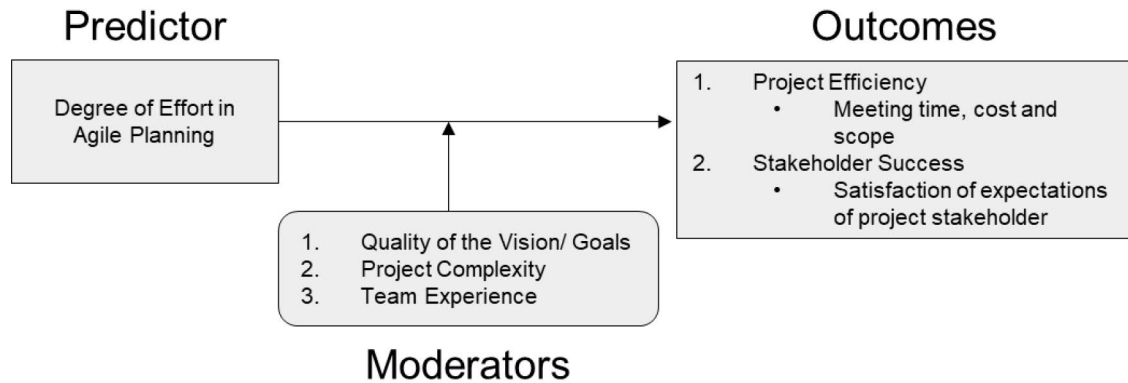
Kruchten's (2011) study also underlines organizational level factors as requirements for agile projects to succeed. He divides factors effecting on agile project outcome to two sub groups: organizational level and project level factors (figure 19). Organization-level factors do influence heavily the project-level factors, which in turn should enable utilizing agile practices in development work. "Sweet spot" is optimal condition for each project level factor:

Organizational level factor		Project level factor	Agile "sweet spot"
Business domain - For what domain is solution for (for example some industries safety-critical like biomedical or aerospace)	→	Size - Overall team size	12
Number of instances - Single system or multiple		Stable architecture - Is <i>de facto</i> architecture already in place	Stable
Maturity of organization - How experienced people and suitable processes are for software development		Business model - What is money flow	In house
Level of innovation - Organization's innovativeness, early adopters or traditionalists		Team distribution - Distributed/ collocated team	Collocated
Culture - Systems, values and behaviours that impact on development practices		Rate of change - Business environment stability	Medium/ high
		Age of system - Evolution or revolution of system	Greenfield
		Criticality - Consequences of failure	Simple, money losses
		Governance - Starting and termination, how outcome is defined	Simple rules

**Figure 19.** Two levels of factors enabling agile adoption and success (adopted from Kruchten 2011)

He concludes his study by stating that "*agility should not be defined in terms of practices, but as the ability of an organization to react to changes in its environment faster than the rate of these changes*". In addition to high emphasis on organizational level enablers he underlines that instead of chasing "*sweet spot*" organizations should note which factors are not ideal for agile practices and pay attention in finding customized solutions to them.

Highest interest in this thesis lies on enablers, barriers, and success criteria of projects that have used agile methodology instead of traditional project management models. Research related to the comparison between agile project management and traditional project management usually attempt to explain how agile approach leads to better outcomes than traditional approaches (Rigby 2016). Serrador & Pinto (2015) conducted a quantitative study of over 1002 agile projects across different industries and nations in their study "*Does Agile work? — A quantitative analysis of agile project success*". Their results stated that the greater the agile approach was reported, the higher was the reported project success. Hypothesis of their study was based on following model where moderators and outcomes were gathered and consolidated from prior literature:



**Figure 20.** *Hypothesis model in analysing correlation between agile adoption and project success (adopted from Serrador & Pinto 2015)*

From moderators, quality of the vision or goals appeared to have the most significant effect on project success leaving two others with less relevance.

Waardenburg et al. (2013) studied the relationship between organization and agile projects in their grounded theory research “*When agile meets the enterprise*”. They found out a few critical impediments that cause agile projects to fail in traditional organizations from which the most crucial were increased IT landscape complexity and lack of business involvement. Corporate culture was found to slow down agile adoption and shift was seen happening mainly bottom-up direction. According to them, shift from-plan driven to agile ways of working requires fundamental changes in project management roles and re-established practices in collaboration with IT and business organizations. Study proposed following ways to increase collaboration between project and organization: changing the mindset of business stakeholders, directing business knowledge through the product owner, and aligning knowledge and requirements at the business level.

## 2.4 Synthesis

Agile development offers a good place to update project management model to more innovation-embracing and customer-oriented direction. Principles of agile development are not only invented and developed within software development teams. **When studying agility-thinking further in its different orientations, it can be seen as a universal concept having common traditions, pursuing towards similar goals and enabled by similar factors.** Agile development as a recent and well conceptualized field of study currently offers not only tools and techniques for a certain project or development work, but also more holistic mindset for organizations to become better in serving customers. Field of agile development has not reached its maturity and there is clear need to study



more applicability and adoption of it beyond software development. Agile development is constantly gaining more interest not only as a project management methodology, but also as a management trend underlining principles such as self-organizing individuals and teams, continuous product delivery, and frequent customer feedback. **Need for innovativeness and complex environments are factors that have led even more industries and organizations to adopt agile development in their work.**

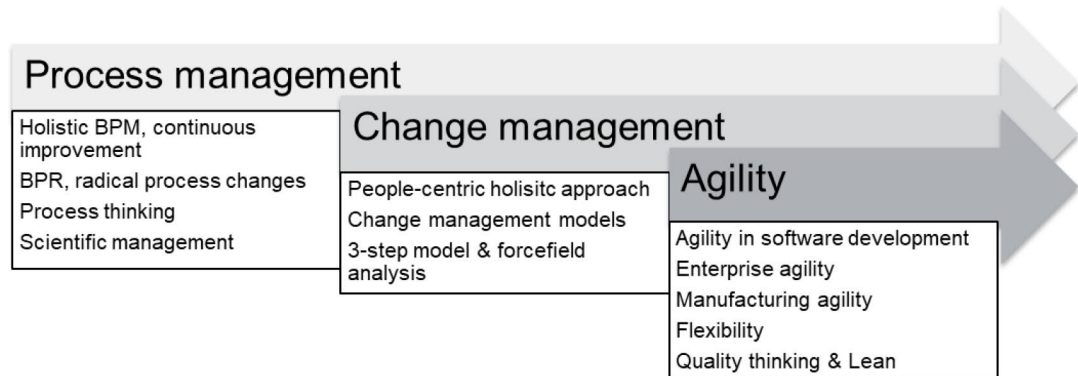
Understanding business process management and change management are logical prerequisites before adopting agile development methodology. Seeing value chains systematically as rows of business processes and **understanding whole end-to-end process and customer value it produces** are essential in process development initiatives. While currently these process improvement initiatives are increasingly taking place as agile projects worked by development teams, it is important to have constant business input to the development work. This is challenging since people who understand well both business and technology are rare and committing business representatives, who are used to work in traditional ways, to time-consuming agile projects is challenging.

Change management is critical part in business process change initiatives where new process or system is wanted to be deployed. **Need for change management is present in various forms in agile projects.** Building urgency towards change is needed to be done within project stakeholders in order to align all to work with the same rules. Usually this change takes place from bottom to top direction and faces challenges in acquiring management support and fitting in to organizational cultures. Shift to agile methodology is not something that happens similarly in each organization: variety of applicable tools and techniques and ratio between agile and plan-driven project management aspect are variables in each organization. Agile methodology is proven to work idealistically in certain conditions. **Organizations need to develop their own approaches to agile methodology by adopting ways of working that best suits to their environments.**

Deploying agile methodology requires constant change management from all project key personnel since its fundamental idea is to embrace change and adapt to constantly changing complex environment. In agile development, changes are both planned and emergent and change communication is emphasized in daily level. Understanding people and organizational factors in development ensures successful change deployment and quality of the product. By seeing business process changes via three dimensions of system, process, and organization ensures holistic project planning where both technical and human aspects are considered. Radical process changes tend to fail due to project

complexity and underestimated change management efforts. Radical change deployment is something that agile methodology attempts to avoid by planning only short period at a time and releasing product features gradually.

Following figure (21) illustrates three theory parts and their central concepts by linking them together roughly in a chronological order:



**Figure 21.** *Conclusion of studied concepts in the literature review and their main development stages*

Even though agility within software development has evolved to its own field of study there is potential to scale it more across different industries. Prior agility research is not outdated, and plenty of earlier findings such as conceptual models and frameworks are applicable with current agile development theories. It is also remarkable to review recent agile development literature in critical light since the field is recognized to be hyped and re-inventing already existing things.

### **3. RESEARCH METHODOLOGY**

In this chapter the research design and process are described. Chapter includes presentation and justifications of selected methodological choices, defining of data collection and analysis techniques, and brief introduction of the Case Company.

#### **3.1 Research design**

Nature of research questions of the thesis lead research to be qualitative and research philosophy to be interpretive. Qualitative research is usually associated with an interpretive philosophy in which researcher need to make sense of the subjective and socially constructed meanings expressed by those who take part in research about the phenomenon being studied (Saunders et al. 2012, p.163). In this research it means that the researcher is taking a position within the studied environment trying to make sense out of rich qualitative data by accepting own and interviewees subjectivism. Research is an explorative study which aims to clarify understanding of a topic in a situation where researcher is unsure of the precise nature of it. Exploratory design allows research to be flexible and adaptable to changes. It may commence with a broad focus, but this will become narrower as the research progresses. (Saunders et al. 2012, p.171) Explorative approach is justified based on the nature of the topic and research environment: agility is wanted to be understood and studied broadly due to multifunctionality of the case organization and narrowed down as the study progresses.

Qualitative data is likely to be characterised by its richness and fullness, based on the opportunity to explore a subject in as real manner as is possible (Saunders et al. 2012, p.546). Qualitative research is chosen due to non-numeric and hardly measurable results of the study. Qualitative research has also ability to reveal new and surprising findings. It allows researcher to adopt different viewpoints to the studied phenomena which is essential in this study. Multiple data collection techniques are chosen for data gathering which makes research's methodological choice to be multi method qualitative study (Saunders et al. 2012, pp.164-165). This is due to that research uses participative observations in data gathering in addition to interviews.

For research approach inductive approach is chosen. In induction naturalistic and emergent research design is used to develop a richer theoretical perspective than already

exists in the literature (Saunders et al. 2012, p.163). Selection is justified because research is attempting to create new theory rather than testing existing one, and the research process is more iterative than linear. Induction supports well interpretivism and qualitative study where rich data content and holistic understanding are emphasized. Elements from both inductive and deductive approaches are likely to be mixed: in deduction theory emerges from the process of data collection and analysis (Saunders 2012, pp.548-549). During data gathering phase of this thesis, analysis have been made and they have directed in forming theory and testing hypothesis in remaining interviews.

The strategy used in the data gathering is case study. In case study research topic is explored within its context. It is relevant when rich understanding of the context of the research and the processes are wanted to be revealed. It suits well with explanatory research setting by providing good opportunity to answer questions “*why?*”, “*what?*” and “*how?*”. In this thesis multiple cases are analysed, which gives good overall view of the studied phenomena within the research scope. Case study setup used in this research setup is rather embedded than holistic because there are multiple units of analysis selected (Saunders et al. 2012, p.180). Multiple case study has strong likelihood to produce strong support for the theoretical propositions on which original predictions were based. Well-constructed case study might enable opportunity to challenge an existing theory and provide ideas for new research questions. Even though case studies, and especially multiple case studies, are considered as time consuming and demanding, it is the best strategy for this thesis where different positions and environments within the studied organization are wanted to be explored. Figure 22 concludes research design setup selected for this thesis:

Philosophy	Interpretivism
Approach	Induction
Methodological choice	Multi method qualitative
Strategy	Case study (multiple & embedded)
Time horizon	Cross-sectional
Techniques and procedures	Interviews, participative observations

**Figure 22.** *Research design choices of the thesis (Adopted from Saunders et al. 2012)*

Cross-sectional time horizon is chosen for the study because it seeks to describe the incidence of a phenomenon at a given point in time and have a limited schedule (Saunders et al. 2012, pp.190-191). Data collection and analysis are discussed further in coming subchapters.

## **3.2 The Case Company**

The Case Company of this thesis is a globally operating technology company. It offers solutions to wide range of industries. Organization consists of a few business areas (BA) which include product lines (PL). Product lines are responsible of their specific offering streams below each business areas. Geographically organization is split to market areas (MA) which all consists of a set of subsidiaries located below the specific area.

The Case Organization in this thesis refers to the global logistics organization of the case company. In the matrix organization it supports different business areas by executing logistics and order management operations and maintaining globally dispersed distribution center network. All the selected cases in the empirical part are related to the case organization, but they are not necessarily led by it. Solutions that the project cases attempt to build are initiatives that are intent to be used by various business areas across the Case Company. Interviewees came from several different organizations.

## **3.3 Data collection**

### **3.3.1 Literature review**

Literature review is used to develop a throughout understanding and insight to previous work that relates to the research questions and objectives. Literature review aims to draw out key points and present them in a logically argued way by discussing critically studied material. It also provides intro and lead reader into subsequent sections of the thesis (Saunders et al 2012, p.115).

Literature review is built on three themes which are logically related to each other and provide adequate pool of relevant source material. According to Saunders et al. (2012, p.80) optimal structure for a literature review is to start at a more general level before narrowing down. Agility only in one of its specific forms would have been too narrow topic itself and would not fully serve objectives of the thesis. Business process management and change management are considered rather briefly and used in order to build prerequisites for agility discussion.

Articles were searched mainly from university's database Andor and public Google Scholar. In addition to scientific journals, approximately 10 books were quoted. In order to find the most reliable and ground-breaking texts, number of earlier citations was emphasized when selecting source material. Primary interest in the literature search was in finding studies that consider applications and adoption of agile methodology within traditional industries. Due to limited amount of these studies and core theory located below engineering and IT domains, those were the most used references in this study. Main search entries consisted of words "*agile*", "*agility*", "*agile development*" combined with "*management*", "*project management*", "*traditional*", "*manufacturing*", "*industry*", "*process management*", "*change management*" and "*adoption*".

### 3.3.2 Semi-structured interviews

Data for the research is collected through semi-structured theme interviews. Interviews are conducted from three different cases which are described in table 9.

**Table 9.** *Summary of cases*

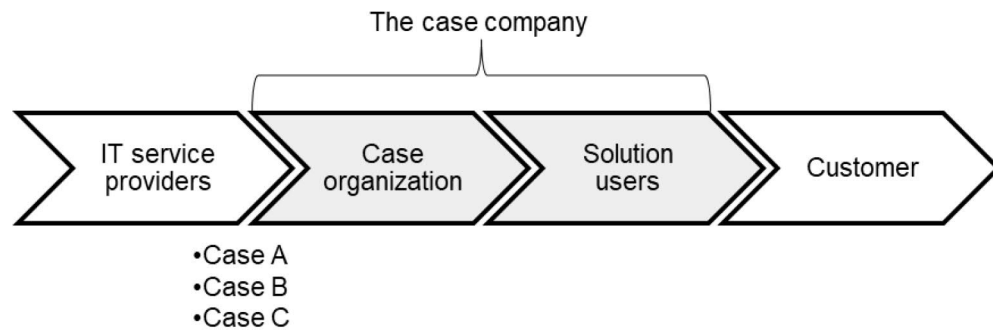
<b>Case</b>	<b>Description</b>	<b>Size</b>
A	Project of system development & business process re-engineering	Small
B	Development project for a new system to replace an old one and process improvements	Medium
C	Program to develop a new web-based portal and modernize and unify processes	Large

Cases were selected based on their recent and ongoing timing, their close relation to the case organization, and their usage of agile project management methodology. All projects were independent entities and they do not have any common inter-project activities or any other interactions.

All cases have been started during 2017 or 2018 and they are currently (Summer 2019) active. Case in the context of this thesis means not only the development phase of the project, but all the activities that need to be take place prior a new system is totally implemented. These new solution developments are business critical to whole company and aim to enable growth and success by improving customer experience and operational efficiency. All of them aim to replace existing systems with totally new and modern solutions. Even though cases are not fully comparable due to their differences in size, resources, and goals, they together provide a comprehensive overview of the current state of agile development in the case organization.

Even though cases are known as agile software development projects aiming to produce software solutions for business purposes, they all represent business process change initiatives from the Case Company's point of view. Cases represent big and radical changes where change needs to happen in all three dimensions which were already brought up in the theoretical background of this thesis: **process, system and organization** (Stoddard & Järvenpää 1994). Interviews attempt to gain insights not only from the systems development dimension, but also from agile projects and their interactions with surrounding organization and business processes.

Figure 23 illustrates case study's research setup and most important project stakeholders.



**Figure 23.** *Selected cases and their most important stakeholders*

All interviewees were selected within the case company because the scope of the study was limited only to the case company. Only managing personnel from each case were selected. These persons were the best contacts to comment their project's state and progress and answer questions related to more holistic discussion about change management and agile adoption. Summary of interviewees and their roles are shown in following table (10):

**Table 10.** *Summary of interviews*

Interviewee	Role (project)	Duration (min)
<b>A1</b>	Manager (temporary role)	39
<b>A2</b>	Manager (current process/ project)	30
<b>A3</b>	Manager (original head of project)	59
<b>B</b>	Manager	1:17
<b>C1</b>	Product Owner (project stream)	1:12
<b>C2</b>	Product Owner (whole project)	60
<b>D</b>	Project Owner (A) Project Owner (B) Manager for selected experts working in the project organization (C)	1:30

5 interviews were conducted as face to face meetings, rest two were phone calls. All interviews were recorded, and data was coded in written format after the interviews. Interviewees were provided opportunity to see interview structure before the interview. To ensure reliability of the results, written interview reports were sent to each interviewee after the interview and they could make corrections and add information afterwards. Providing questions beforehand attempted also to increase validity of the results. Questions were designed to be clear and easy to understand and they are further clarified during interviews if needed. For ensuring quality of interviews, structure and questions were iterated with a professional researcher and piloted before the actual data gathering. Cases were selected so that different viewpoints were considered: cases represent different sized projects led by different people and organizational units. Project managers came from a variety of different backgrounds and corporate experiences. Relations to existing theory are formed in conclusion part of the thesis in order to demonstrate that findings have a broader theoretical significance. With this action generalisability of the research is attempted to be maintained high. (Saunders et al. 2012, pp.380-384)

Project manager interviews attempted to form a view to the current usage of agile development methodology in the case company and answer to the second research question *“How case organization could improve its agility by learning from its prior business cases where agile development has been utilized?”*. Interview frame was roughly divided into three parts. Interviews began with more structured questions which defined project status and project manager’s main findings related to the outcome of the project and its progress. Approximately last half of the interview was less structured and focused on gaining insights of agile development within the projects below three different themes: **technical, management, and communication** (Boehm & Turner 2013). After analysing agility within the cases through these themes project managers were asked to conclude



their findings and lessons learnt by answering how agile ways of working could be adopted outside this kind of project environment. Used interview frame is presented in appendix B.

### **3.3.3 Participative observation**

Since the person conducting this study was an employee of the case company, participative observation has a role in this research. Case and interviewee selections have partly been guided by own experiences of the researcher. Supervisor's guidance played also major role in sample selection. In most cases background information had been gathered via observations already before interviews.

In this thesis secondary data, data that has already been gathered and documented, is used in order to analyse current state of the studied phenomenon in the organization. Secondary data is often needed in addition to primary data to answer the research questions (Saunders et al. 2012, pp.304-307). Secondary data was gathered from organization's internal documentation. Announcements, newsletters, presentations, blog and video posts, Yammer, and internal share-point sites of different departments were used as sources for secondary data.

## **3.4 Data analysis**

Qualitative data is characteristic by its richness and fullness and based on opportunity to explore a subject in as real manner as it is possible (Saunders 2012, pp.546-548). Data analysis of this thesis is based on transcription of interviews and notes taken during data gathering. Data was coded systematically in a single table dividing interviews below questions and themes. Coding was based on the interview structure with following sections: project specific attributes, agility and agile development in that specific project work, agile adoption and barriers, agile capabilities development, and agile adoption beyond the specific project work. Those were the main discussion points, but interviews allowed respondents to give wider observations that were not planned in advance in the interview structure.

Data analysis attempted to form a solid view to current state and point out potential troubles and development points. In the data analysis and in the interview structure formation, existing theory was partly used and referred. For example, usage to themes such as technical, management and communication (Boehm & Turner 2014) and considera-

tion of change in dimensions of system, organization and process (Stoddard & Järvenpää 1995) were used. In the discussion part results were analysed further and reflected with the theoretical background.

## 4. RESULTS

Results chapter is divided into three parts. First part forms brief introduction of current state of agile development in the Case Company based on participative observations. Second part analyses different project cases and their succeeding. Third part considers results of the latter part of the interviews by analysing agile adoption within different cases. It also consolidates more subjective observations about change barriers, applicability of agile methodology to other work, and action points related to increasing agile knowledge within the organization. Appendices C, D and E visualize results in table and figure formats.

### 4.1 Agile development in the case company

Prior to representing interview results of project management personnel, current state of agility and agile development within the case company is briefly introduced. As-is analysis is based on participative observations that have been conducted based on available materials found from corporate intranet. Corporate digital strategy is also actively communicated via public blog and video posts.

Agile development within the case company is defined in its digital strategy managed by separate digital office. Digital strategy names “*agile framework*” to be primary way to execute digitalization initiatives: “*No more massive, multi-year waterfall projects. We will run our digital program with an agile framework. Continuous deliveries to ensure fast time-to-market, gradual commitment of investment and continuous improvement*”. The following definition for agile development is presented in corporate intranet: “*a method for creating solutions through collaboration between self-organizing, cross-functional teams. Agile approach is iterative as the team is able to do “planned rework” as in intentionally repeat phases or activities*”

Digital strategy states that company’s goal is to be the digital leader in its industry. Company aims to achieve this via its digital program that focuses on digitally enhanced business models, new technologies such as IoT, omnichannel, digitalized processes and digital manufacturing, and via adding new digital skills and capabilities. All three cases studied in this thesis reflect corporate digital strategy which aims to “*build an improved digital customer journey for the entire equipment lifecycle*”. Company’s chief digital officer (CDO) compares digital program to servitization: “*The shift to digital leadership is*

*as equally demanding as the transformation that company had undergone from a product-oriented company to a services leader over the past decade”*

Digital strategy notes that *“We need to build new skills and capabilities codified in our business systems and processes”*. This can be seen referring to agile adoption in wider scale than only in project management work. Company’s current operating model implemented in the beginning of 2018 underlines agility in its reasoning: *“a more focused and agile organization to improve business accountability and to speed up decision-making, implementation of our growth plans, and response to market changes”*

To conclude, digitalization is one core focus area of the case company’s strategy. Agile development methodology is recognized to be enabler for new and innovative solutions development projects from the strategic level. Organization has attempted to be developed more agile by implementing matrix organization that focuses better on innovations and technology among other things. In more operative level, corporation’s IT department and its project management office (PMO) are driving forces behind agile project management. They provide resources, knowledge and other support for project initiatives across the company and aim to standardize way of doing projects within the company. There exists systematic model for IT project portfolio management stating how agile projects are managed including demand, development, and services phases and their main actions. Model could be taken further to be integrated with business process management and change management activities, or business parties could use it as benchmark in developing their own operating models for agile projects and project portfolio management.

## **4.2 Overview of project cases**

Summary of the results of the project case interviews is shown in appendix C. Citations in the text are translated into English based on recorded material. Usage of agile development methodology in solution development was the common factor in all cases. Project A was the smallest one, it aimed to define a unified process for the old ways of doing the work and to build a system to support it. The solution was attempting to replace various old and not unified practices and systems. Developed solution had greenfield attributes that were not used prior in any format. Project management changed a few times during the project and management roles were general including both product owner (PO) and project managerial responsibilities. Case B was conducted in order to build a new system to replace an old and outdated one. Project was heavily dependable

on its only manager who was fully allocated to the project. Both A and B projects can be considered as business-led solution development projects while C was rather Digital office-driven. Project C included a few smaller streams which varied as project evolved. Management roles in it were resembling more agile development than traditional project management.

**All interviewees stated that their projects exceeded their original schedules and budgets** when they were asked to describe outcome of the project in terms of cost, scope, and schedule. All respondents saw that their project did not reach their scope as it was defined in the first place when the so called minimum viable product (MVP) was formed. MVP-thinking raised discussion in all interviews. Project A was said to have too poorly communicated MVP and lack of decent roadmapping in the beginning which caused misunderstandings during the project. C1 questioned MVP-thinking and its heavy focus on adding value as early as possible: *“We can’t put our customers back to the stone age. MVP should be content driven, not schedule driven”*. Program owner of the same project (C2) supported this by underlining organization’s ability to support the idea of incremental and continuous delivery as a challenge. B named planning phase before starting the project and better idea validation process as key learnings: *“Discovery work of which projects should even be established should be paid more attention”*.

Despite the fact that all projects said to have missed their original scope, **all interviewees named inventing new and better features during the development phase as one of project’s key successes**. Gaining understanding and learning while development progresses allowed project teams to be innovative in finding alternative solutions and even to drop off original business requirements if they were not really needed. Relationship of the agile project and its surrounding company and business appeared to be similar in each case. **Original needs from business representatives were likely to tie agile projects at some point to work on unnecessary features due to the lack of system and user knowledge of business**. *“We have had to do complex and even bad features since business tends to think in old-fashioned way”*, told C1. Manager of project B told that *“wrong things have been made”* and partly put the blame on the lack of decent idea validation process before production. Project A was said to carry historical load of previous not so successful projects attempting to fulfill the same goal. This was said to be one factor causing prejudices among some stakeholders which possibly harmed business input. Project C was the only case where respondents mentioned strong core team as a success. This was due to the fact that project was prioritized as a top initiative which led it to get best resources behind it since the beginning.

When analyzing failures roughly four themes were brought up that were supported by most of the interviews. Those and practical examples of each are following (appendix E illustrates failures further):

**1. Inadequate communication between project stakeholders**

- Collaboration with the partner company failing in some extent
- Establishing feedback cycles with business owners and users not optimal

**2. Lack of commitment of business owners**

- Resource allocations for project supporting work too low
- Participation to development irregular

**3. Challenges in planning and resourcing**

- Agile projects planned too schedule and budget driven
- Resources systematically underestimated (for example roll-out activities)

**4. Discontinuities and drawbacks due to lacking competences**

- Core team not knowing key technologies precisely enough
- Discontinuity in key personnel and difficulty in finding competence

Different visions between development team and project management about how project should be managed were present in all cases. Managers of project A named poor communication of wanted requirements from project management and business representatives to the development team as one key learning point what should be improved in the future. Project B's manager was disappointed in the way how vendor company did not follow agile-methodology as precisely as it was assumed in the beginning of the project: *"When hands were taken off from the steering wheel, they tend to shift back to their own routines delivering results rather via waterfall-model"*. Similar relationship with partner company seemed to appear in project A where partner was *"expecting to have solution spelled in plain English and instead of self-organizing only working hours and costs were reported"*. Interviewees of project C did not recognize similar difficulties in their relationship with the partner company: *"Commitment is great thing in these planning sessions. "We pay you and you do"- attitude has evolved more to collaborative planning"* (C1). **Smaller projects appeared to have bigger difficulties with partner companies.** There are a few potential explanations to that: business-led projects were not used to agile project work with external partners, their resources were limited, and collaboration was not coordinated enough, or simply partner companies were not fully committed to

these projects. Overall, more consultative and customer focused relationship was expected. Rate of self-organization of developers was seemingly low. One obvious reason to that could be in outsourcing where individual developers face organizational borders which are preventing them from interactions with users and other members outside the project core group.

**End user and business representative feedback frequency was named to be development area in all studied projects.** Still projects varied a lot what came to the end user and business collaboration. Project B began with decent user usability mapping, but later practically only business representatives gave input on behalf of the users. Reasons to that were said to be tight schedule and lack of trust to developers to individually gather and process user feedback. Exceeding schedule was also named to be the reason why project A had to skip some testing sessions with users in the end phases of the project. *“Role is new to many and people don’t necessary understand how big the role is”* told B about business owner’s role. Towards the end of development phases both these projects drifted to make decisions more within the core team and mainly without asking external opinion even though there were cases where external opinion would have been useful. This was not seen to be such a problem in bigger project C which was seen more outcome than schedule driven from the beginning. Project C had also dedicated people working as *“business analysts”* whose role was to define and translate business needs to developers.

After all, similar pattern appeared to be present in all the studied projects in end user collaboration according to their managers: it should be included more, but exceeding schedule and lack of resources are usually having negative impact on it. **Concept of business owner was not necessarily clear enough to people which led business owner presence to be partly unstable.** This is logical since projects were among the first ones to follow agile methodology in the case company and people acting as business owners were likely not having previous experiences in acting in such a role. Genuine end-user collaboration is even harder to maintain, projects said to have those connections as well, but in the course of time projects tended to concentrate mainly on getting business owners’ input. Getting business owner input was already itself challenging and required too much extra effort from project management.

Corporate culture was mentioned in some interviews when discussing about challenges in commitment building and feedback gathering. It was not seen fully to support this kind of actions according to the manager of project B: *“Can I even ask something from the*

*employee if I don't have his/her supervisors permit*". This is one example of the idea of **agile-supporting organization** that was mentioned by D in his interview. **If constant feedback loops, early value delivery and other agile fundamentals are not known and supported outside the core project group agile development faces obstacles.** *"Management needs to be involved, agile "cells" won't help when they are colliding with non-agile surroundings"*, concluded B. Various reasons exist to the issue of business and market areas' partly insufficient commitment: historical reasons (A), *"combat fatigue"* among owners (A), skepticism towards demo versions (A, C) and *"no need to concentrate on the new system since the old is working properly"*-thinking (D). Biggest requirement for ensuring and maintaining commitment was generally said to be efforts paid on change and expectation management work. **Lack of trust in agile methodology caused by lacking benchmarks and agile projects failing in delivering concrete value in early phases of the development** can be seen as factors that decreased business commitment and support in all cases.

**Planning and resourcing can be tracked to be systematically underestimating projects.** Business-led cases A and B appeared to follow more traditional cost and schedule driven plans while Digital office-led project C was rather valued based on its outcome. Most experienced and business backgrounded managers showed skepticism towards radical changes in project planning practices and underlined the need to have clear budget and schedule even though agile model would need more flexibility in terms of money and time. As a matter of fact, well planned schedules and so called *"agile cadence"* were mentioned to be undoubtedly big advantages of agile methodology. *"When scope in big picture is not clear it is super important to follow precisely schedules of smaller sprints"* told D. **Other systematically recurring feature in current project planning was underestimation of change managerial work required in roll-outs and in gaining momentum behind the project among businesses.**

All the project cases had their milestones in replacing old and existing systems by new solutions. **This goal was not achieved in any project and old system was left working** likely because new system was either not complete enough, transition to new systems were attempted to be done incrementally/ without systematic plan, or users were not ready to do the transition. Project A was managed to establish a new platform, but while the MVP was quite raw plenty of work left still ahead. Ramp-down in project B had been postponed because new system was not capable to replace the old one in the original schedule. Project C had streams with different maturity rates which lead ramp-down and ramp-up activities to be scattered. There had also been difficulties in finding



common plan to align these activities, but it was hard since each BA tend to drive their own interests instead of common ones. Failures in systems deployment phases were seen as the biggest overall drawbacks in the big picture by the director (D) who had had steering or supervising role in each of these projects: *“Agile’s common problem, when solution is attempting to replace an old one, is the difficulty in getting rid of that old one. This requires tough decisions and commitment to the first change which is likely going to be bad and causing negative feedback.”* He mentioned that failures in ramping down old systems are not only adding costs in maintenance but also tying important development resources and preventing continuous improvement of the new solution from happening. *“When an agile project is active too long people get used to the situation where two parallel systems are working, and they find it is ok to use the old one. It is change managerial and psychological issue”* he noted.

Some external factors were named to complicate projects such as **more complex systems integrations and bigger team distribution that were originally planned**. Also changes in project key personnel were realized at least in projects A and C. A1 joined the project during the development phase and named lack of decent documentation of prior decisions and other important tacit knowledge that was not transferred to have negative impact on the outcome of the whole project. In project C changes in project group were not seen unpredictable when taking into account project’s size and its variations. **Finding suitable project managers and product owners** was concerned as an issue in interviews of more senior management (C2; D). D underlined continuum from development work to deployment and actual process management as a very important chain which too often breaks when project gets ready and resources start to work for other initiatives. This realized in project A, A3 told that *“while future organization was not in place early enough, we were late in organizational communication of the new process”*. D also said that even though system knowhow is emphasized in this kind of technology projects **core group needs to have change and process managerial competences**. Process management in this context refers to ability to form a vision of end-to-end customer centric process and integrate solution to it. In other words, in addition to the system it is important that project management sees the future to-be process and organization that takes ownership over it already in planning and system development phases in order to ensure continuity and success. C2 named the role of product owner as one key learning point of the project: *“For the development team product owner is the one who decides and who knows – – PO has great power to influence on the direction in which solution develops.”* Finding competent people who can allocate enough time to the role of product owner was challenging according to him.

When project managers were asked to tell if knowledge or experience of agile project management would have been useful to have before taking the leading role in the project, they all responded quite positively. Approximately half of the managers did not have prior experiences from this kind of projects. In general, prior knowledge of agile was not named to be such a critical factor in project's success in most cases. Respondents A2 and C1 told that prior knowledge would have made easier to plan the project and work with development teams. Situation was opposite in project B where agile project management was rather driven by the project manager than the partner company developing the software. Majority of the managers were basically having their first project that used agile development methodology. C2 found that "*beginning sessions were confusing and strange but afterwards understood better*" and after all, lack of previous knowledge was not impediment since "*learning happens by doing and program educates itself*". This quick adoption to agile methodology and the used SAFe-framework (Scaled Agile Framework) with relatively large and heterogenous project group in Project C was named as a key success in the project by C2 and D. A1 stated that "*it is not obligatory prerequisite although agile is de facto way to do this kind of projects and that's why agile methodology should be included in every project manager's toolkit*". Based on interviews, overall **in product owner work knowledge of business process is very valuable asset. Other important ones are ability to communicate with development team and rapid utilization of professional network in problem solving.** Agile knowledge besides these helps the PO to cope with developers and enables driving agile practices also beyond the core team.

### 4.3 Agile adoption

#### 4.3.1 Agile practices within the projects

Latter part of the interviews was approaching agile methodology via three different themes. Results were mainly linked to these specific projects, but more general observations and statements were allowed. Appendix D summarizes main findings of each theme in all the studied projects.

From technical point of view **each project was said in general to have adequate set of tools available and used. Sizes of the projects were found to set different requirements for tools usage.** Project A was smallest one and its managers generally told that tools did not have a crucial role in the project. Still project appeared to have

troubles related to the lack of systematicity in documentation and in communication between the stakeholders.

Management-themed discussions were led by a question related to the decision-making process. All project managers were required to make daily decisions and follow up development to oversee that the business requirements set by the management were reached. Project integration to the in-house IT department and its PMO was discussed, but any conclusions about it are hard to form. Only case A was said to have needed more support from internal IT. D concluded that integration of IT and businesses has been improving and it currently allows the company to run more complex system development initiatives than before.

**Two different project management roles were recognized and present in each case:** classic project management role which was more administrative and product owner's role which was to lead the product development by setting requirements for each development cycle. Managers of smaller and business-led projects A and B were the ones who were acting purely on both of these roles simultaneously. They were also those who mentioned tight schedules and lack of time during the interviews. C1's role was closer to product owner's role in this subproject which was a stream of a bigger development program owned by C2 together with his colleague.

Decision-making paths and processes were not seen as problematic in all cases and managers had autonomy to do most of the decisions without further validation. Commitment building between project stakeholders was done slightly differently in every project: managers of project A agreed that commitment of business areas was inadequate, and input was mainly given too late: *"User side woke up when product already looked and felt nice. Input during the development phase would have enabled product to be even better"*. Reason was not only due to lack of interest in external parties (business areas) but also in inexperience of project management: *"Engaging stakeholders throughout the project is challenging and should be paid more attention"* (A2), *"Committing stakeholders is important and it is project management's duty, which remained lacking"* (A1). Bigger projects had more systematic ways to include different parties to the development throughout the project. These ways were for example naming business ownership roles and inviting those owners frequently to project meetings. **Agile cadence** (schedule of regular development checkpoints) was said to be one crucial enabler of success in project C. It was also used systematically in project B and less systematically in A, but **overall its importance appeared to increase while project group increased.**

All projects were following principle ideas of scrum in their formal communication and development cycles with their own project-specific attributes (scrum is the most widely used process framework for agile development). Scrum “ceremonies” of communication were approved generally by all the managers. Small project tended not to follow scrum as systematically as bigger ones. **All interviewees agreed that face-to-face communication was the most important way of communication** when important decisions were made. Manager of project B stated that team distribution has harmed project work, but he also had come up with a solution: “*Online whiteboard application has enabled concurrent working and proved to be revolutionary tool in remote working*”. C1 named networking with other project streams as an essential prerequisite for establishing open communication within the whole program. “*The more you discuss the more things tend to progress – – It is important to be updated on what happens in different project streams in order to avoid surprises*”.

As A3 noted, communication during agile projects can generally be split into two dimension, internal and external. Those are linked to each other, but they are different sections requiring different things, scrum is mainly directing internal communication. External communication requires different type of influencing and it aims to get support and sponsors behind the project while internal is about getting operative development done. **External communication was usually seen challenging**: it has to be started soon enough, and it needs to involve people that have not been necessarily aware of the project prior. It requires process and organizational knowledge and it aims to enable and ensure the successful deployment of the solution. **Inadequacy of external communication can be named as one of the common reasons why projects missed their original goals in replacing old systems with new ones.**

Team dispersion was one discussion point in most of the interviews. B and C2 told that distributed teams have had negative effect on projects. They both underlined the importance of PI (Program increment) planning sessions where project team frequently gathers to the same location to do planning for the next iteration sprint. B went further and told that core team cannot be global. Overall, team dispersion was said to be hardly avoidable and people working in this kind of projects should get used to do work remotely with the assistance of best possible technological solutions for remote working. D thought that there are not yet necessary enough experience and competence to run agile projects in a global team within the company even though projects should be global by default. He stated: “*Our customers are around the world – – If a global system is developed by*

*a local team the project will not sense the waiting customer value potential and will face pain when beginning large roll-outs.*” Challenges caused by regional differences in roll-outs were mentioned at some level in all project cases, which supports this statement. Also, core groups were after all not fully global in any of these selected three cases.

After all, interviews showed slightly different view to communication in agile projects. Traditionally, and based on literature, agile development might seem to be very engineering driven and highly focused on certain tools and techniques. All interviews highlighted that communication on studied projects were more about so called “*soft skills*”, how to present things and collaboratively iterate them before actual development happens. *“If only tools such as online Kanban boards were used the most essential parts of agile development would be skipped: storytelling, together doing, talking, drawing, putting post-its on the wall etc.”* Told manager of project B.

#### **4.3.2 Change barriers preventing agile adoption**

Change management issues were asked from respondents in separate question “*What is preventing Agile implementation the most in your organization?*” in the end of the interviews. Following table concludes named barriers and number of respondents mentioning it in interviews:

**Table 11.** *Change barriers preventing agile adoption*

<b>Barrier</b>	<b># of responses</b>
Lack of knowledge/ poor communication of new things	5
Need to stand more uncertainty when outcome is not defined in advance	5
Lack of support from management/ coworkers	4
People don't want to learn new things	4
Fear of increasing complexity	2
Tight schedules	1
Effort in establishing closer relationship with stakeholders	1
Changes in project personnel	1

### **1. Lack of knowledge/ poor communication of new things**

Respondents mentioned most frequently barriers in informing people about new ways of working. Selling the benefits and showing what is the actual potential added value with agile methodology needs to be done prior demanding people to adopt it (A1; C1). Lacking change communication was seen impeding change from happening. Practical examples and demonstrations were mentioned multiple times as important source to spread and deepen the knowledge within the company. On the other hand, lack of benchmark-level successes due to the fact that agile methodology has not been utilized prior was said to be a critical slowing factor in information diffusion (D).

### **2. Need to stand more uncertainty when outcome is not defined in advance**

Uncertainty that agile methodology requires was named other main source of change resistant that interviewees had experienced. This was affecting both in worker level and management level: team members might need to be committed until further notice and workload might vary more which can be seen causing difficulties not only to the worker but also for project planning and resourcing (D). People assumed to have a certain level of control in their work which agility is generally seen decreasing (C2). Agile projects require accepting uncertainty in some extent. Since agile projects are rather recent in the case company there have been more traditional approach to project planning when projects initiatives have been launched. At least business-led projects appeared to have highly cost and schedule driven valuation and details were wanted to be locked already in the planning phase (A3; B). *“Solutions’ difficulties are inbuilt in development. You have to trust on the team, fund it and follow what it produces”* told C2 and underlined that the steering of an agile project should happen during the progress. From management this requires not only tolerating uncertainties but also actively participation and time allocation to the development work.

### **3. Lack of support from management/ coworkers**

Lack of management support can be seen behind many of these barriers. Inexperience of agile projects drives to too fixed plans and false expectations which might result agile projects to be seen in negative light. Agility and agile projects require seamless collaboration of different functional units across the organization. Currently cross-functional collaboration is not working as it should be in an optimal scenario which caused problems in committing different units and getting feedback across organizational borders practically in all the cases. Corporate culture as an enabler of agility was splitting respondents roughly to two parts: others saw it too traditional and inflexible for agile ways of working where room needs to be left for uncertainty and unplanned changes. *“Everything cannot*

*be planned beforehand which needs to be accepted. – – “In our company you can’t fail” attitude is slowing the change, culture in which only outcome is valued, and risks cannot be taken is braking the change”* stated one respondent mainly referring to the role of middle-management. On the other hand, respondents generally found corporation’s top management rather enabling than preventing agile-thinking. At least some kind of gradual shift to the right direction in corporate culture was mentioned in a few interviews. This is in line with the earlier mentioned digital strategy which stated that agile methodology has started to take place in corporate strategy.

#### **4. People don’t want to learn new things**

General change resistant, negative attitude towards the change, was mentioned in half of the interviews. Need to get aware of the change by building up urgency towards the change and communicating the benefits of it were noted. C1 noted that change management is often easily forgotten. He stated that *“system development projects are underestimating people’s receptivity and there is clear need for Q&A sessions, side-by-side trainings etc. in order to explain why and how the new way is an improvement compared to the old one”*. Change-preventing individuals such as *“non-players”* and traditionalists were also mentioned.

As in project communication, there exists different levels and types of changes that are relevant in this kind of change processes like these projects and were present in interviews:

1. Changes in working habits of project team members and main stakeholders
  - How to involve and commit all to agile development work?
2. Changes that new systems cause to users’ daily work
  - How to ensure success in system deployment and usage?
3. Changes in corporate culture
  - How organization and its people can be made more compatible with agile development?

Questions illustrate general change managerial troubles that were brought up multiple times during interviews. They are further analyzed and answered in discussion chapter.

### 4.3.3 Increasing agile adoption and knowledge beyond the cases

Following table 12 gathers responses when managers were asked how they would improve agile project management capabilities within the case company.

**Table 12.** *Ways to improve APM readiness within the organization*

Way to increase agile knowledge	# of responses
External trainings/ certificates	4
Interactive learning, learning by doing	4
Learning via networking (forums, ambassadors, communities)	4
Learning via shared success stories	2

Lack of prior knowledge of agile projects was not considered as a showstopper, but it had negative effect on overall succeeding in projects. Trainings led by an external party or certificate trainings were mentioned in 4 interviews. Better intercompany knowledge sharing was the second general theme brought up by the interviewees. Platform for sharing best practices and networking with other project managers in different organizations was seen as a potential way to gain and spread agile knowledge within the company. *“Information spreads in networks, not in hierarchies or silos, and especially in networks where people are interested in the same topics and passionate to learn more”* told B.

Also, systematic and unified templates related to agile project management were asked. B for example highlighted the importance of discovery work and systematic idea validation process which takes place before the actual development. A1 would have needed decent models for project closing and end documentation since *“they are usually ignored”*. It also appeared that systematic project establishment model would have been needed prior the actual development phase of project A since all the managers mentioned planning and communication in the beginning lacking. C1 agreed with common project establishment model and stated that used project management methodology should already be chosen in *“strategic initiatives”* phase. Based on participative observation, materials such as templates and guidelines related to project management from system development point of view are found from corporate intranet, but they are not necessary known within all the respondents. Also, forums gathering project management and agile development experiences existed in some extent in internal platforms, but they had not reached popularity. Agile dispersion via ambassadors, people with knowledge



and willingness to share information, can be seen already taken place via some of the interviewees.

#### 4.3.4 Applying agile ways of working in other work

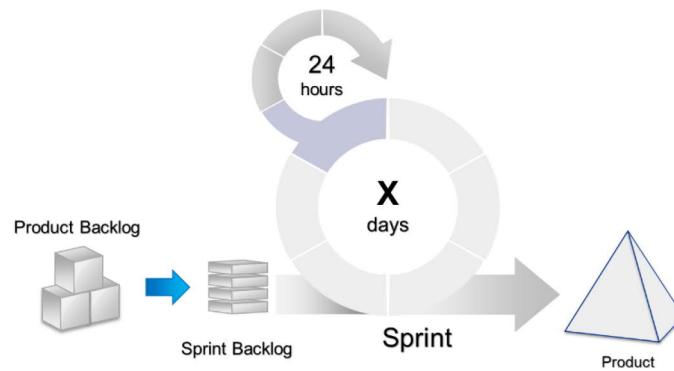
In the end of interviews, respondents were asked to summarize their thoughts about agile methodology and reflect their experiences from agile projects to other work by naming things they would see applicable beyond agile projects. Table 13 summarizes practices which were mentioned by respondents:

**Table 13.** *Useful agile development attributes to be applied beyond project cases*

<b>Agile attribute</b>	<b># of respondents</b>
Workflow management	4
Backlog-thinking	3
Increased transparency	3
Systematic and regular communication model	3
Incremental and cyclic development	3
Daily management practices	2
Customer centricity in development	1
Continuous improvement	1

Responses in this question are hardly measurable since these attributes are partly overlapping and most of the interviewees gave general level statements without specifying recommended tools or practices further. Also, the fact that most interviewees did not have prior experiences of agile development and had their backgrounds outside IT might have effect on this.

Workflow management, where tasks are systematically progressed and followed, was named as a top attribute of agile development to be applied in process and project work in general. Backlog-thinking refers to systematically maintained list of tasks with priorities that needs to be done in order to finish the product. It also includes the idea to limit the amount of simultaneously active tasks. Especially backlog maintaining was mentioned frequently and it was said to allow transparency and clear commitments: *“Instead of who comes first or shouts the loudest developers have been able to show what tasks are ongoing and accurately tell when their resources would be available for these new tasks”* (C1). Basic operational model of scrum is shown in figure 24:



**Figure 24.** Scrum-cycle

Systematic communication pattern was also highlighted in almost every interview. Basic scrum- approach includes frequently reoccurring daily meetings and other bigger “ceremonies” reoccurring in certain phases of sprints or development cycles where activities are either planned or reviewed. Frequent alignment with others was named a few times, but people saw also difficulties in maintaining that. B and D noted that one common threat in daily alignments is misunderstandings: instead of “micromanagement” and “what did you do”- approach focus should be purely on the progress of the development and workload sharing, not in what every individual is doing. A3 noted that the change in agile communication should happen from bottom to up direction and people should begin to understand that it is beneficial for individuals themselves to share their progression status frequently and openly with others.

Overall respondents considered agile methodology as a potential improvement and only a few arguments against it were presented. C1 and D, both business directors with higher seniority level in the company, mentioned that agile development initiatives should have opportunity to switch delivery methodology to traditional waterfall model in some phases of the project in order to ensure meeting a certain critical milestone. These milestones were mentioned to be the first MVP (C1) and roll-out, the time when old system is going to be closed (D). Some examples of specific application fields were mentioned, for instance R&D and process development teams which have utilized agile development practices in some extent to their operations. All work where environment is complex and where something is done for the first time were also mentioned as potential application areas. On the contrary, some sceptic statements were also recorded: “in this kind of traditional environment this is not often profitable to be applied”. This was justified with manufacturing long lead times which makes utilizing agile development unnecessary for example in product launch projects.

## 5. DISCUSSION

In this chapter, the results of the empirical case study are reflected and discussed in the light of existing literature discovered prior in the literature review part of this thesis. The main purpose is to analyse how results of the study could be utilized in the Case Company, but also to produce new academically valuable knowledge. Chapter aims to answer the research questions of this thesis:

**RQ1: What agility in development work means and what changes it requires from an organization?**

**RQ2: How case organization could improve its agility by learning from its business cases where agile development has been utilized?**

Overall results showed that the maturity level of the Case Organization in agile development is currently relatively moderate. Agility and agile development methodology have been emphasized clearly in the strategic level of the Case Company and clear intent can be seen in driving organizational change towards agile ways of working. Business-led system development projects are becoming more common and they have also started to utilize agile methodology in their projects. The biggest concern in adopting new project management model was in commitment building and involvement of business representatives which supports the findings of Waardenburg's et al. (2013) study. It stated that ensuring business involvement is "*one of the most challenging parts of the agile adoption process*". Also change between agile and traditional project work in planning and resourcing was perceived as a challenge. Appendix E summarizes findings by analysing agile adoption challenges and failures by dividing them into causes, contingencies and consequences according to Glaser's six c's model (1978).

### 5.1 Meaning of agility and agile development

Even though agility can be seen in a great variety of different viewpoints and disciplines any conflicts or inconsistency between disciplines could not be found. Due to practicality and topicality of agile development people in general are starting to get more familiar with its purposes. Agility can be considered roughly in two abstraction levels: **high level** where agility is referred to organizational or enterprise agility which state that organization needs to be able to do changes rapidly and gain competitive advantage throughout these changes. When going to **practical level** like in application or system development,

the same fundamentals exist but practices how to achieve agility are defined more precisely and industry-specifically.

Any misunderstanding or clarifications were not needed about the usage of terms agility or agile development during the data gathering. Also, via participative observations agility was constantly referring to agile development methodology used in project management. Insufficient knowledge of agile development and its methods was recognized to be a big obstacle which is supported by many authors (Laanti et al. 2011; Boehm & Turner 2005; Hohl et al. 2016). After all, this was not surprising since projects A and B were among the first business-led projects utilizing agile methodology in the Case Company. **Lack of benchmark-level agile projects** with documentation proving their applicability and strengths could have strong way to increase inter-organizational agile knowledge. Consequently, this study managed to gather lessons learned and other valuable experiences from first applications of agile development happening in the Case Organization. Results can be used as a basis for further agile development discussion and organizational capability development, and as a guidance for future agile projects. Agile development means following principles of agile manifesto. It includes not only utilization of certain tools and techniques but also changed mindset for development work which highest goal is to increase customer value.

Shift to agile development requires both individual and organizational level changes. Firstly, individuals need to be made aware of growing importance and potential of agile development. When this knowledge transfers to daily actions people are likely to understand its benefits on practical level. **Business people aware of agile development and technology are valuable assets for the company** as results and various modern authors such as Hoda et al. (2018) and Jovanovic et al. (2017) stated. They are the ones who are likely to have biggest influence over agile project success as they work in roles of product owners, project managers, and business owners. They have important roles as change agents within the organization spreading agile-knowledge. By doing that they also gradually change corporate culture to more agile-friendly.

## 5.2 Applicability of agile methodology

Agile development was commonly kept suitable for all the studied projects. When comparing project attributes to agile “*sweet spot*” presented by Kruchten (2013) factors **software outsourcing, high team distribution, and traditional governance model focused on costs and schedule** were all project-level factors that were not in the “*sweet*

*spot*”, and they were also recognized to cause troubles. From those, team distribution and software outsourcing model are mainly fixed factors since people involving the projects come from different countries and cultures and the Case Company’s development resources for inhouse-production are limited. Governance model including definitions for project starting, termination, and valuation of the outcome are set by management. Currently project governance appeared to follow more traditional model which did not take into account uncertainty of project scope and incremental progression enough.

Effect of project team size is studied by various authors and it is commonly stated that optimal team size for agile projects is around ten people and teams bigger to that require plan-driven planning (Boehm & Turner 2004; Kruchten 2013). Based on three project cases small project (A) suffered the most from changing resources. Small project crew tended not to follow agile cadence so systematically and too light documentation was noticed to cause troubles in discontinuities. Big project (C) was split into streams of approximately ten people in order to manage project better and allocate resources more efficiently. Difficulties caused by differences and alignment issues between program streams were noted in Waardenburg’s et al. (2013) study and they were also supported by case C where roll-out and old system shutdown were difficult to manage. Findings seem to support the theory that agile development methodology suits the best for teams around ten people.

Even though agile development is mostly studied in software projects, there exist studies concerning it in wider scope. Environments and projects with high volatility and unclear solutions (Fernandez et al. 2009) and innovative projects and projects requiring more flexible management approach (Conforto et al. 2014) are circumstances which also included these three project cases, and where agile development would be the best option. When projects and environment are too far from the agile “*sweet spot*” agile methodology should not be forced (Conboy 2009; Kruchten 2013; Cram et al. 2016). Based on the results, too big and complex teams and easily predictable or fixed outcomes are main factors when project should not adopt agile methodology. Industry or product type (tangible/ system) is not affecting on agile development’s suitability as long as **conditions of complexity in environment and product are present** and innovative mindset is required. In current literature agile development is intensively considering software development. Studies conducted by other instances beyond it in different fields are supporting its applicability. With the low maturity and volume of this research it is suggested that the topic is studied further in the future.

Lack of management support, low maturity of organization in adopting agile development, or corporate culture not supporting it are found factors that effect on success of agile methodology utilization, but which are not preventing it. Results show that **even though the environment is not optimal for such a project it can succeed and follow agile methodology if project management has the knowledge and drive to do it.** As a matter of fact, bottom-up direction change is usual in agile adoption and reluctant management might be the instance who does not want to change (Waardenburg et al. 2013; Dikert et al. 2016). When comparing adoption of agile methodology between development team and business representatives, different contexts sets different requirements for tools and techniques utilization, which is worth mentioning. Personnel in the case organization involving in agile projects are usually business owners, product owners, managers or specialists whose role is not to do the actual development work which might require more complex practices and tools harder to utilize.

Different frameworks explaining agile adoption process were not found to have high relevance on the Case Organization. Systematic classification of agile practices (Sidky et al. 2007) and adoption process from project level assessment to matching with organizational practices (Sidky et al. 2007 & Javandi Gandomani 2015) might become useful ideas in the future when more advanced methods are planned to be deployed. Commonly stated theory that each organization must itself decide which practices it adopts can be seen supported (e.g. Cram et al. 2016; West & Grant 2010). Agile adoption was also proved to be primarily bottom-up change where people need to understand benefits by themselves rather than just use given techniques. More systematically shared knowledge of agile development could be internally shared.

Coexistence of agile and plan-driven methodologies in a single project is a topic which is recommended to be studied further. Especially a traditional organization, like the Case Company, cannot fully transform to use extensively agile methodology. Different project phases require more plan-driven management and controlling styles. Findings are in line with studies of Fernandez et al. (2009) and Conforto et al. (2014) who stated that hybrid model for project management combining elements from both traditional and agile ways of working should be developed.

## 5.3 Changes required by agile adoption

### 5.3.1 Increasing business commitment

Inadequate business commitment to agile development projects was appeared to be the major barrier in agile adoption within the case company. Agile and traditional project management have fundamental differences in communication and stakeholder involvement: agile requires continuous involvement of customer opinion, which is critical for the development. In order to do that, there should be numerous mechanisms for feedback gathering (Conboy & Coyle 2011). During the case projects, project teams were developing system solution for different business areas to improve their operations. That made business areas not only the ordering party of the solution but also the party that should represent ultimate customers and involve them to the development. Quite often projects' feedback cycles were not involving customers which occurred from low business commitment. Low business commitment led feedback cycle to be even smaller and irregular containing only project core team with the most active business representatives.

According to Conboy & Coyle (2011) and Waardenburg et al. (2013), **business representatives' most important tasks in agile projects are helping the construction of user stories, discussing and prioritizing product features, and providing feedback to the development team in a timely manner.** In order to commit to its tasks, businesses overall mindset needs to be changed. Understanding of agile process needs to be generated among business representatives and their managers. They need to know their roles and responsibilities in the development process and understand why regular input and involvement is needed. After all, agile development is all about maximizing customer value (Denning 2013), and irreplaceable part of the process is business involvement. Business parties should understand that better, and by doing that they should become the ones who drive implementation of agile methodology in the first place.

Based on this study following ways would increase business commitment in agile projects in the future:

#### 1. Changing mindset among business representatives

- What agile development means, why it is better than plan-driven approach, and what it requires from a business representative? Business should also accept uncertainty and approach development process from the point-of-view that innovations and new ideas are wanted instead of locking in to old solutions

- Generating unified understanding across different business areas that it is beneficial for businesses to allocate enough resources for agile projects and give input which in the end potentially increases customer value
- 2. Product owner/ project manager's role as the people who knows the most could be utilized better in knowledge sharing between development and business**
- Establishing and maintaining relationships to business in order to decrease barriers in information sharing and ensure continuous feedback loop
  - Project core should allocate enough time for “*extra*” communication in expectations and change management and consider it early enough

**Change communication is likely hard since experiences from successful inhouse-agile projects are currently rare or not easily available.** When launching new project initiatives, maturity of project-involving businesses needs to be analyzed and taken into account in planning of change managerial activities. Business representatives have important roles in acting as change agents in business organizations. When entrepreneur-mindset is taken from project core also among businesses by business owners and representatives, awareness starts to gain ground in business process management organizations and their management.

### **5.3.2 Changing planning and resourcing practices**

One major issue in adopting agile development in new organizations is that management tends to consider agile projects similarly to traditional projects. Agile adoption-related studies are mentioning that staying in old plan-driven way in project planning and resourcing is an obstacle that agile projects face in organizations which are not fully supporting it (e.g. Jovanovic et al. 2017; Dikert et al. 2016; Laanti et al. 2011). Agile projects require responsive management and continuous planning. They do not support substantial documentation and fixed and bureaucratic organizations that do not allow organic changes. (Conboy & Coyle 2011) These factors lead to conflict in an organization which is used to run traditional plan-driven projects where traditional project-planning dimensions cost, schedule, and scope are fixed as early as possible.

Results support these statements. Implementing new project planning practices, and modifying old ones to support better agile development, are causing major challenges in a large organization which is not used to act in software projects and do not have previ-



ous experiences of agile development. When selecting agile methodology, planning activities should be distributed along the project and they should be focused on getting accurate plans for smaller sprints instead of the whole project. **Agile development is not forgetting the overall view. It assumes that with this uncertainty level project should not be planned too far from the beginning since change during the progress is inevitable and even wanted.** Roadmapping and long-term visions are still very important in agile projects especially in bigger and more heterogenous organizations like the Case Company. Those form the foundations for the whole project work and enable change communication and commitment building from the beginning of the project. Ser-rador & Pinto (2015) named quality of the vision and goals, how they fit to larger organizational goals, to be top one moderator for agile project's success. This theory can be seen supported by the results.

Inadequate stakeholder commitment and obscure deployment phase can be seen consequences of lacking or not ideally communicated project vision. Role of discovery work and idea validation was discussed in interviews. They play a major role in roadmapping and MVP defining processes and should be emphasized more in order to avoid unnecessary work. Alignment between business and development viewpoints should already be included in the discovery phase.

High-level action points in improving planning processes to support agile projects are following:

- 1. Distributing expectations, like costs and schedule of agile projects, to one development cycle at a time**
- 2. Agile projects should be approached as investments in innovations which include tolerating uncertainty in long-term planning**
- 3. Crucial milestones like deployment of MVP and ramp-down of old systems need to be better clarified in project roadmaps and visions**
  - Sometimes plan-driven project management might be needed in order to ensure conduction of crucial phases inside agile projects. When consequences of failure are intolerable, agile methodology is not suitable (Kruchten 2013)

Project resourcing requires also different approach in agile projects. In the Case Company, and during the projects, employee need was filled with old employees. This required adopting different project managerial roles and acquiring new capabilities. Agile

development requires management style to become-people centric and collaborative instead of commanding and controlling (Conboy & Coyle 2011). Role of product owner is discussed in various studies, Dikert et al. (2016) and Hoda et al. (2018), for example underlined the importance of dedicated PO for the success of the whole initiative and stated that well coached PO's would easily turn out to be valuable assets because of their understanding in business and technology and driving agile ways of working in the organization. Results supports the importance of product owner in development work. Suitable PO's are hard to find since people with such a wide inhouse business knowledge are rare and they are most likely tied and irreplaceable in their business management roles. If project manager needs to act in the role of product owner simultaneously, the person is likely to have too big allocation. When project is bigger and more complex, it needs to start splitting project-managerial responsibilities to different parts in order to ensure efficient and continuous flow. Following roles are recommended to be taken into account when project resourcing is made:

- Product owner- leader of the development work and main link between business and developers
- Project manager- person who ensures that conditions are suitable. Represents the project outside project group, builds supportive network within the company, and communicates change
- Business analyst- supports product owner by gathering business needs and transfers them to product backlog
- Scrum master- ensures performance of operative development by facilitating daily actions

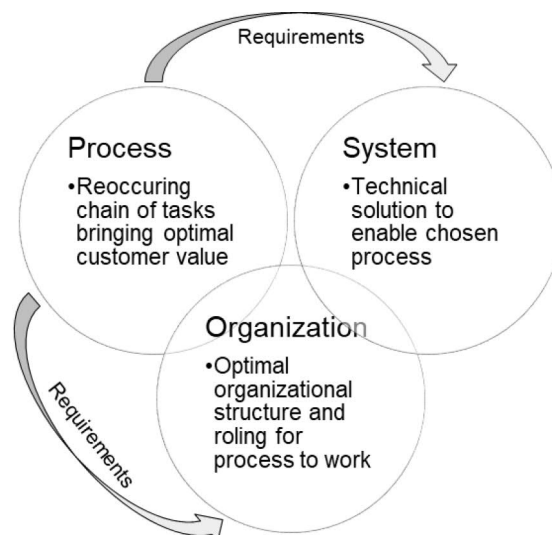
To summarize findings of this study, following learnings of project roles and resourcing were made:

- 1. Agile project's resourcing differs from traditional projects and requires new competences combining technology and business knowledge**
- 2. Project manager working in multiple roles in an agile project is likely to become overloaded when project complexity increases**

Business owners should be trained more systematically for securing and increasing in-house-PO capabilities. According to the results, external courses and certificates would be useful for personnel frequently participating to agile development projects.

### 5.3.3 Integrating projects to processes and organizations

When these agile projects are placed in bigger picture, they represent business process management which aim is to improve value chains by making modifications to some certain processes below it. Instead of handling those as isolated and disconnected projects they should be integral parts of business process management to ensure customer centricity and to fit to whole end-to-end process and value chain. Both business representative commitment and improved planning are ways to integrate projects more into regular business process management. This integration means that instead of highly software and system development driven approach projects should more systematically recognize process and organizational dimensions of business process change. Dimensions proposed by Stoddard & Järvenpää (1995) pointed out to be useful framework to classify project managerial focus areas in complex system development projects. Following figure (25) illustrates dimensions of process change in business-driven system development project:



**Figure 25.** *Dimensions of business process change*

Discontinuities were present in the results: when process management and system development are too far apart from each other and continuous iterations are not happening as they should, quality of the product decreases and development becomes inefficient when wrong things are made. **If project is system driven, it is more likely to ignore non-technical practicalities of system usage such as deployment and integrating system to organization.** This leads to lacking visions of project's future state when people and organization taking ownership over the new system are not defined. Obscure implementation phases, where both old and new systems are used simultaneously, are

caused by this same lack of organizational and process planning that have not been defined and communicated soon enough.

Agile projects are ways to conduct modern business process re-engineering initiatives. In the theoretical background radical business process changes were found to be very difficult to conduct successfully and organizational change management was named as top one factor for project failure. Change managerial issues such as *“failure to consider existing organizational culture, failure to anticipate and plan for the organizational resistance, difficulty in gaining cross-functional cooperation and need for change management not recognized”* named by Grover (1995) were supported by results of this study. Theory also stated that radical changes in business processes are not so popular anymore since they have high tendency to not succeed. All studied cases had not met their original goals in their implementation because complexity in all above-mentioned change dimensions.

Making changes less radical is something that implementing agile methodology in project management would do with its idea of continuous delivery. Agile development methodology suits well together with the current business process management-thinking where radical changes are recognized to be difficult and tried to be replaced with more incremental changes (Garvin 1995; Melao & Pidd 2000). Also, it needs cross-functionality which is emphasized in BPM in order to build organizations more process-centric (Dav- enport 1992; Garwin 1995). Involving people who are going to be affected by the change is essential. Releasing versions to be used and tested before the final release gives people time to adopt to the change and even contribute to it before it happens. As change management theory commonly states, **before the actual change urgency towards the change needs to be established among the people. This requires time and needs to be done before the actual system deployment can begin**, which was pointed out to be insufficient in all studied cases.

Learnings how agile projects would be better in succeeding from the organizational change:

#### **1. Appointment of process owners and user networks on early stages of development**

- Roll-out should be driven by businesses, not the project core team
- To-be accountabilities should be clarified already in the discovery phase and included in roadmapping

**2. Building urgency towards the change and communicating defined change plans with implementation schedule**

- If deployment of the new system and ramp-down of the old system are business-critical, strategy should be established how and when change is happening with the commitment of all the stakeholders

**3. To avoid radical change, system development project should attempt to utilize continuous delivery by gradually implementing new features to working system**

After all, instead of treating system development projects as own entities and temporary actions listed in project portfolio, they should be seen as integral parts of business process management activities led by businesses. When system handover is done and project ends, development should not end. It only shifts to maintenance phase where system and process changes are rather continuous improvements than independent development projects. Agile mindset is something that should remain in regular business process management work outside agile initiatives. Managing flow of actions, gathering frequent customer feedback, and establishing systematic communication pattern are practices that should be utilized more commonly, and they fully support major process management objectives such as those found by Palmberg (2009). Based on the results, agile methodology can be said to be the best option to run bigger and more complex projects as the corporate digital strategy stated.

## 6. CONCLUSIONS

Final chapter concludes the results of this study. Firstly, managerial implications and contribution are summed up. Secondly, academic contribution is analysed after which limitations are reflected. Need for future research is reviewed in the end of this chapter.

### 6.1 Managerial implications and contribution

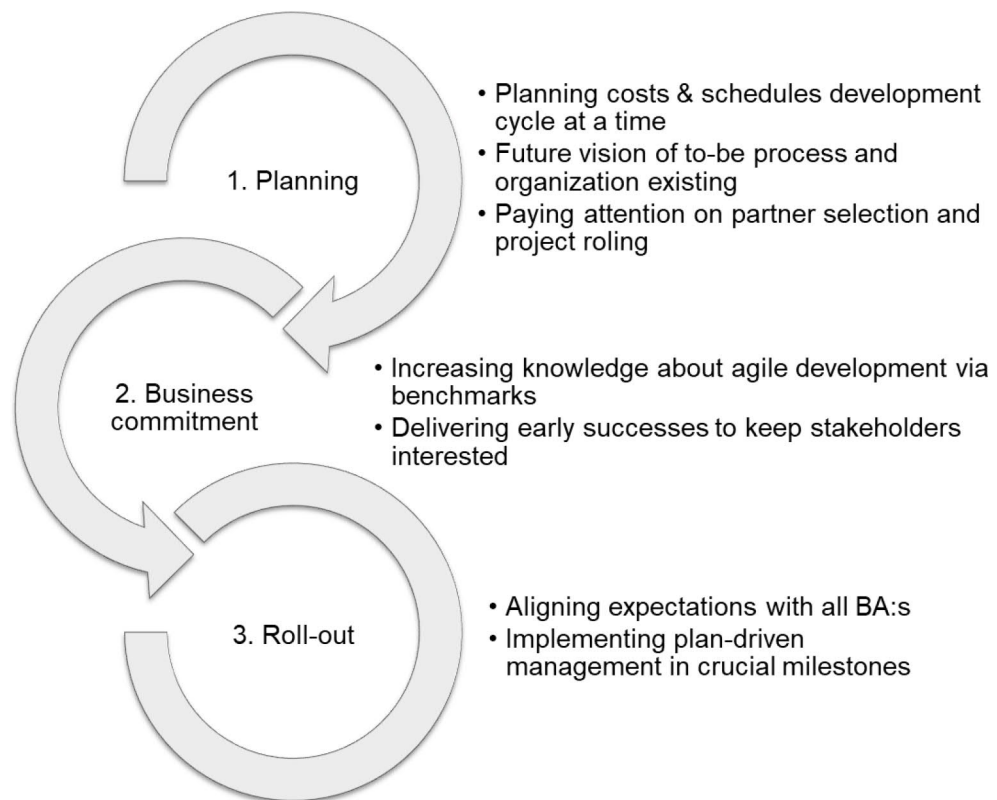
Study was conducted as an embedded multiple case study attempting to gain insights of current state and utilization of agile development methodology in a traditional organization. Starting point was to find out how businesses not producing software have adapted to conducting business-led agile system development projects. Beyond the selected project cases and their specific attributes, best practices and potential to transfer agile ways of working to business process management work in general was analysed. Projects and their managers formed a comprehensive sample of different viewpoints to the studied phenomenon. This kind of research setup served well the exploratory nature of the research where more knowledge about the studied phenomenon within a certain environment was attempted to be gathered. After interviews, all different viewpoints were consolidated to form the results of this study.

The main objective of the study was to answer question "*How case organization could improve its agility by learning from its prior business cases where agile development has been utilized?*". The most essential findings from managerial point of view are listed below. After that, results are summarized and illustrated below three main themes with concrete action points based on the findings:

1. Agile development enables better ability to make innovations which is why it should be utilized in projects which attempt to make something new and unique
2. Collaboration between business representatives and system developers require more mutual time allocation and effort in communication
3. Agile projects should be planned continuously and measured primarily based on output
4. Roles in agile development differ from traditional project management and require new capabilities from a traditional organization
5. Linking to-be process and organization to the system development in early phases enable smoother deployment phase

6. Project complexity tends to lead to challenging roll-out where agile methodology cannot alone ensure successful system deployment
7. Change and expectation management work require large time allocation from project core team and is key enabler in project success especially in reluctant and traditional organizations

Following figure 26 sums up three main themes and proposes action points how they should be handled in the future:



**Figure 26.** *Managerial implications*

Agile development might partly be considered as a hyped approach, and it is important to note that it is not necessarily granting cost or time savings. Before making revolution by switching all work to be done in an iterative and agile way, first should be considered nature of the work. In agile projects there exist phases which are better to be done via plan-driven way. Best option is to know both ways and utilize them in a suitable ratio depending on a specific work phase.

Agile development has conceptualized plenty of useful practices and tools. Most of them have been used before they were connected to be agile. Its fundamental ideas of visual workflow management, frequent feedback cycles, and early value delivery are examples

of ideas that are highly recommendable to be utilized beyond certain project works. Systematic communication pattern of scrum with its regular “*ceremonies*” is a good framework to establish truly iterative and customer focused development.

## 6.2 Academic contribution

During literature review it was stated that theory related to agile development and its adoption beyond software development is a weakly studied topic lacking empirical evidence. Empirical studies of agile development are heavily concentrating on software and IT related journals. Even though agile projects are usually conducted by a team including personnel from both system provider and customer buying the system, studies are constantly giving the biggest focus on seeing projects from developers’ point of view. This study took an opposite approach and attempted to study the topic from business point of view, especially in traditional manufacturing industry, and via respondents that do not necessarily have prior experience of agile software development projects. Business process management and business process changes have not been prior seen in the primary scope of agile development. This thesis attempted to consolidate theory from both themes and gain more comprehensive view over an agile project as a business process management initiative where not only system dimension, but also process and organizational dimensions are considered. Study was not only limited to agility in system development phase, it included analysing project entities from pre-planning to deployment and maintenance phases.

To conclude, this thesis reached its objectives and managed to answer to the research questions. Results pointed out that adopting agile development in traditional business environment can be challenging and requires both large and small changes. Agile development has unquestioned potential in increasing overall agility of the company. When products and customer needs are getting more complex and requiring more digital solutions it is likely that agile development methodology is also going to increase its utilization rates in traditional industries and among business people. This thesis is one step to get closer in understanding agile development and its potential from business point of view. Results are good baseline in beginning of reviewing agile projects and systematically collecting lessons learned from those and applying learnings to upcoming projects. Via these lessons agile knowledge can be shared within the organization and spread to be utilized in applicable fields outside system development projects as well.



### **6.3 Limitations**

Results of this study have certain limitations which need to be acknowledged. Firstly, study was limited within one company. Population for suitable sample selection was very small which led interviewee selections to be practically fixed without opportunity to get wider sample. On the other hand, only key people were included which maintained credibility of gathered data high. To ensure validity of the results, at least two interviewees were selected from each case. Interviewee and case selection served well the purpose of the study which was to study a certain organization. Because of the nature of the case study, results cannot be generalized for all environments and industries. To be able to have more general view over these topics, more research needs to be conducted.

Because empirical data is gathered via interviews, it is practically impossible to collect data fully objectively. It is possible that answers have been interpreted incorrectly. Author of this study was employed by the Case Company throughout the study. This needs to be taken into account when analysing objectivity of the study. Also, there is possibility that data gathered via interview is not truthful, which was attempted to be avoided by selecting multiple interviewees from each case. Since exactly matching literature about the subject of the thesis was not found, used references are from different subjects and contexts and combined in this thesis accordingly to its themes. Due to limitations, only the most important and relevant studies were fitted in literature review. Especially agile development literature was usually coming from software development and IT-engineering fields. Due to this, applicability and generalisability of those studies in wider business context can be at least partially questioned.

### **6.4 Future research**

As study was limited to a certain company, it is important to research other companies and industries to get more generalizable results. Study appointed many practical issues that could be interesting topics to be researched further. Hybrid approach getting the best practices from both agile and plan-driven management models within one project, was mentioned by a couple of authors in the literature review. According to this study, especially traditional industries switching to agile ways of working might benefit from a model telling them more concretely how these two methodologies could be successfully combined within one project.

Other potential future research could be in roll-out activities of agile projects. Results showed that achieving this milestone where new system is replacing old one is likely

failing in agile system delivery projects. This revealed potential issues to be taken into further investigation. Agile research is commonly not considering system deployment phases as much as development.

Change and expectations management work were constantly noted to produce troubles in studied cases. Further research might be useful in order to make guideline how change communication in complex agile projects should be handled. This could be utilized as a tool for project management. Utilization of agile development in international and remote teams could be studied further before launching major international agile initiatives.

## REFERENCES

- Ahimbisibwe, A., Cavana, R.Y. & Daellenbach, U. 2015, "A contingency fit model of critical success factors for software development projects: A comparison of agile and traditional plan-based methodologies", *Journal of Enterprise Information Management*, vol. 28, no. 1, pp. 7-33.
- Agarwal, A., Shankar, R. & Tiwari, M.K. 2007, "Modeling agility of supply chain", *Industrial Marketing Management*, vol. 36, no. 4, pp. 443-457.
- Beck, K., Beedle, M., Bennekum, A., Cockburn, A., Cunningham, W., Fowler, M., Grenning, J., Highsmith, J., Hunt, A., Jeffries, R., Kern, J., Marick, B., Martin, R., Mellor, S., Schwaber, K., Sutherland, J. and Thomas, D. (2001). Manifesto for Agile Software Development. [online] Agilemanifesto.org. Available at: <http://www.agilemanifesto.org/>
- Birkinshaw, J. 2018, "What to expect from agile", *MIT Sloan Management Review*, vol. 59, no. 2, pp. 39-42.
- Boehm, B. & Turner, R. 2005, "Management challenges to implementing agile processes in traditional development organizations", *IEEE Software*, vol. 22, no. 5, pp. 30-39.
- Boehm, B.W. & Turner, R. 2003, *Balancing agility and discipline: a guide for the perplexed*, Addison-Wesley, Boston.
- Boehm, B., Gray, T. & Seewaldt, T. 1984, "Prototyping vs. specifying: A multi-project experiment", *IEEE Press*, pp. 473.
- Burnes, B. 2017, *Managing Change*, Seventh Edition. Pearson. Harlow.
- Burnes, B. 2004, "Kurt Lewin and the Planned Approach to Change: A Re-appraisal", *Journal of Management Studies*, vol. 41, no. 6, pp. 977-1002.
- Bottani, E. 2010, "Profile and enablers of agile companies: An empirical investigation", *International Journal of Production Economics*, vol. 125, no. 2, pp. 251-261.
- Chow, T. & Cao, D. 2008, "A survey study of critical success factors in agile software projects", *The Journal of Systems & Software*, vol. 81, no. 6, pp. 961-971.
- Christopher, M. 2000, "The Agile Supply Chain: Competing in Volatile Markets", *Industrial Marketing Management*, vol. 29, no. 1, pp. 37-44.
- Ćirić, D., & Gračanin, D. 2017, "Agile project management beyond software industry", *Proceedings of the XV International Scientific Conference on Industrial Systems* (pp. 332-337). Novi Sad: Faculty of Technical Sciences

- Conboy, K. 2009, "Agility from First Principles: Reconstructing the Concept of Agility in Information Systems Development", *Information Systems Research*, vol. 20, no. 3, pp. 329-354.
- Conboy, K., Coyle, S., Wang, X. & Pikkarainen, M. 2011, "People over Process: Key Challenges in Agile Development", *IEEE Software*, vol. 28, no. 4, pp. 48-57.
- Conforto, E.C., Amaral, D.C., da Silva, S.L., Di Felippo, A. & Kamikawachi, D.S.L. 2016, "The agility construct on project management theory", *International Journal of Project Management*, vol. 34, no. 4, pp. 660-674.
- Conforto, E.C., Salum, F., Amaral, D.C., da Silva, S.L. & de Almeida, Luís Fernando Magnanini 2014, "Can Agile Project Management Be Adopted by Industries Other than Software Development?", *Project Management Journal*, vol. 45, no. 3, pp. 21-34.
- Cram, W.A. & Newell, S. 2016, "Mindful revolution or mindless trend? Examining agile development as a management fashion", *European Journal of Information Systems*, vol. 25, no. 2, pp. 154-169.
- Danilova, K.B. 2018, "Process owners in business process management: a systematic literature review", *Business Process Management Journal*.
- Davenport, T.H. 1993, *Process innovation: reengineering work through information technology*, Harvard Business School Press, Boston (Mass.).
- Davenport, T.H. & Short, J.E. 1990, "The New Industrial Engineering: Information Technology And Business Process Redesign", *Sloan management review*, vol. 31, no. 4, pp. 11-27.
- DeGroote, S.E. & Marx, T.G. 2013, "The impact of IT on supply chain agility and firm performance: An empirical investigation", *International Journal of Information Management*, vol. 33, no. 6, pp. 909-916.
- Denning, S. 2012, "How Agile can transform manufacturing: the case of Wikispeed", *Strategy & Leadership*, vol. 40, no. 6, pp. 22-28.
- Denning, S. 2013, "Why Agile can be a game changer for managing continuous innovation in many industries", *Strategy & Leadership*, vol. 41, no. 2, pp. 5-11.
- Dikert, K., Paasivaara, M. & Lassenius, C. 2016, "Challenges and success factors for large-scale agile transformations: A systematic literature review", *The Journal of Systems & Software*, vol. 119, pp. 87-108.
- Dingsøy, T., Nerur, S., Balijepally, V. & Moe, N.B. 2012, "A decade of agile methodologies: Towards explaining agile software development", *The Journal of Systems & Software*, vol. 85, no. 6, pp. 1213-1221.
- Dybå, T. & Dingsøy, T. 2008, "Empirical studies of agile software development: A systematic review", *Information and Software Technology*, vol. 50, no. 9, pp. 833-859.

- Felipe, C.M., Roldán, J.L. & Leal-Rodríguez, A.L. 2016, "An explanatory and predictive model for organizational agility", *Journal of Business Research*, vol. 69, no. 10, pp. 4624-4631.
- Fernandez, D.J. & Fernandez, J.D. 2009, "Agile project management – Agilism versus traditional approaches", *The Journal of Computer Information Systems*, vol. 49, no. 2, pp. 10-17.
- Ganguly, A., Nilchiani, R. & Farr, J.V. 2009, "Evaluating agility in corporate enterprises", *International Journal of Production Economics*, vol. 118, no. 2, pp. 410-423.
- Garvin, D.A. 1995, "Leveraging processes for strategic advantage", *Harvard Business Review*, [Online], vol. 73, no. 5, pp. 76.
- Goldman, S.L., Nagel, R.N. & Preiss, K. 1995, *Agile competitors and virtual organizations: strategies for enriching the customer*, Van Nostrand Reinhold, New York.
- Gunasekaran, A. 1998, "Agile manufacturing: Enablers and an implementation framework", *International Journal of Production Research*, vol. 36, no. 5, pp. 1223-1247.
- Grover, V., Jeong, S. R., Kettinger, W. J., & Teng, J. T. C. 1995. "The implementation of business process reengineering". *Journal of Management Information Systems*, 12(1), 109.
- Grover, V. 1999, "From business reengineering to business process change management: a longitudinal study of trends and practices", *IEEE Transactions on Engineering Management*, vol. 46, no. 1, pp. 36-46.
- Harmon, P. 2014, *Business Process Change, 3rd Edition*, 3rd edn, Morgan Kaufmann.
- Hoda, R., Salleh, N. & Grundy, J. 2018, "The Rise and Evolution of Agile Software Development", *IEEE Software*, vol. 35, no. 5, pp. 58-63.
- Hohl P., Münch J., Schneider K., Stupperich M. 2016, "Forces that Prevent Agile Adoption in the Automotive Domain". In: Abrahamsson P., Jedlitschka A., Nguyen Duc A., Felderer M., Amasaki S., Mikkonen T. (eds) Product-Focused Software Process Improvement. PROFES 2016. *Lecture Notes in Computer Science*, vol 10027. Springer, Cham
- I. van Hoek, R., Harrison, A. & Christopher, M. 2001, "Measuring agile capabilities in the supply chain", *International Journal of Operations & Production Management*, vol. 21, no. 1/2, pp. 126-148.
- Javdani Gandomani, T. & Ziaei Nafchi, M. 2015, "An empirically-developed framework for Agile transition and adoption: A Grounded Theory approach", *The Journal of Systems & Software*, vol. 107, pp. 204-219.
- Jiang, L. & Eberlein, A. 2009, "An analysis of the history of classical software development and agile development", *IEEE*, pp. 3733.

- Jovanović, M., Mas, A., Mesquida, A. & Lalić, B. 2017, "Transition of organizational roles in Agile transformation process: A grounded theory approach", *The Journal of Systems & Software*, vol. 133, pp. 174-194.
- Kettunen, P. 2009, "Adopting key lessons from agile manufacturing to agile software product development—A comparative study", *Technovation*, vol. 29, no. 6, pp. 408-422.
- Kotter, J. P. 1996, *Leading Change*. Boston: Harvard Business School Press.
- Kristekova, Z., Jurisch, M.C., Schermann, M. & Krcmar, H. 2012, "Consolidating findings from business process change case studies using system dynamics: The example of employee morale", *Knowledge Management & E-Learning*, vol. 4, no. 4, pp. 455.
- Kruchten, P. 2013, "Contextualizing agile software development", *Journal of software: Evolution and Process*, vol. 25, no. 4, pp. 351-361.
- Laanti, M., Salo, O. & Abrahamsson, P. 2011, "Agile methods rapidly replacing traditional methods at Nokia: A survey of opinions on agile transformation", *Information and Software Technology*, vol. 53, no. 3, pp. 276-290.
- Llewellyn, N. & Armistead, C. 2000, "Business process management: Exploring social capital within processes", *International Journal of Service Industry Management*, vol. 11, no. 3, pp. 225-243.
- Melão, N. & Pidd, M. 2000, "A conceptual framework for understanding business processes and business process modelling", *Information Systems Journal*, vol. 10, no. 2, pp. 105-129.
- Ben Naylor, J., Naim, M.M. & Berry, D. 1999, "Leagility: Integrating the lean and agile manufacturing paradigms in the total supply chain", *International Journal of Production Economics*, vol. 62, no. 1, pp. 107-118.
- Palmberg, K., Institutionen för ekonomi, teknik och samhälle, Industriell Ekonomi & Luleå tekniska universitet 2009, "Exploring process management: are there any widespread models and definitions?", *The TQM Journal*, vol. 21, no. 2, pp. 203-215.
- Paquette, P. & Frankl, M. 2016;2015, *Agile project management for business transformation success*, First;1; edn, Business Expert Press, New York.
- Paton, R. & McCalman, J. 2008, *Change management: a guide to effective implementation*, 3rd edn, Sage Publications, Thousand Oaks (Calif.).
- Pritchard, J. & Armistead, C. 1999, "Business process management - lessons from European business", *Business Process Management Journal*, vol. 5, no. 1, pp. 10-35.
- Power, D.J., Sohal, A.S. & Rahman, S. 2001, "Critical success factors in agile supply chain management - An empirical study", *International Journal of Physical Distribution & Logistics Management*, vol. 31, no. 4, pp. 247-265.

- Raschke, R.L. 2010, "Process-based view of agility: The value contribution of IT and the effects on process outcomes", *International Journal of Accounting Information Systems*, vol. 11, no. 4, pp. 297-313.
- Rigby, D.K., Sutherland, J. & Takeuchi, H. 2016, "Embracing agile", *Harvard Business Review*, [Online], vol. 2016, no. May, pp. 1.
- Sabri, E.H., Shaikh, S.N. & ebrary, I. 2010, *Lean and agile value chain management: a guide to the next level of improvement*, J. Ross Pub, Ft. Lauderdale, Fla.
- Sambamurthy, V., Bharadwaj, A. & Grover, V. 2003, "Shaping Agility through Digital Options: Reconceptualizing the Role of Information Technology in Contemporary Firms", *MIS Quarterly*, vol. 27, no. 2, pp. 237-263.
- Saunders, M., Lewis, P. & Thornhill, A. 2012, *Research methods for business students*, 6th edn, Prentice Hall, Harlow.
- Seethamraju, R. & Seethamraju, J. 2009, "Enterprise Systems and Business Process Agility - A Case Study", *IEEE*, pp. 1.
- Sharifi, H. & Zhang, Z. 1999, "A methodology for achieving agility in manufacturing organisations: An introduction", *International Journal of Production Economics*, vol. 62, no. 1, pp. 7-22.
- Stare, A. 2014, "Agile Project Management in Product Development Projects", *Procedia - Social and Behavioral Sciences*, vol. 119, pp. 295-304.
- Takeuchi, H., Nonaka, I. & groups, w. 1986, "The new new product development game", *Harvard Business Review*, [Online], vol. 64, no. 1, pp. 137.
- Thiemich C., Puhlmann F. 2013, "An Agile BPM Project Methodology". In: Daniel F., Wang J., Weber B. (eds) *Business Process Management. Lecture Notes in Computer Science*, vol 8094. Springer, Berlin, Heidelberg
- Trikman, P. 2010, "The critical success factors of business process management", *International Journal of Information Management*, vol. 30, no. 2, pp. 125-134.
- Tseng, Y. & Lin, C. 2011, "Enhancing enterprise agility by deploying agile drivers, capabilities and providers", *Information Sciences*, vol. 181, no. 17, pp. 3693-3708.
- Vallon, R., da Silva Estácio, Bernardo José, Prikladnicki, R. & Grechenig, T. 2018, "Systematic literature review on agile practices in global software development", *Information and Software Technology*, vol. 96, pp. 161-180.
- van Waardenburg, G. & van Vliet, H. 2013, "When agile meets the enterprise", *Information and Software Technology*, vol. 55, no. 12, pp. 2154-2171.

Vázquez-Bustelo, D., Avella, L. & Fernández, E. 2007, "Agility drivers, enablers and outcomes: Empirical test of an integrated agile manufacturing model", *International Journal of Operations and Production Management*, vol. 27, no. 12, pp. 1303-1332.

Walsh, P. 1995, "Overcoming chronic TQM fatigue", *The TQM Magazine*, vol. 7, no. 5, pp. 58-64.

Williams, L. & Cockburn, A. 2003, "Agile software development: it's about feedback and change", *Computer*, vol. 36, no. 6, pp. 39-43.

Wolf, C. 2003, "Technical Brief: Value Chains and Business Processes", *Business Process Trends 2003*. Available at: <https://www.bptrends.com/publicationfiles/11-03%20TB%20Value%20Chains%20and%20BPs%20-%20Wolf.pdf>

Yusuf, Y.Y., Sarhadi, M. & Gunasekaran, A. 1999, "Agile manufacturing: The drivers, concepts and attributes", *International Journal of Production Economics*, vol. 62, no. 1, pp. 33-43.

Zacarias, M., Martins, P.V. & Gonçalves, A. 2017, "An Agile Business Process and Practice Meta-model", *Procedia Computer Science*, vol. 121, pp. 170-177.



## APPENDIX A: LITERATURE OF APM ADOPTION OUTSIDE ASD

Article & research design	Contribution
<p>Stare, A. 2014, "Agile Project Management in Product Development Projects"</p> <p>Survey</p>	<p>Many agile practises are already existing in the examined projects, but practices are not implemented in a systematic way. Larger and more detailed sample needed in order to examine APM practices' impacts on project performance.</p>
<p>Thiemich C., Puhlmann F. (2013) "An Agile BPM Project Methodology"</p> <p>Case study</p>	<p>Implementing agile practices (mainly Scrum &amp; Kanban) improves change implementation by establishing iterative collaboration between development and users (transparency) in business process management related projects. Project initiative needs to match agile ways of working.</p>
<p>Fernandez, D.J. &amp; Fernandez, J.D. 2009, "Agile Project Management – Agilism Versus Traditional Approaches"</p> <p>Literature review</p>	<p>Need for APM is clear in projects with high volatility and unclear solutions and goals. Dissatisfaction and criticism against term "agile" is presented, hybrid approach to project management proposed to be developed. More research outside software development needed.</p>
<p>Birkinshaw, J. 2018, "What to expect from agile"</p> <p>Case study</p>	<p>Implementing new practices is more difficult than suggesting them. Proper coaching and support are needed in agile transformation. A bank can implement agile practices and gain benefits out of it. Agile is starting to migrate on mainstream business, comparable experiments and explorations are suggested to be shared.</p>
<p>Conforto et al. 2014, "Can Agile Project Management Be Adopted by Industries Other than Software Development?"</p> <p>Exploratory survey</p>	<p>APM approach is suitable at least within innovative projects and projects which require more flexible management approach. Studied companies are having APM enablers more than expected, need for hybrid project management model proposed.</p>
<p>Ćirić, D., &amp; Gračanin, D. (2017). "Agile project management beyond software industry"</p> <p>Systematic literature review</p>	<p>Agile research beyond software industry is scattered and rare. Some scientific evidence of agile adoption exists in the fields of innovation management, product development, construction &amp; real estate, education and services.</p>
<p>Rigby, D.K., Sutherland, J. &amp; Takeuchi, H. 2016, "Embracing agile"</p> <p>Article</p>	<p>Management understanding is the biggest impediment in adopting agile practices. It is obvious that agile practices can be successfully extended outside IT if they are managed well.</p>
<p>Denning, S. 2012, "How Agile can transform manufacturing: the case of Wikispeed"</p> <p>Case study</p>	<p>The same management process revolution of agile is coming inexorably to manufacturing. Using agile development in car designing process resulted to innovative product with less time and cost consumption. Corporate culture is the main barrier for manufacturers to adopt agile development.</p>

## APPENDIX B: INTERVIEW FRAME

1. Project details
  - a. What was your role in the project?
  - b. How frequent work your role required?
  - c. What is project's status currently? How would you describe outcome of the project?
  - d. What was successful in this project?
  - e. What was not successful in this project?
  - f. What were the key learnings?
2. Agile project management
  - a. Did you need to understand agile development methodology during the project?
    - i. How these competences should be developed within the organization?
  - b. When comparing this project to more traditional ones what were the key differences in following aspects and how did you find those enabling project to succeed?
    - i. technical (tools, platforms, ways to follow progress and allocate resources)
    - ii. management (decision making, self-organizing teams, hierarchy, change management)
    - iii. communication? (meeting frequencies/ agendas, customer/ end user collaboration, documentation, learning)
  - c. Would you utilize or recommend agile based project management model to other projects and work?
    - i. Which practises and why?
    - ii. To what kind of projects or process work and why?
    - iii. What is preventing Agile implementation the most in your organization?
3. Ending
  - a. Are you interested in topic, is there potential? Should there be more trainings etc? (free speech)

## APPENDIX C: SUMMARY OF PROJECT CASES

	Project A	Project B	Project C
<b>Interviewees</b>	A1, A2, A3, D	B, D	C1, C2, D
<b>Status &amp; length in 6/19</b>	Development phase ready. Old system partly replaced, new process and organization established. 1yr.	Development partly ready, roll-outs begun. Old system not replaced. 1yr.	Development partly ready, roll-outs ongoing. Old system partly replaced. 2 yrs.
<b>Project team size estimate</b>	5	10	20-30
<b>Outcome compared to planned</b>	Moderate: Budget and schedule exceeded, 80% of the original scope achieved.	Moderate: schedule exceeded, 75% of MVP work done. Budget exceeded. Compared to small resources project proceeded well	Good: Schedule exceeded, scope grown but managed efficiently. Project success rather measured via usage rates of the new system
<b>Successes</b>	<ul style="list-style-type: none"> <li>- Appearance of new ideas to handle the process</li> <li>- System exists and there is finally ownership in taking it further</li> </ul>	<ul style="list-style-type: none"> <li>- User stories and usability design included well</li> <li>- Managed to spot and drop off some business requirements that were not needed</li> <li>- Amount of learning huge for the first decent business-led agile project</li> </ul>	<ul style="list-style-type: none"> <li>- System and its features itself</li> <li>- Ability to spot and react to possibilities and troubles in advance during the project</li> <li>- Strong core team</li> <li>- SAFe framework and agile routines serving well the project and adopted easily</li> </ul>
<b>Failures</b>	<ul style="list-style-type: none"> <li>- Commitment and input from business areas inadequate</li> <li>- Support from internal IT department inadequate</li> <li>- Amount of tacit knowledge and project team changes causing discontinuities</li> <li>- Underestimated system complexity causing troubles</li> <li>- Partner company did not meet expectations</li> </ul>	<ul style="list-style-type: none"> <li>- Collaboration with the partner company</li> <li>- Unexpected physical dispersion of the project team harming collaboration</li> <li>- Core team too light</li> <li>- Proactiveness in change communication and commitment building among stakeholders too low</li> <li>- Goals vs resources were not realistic</li> </ul>	<ul style="list-style-type: none"> <li>- MVP definition partly too minimalistic and software driven for business to support</li> <li>- Underestimation of systems complexity constantly causing extra work</li> <li>- Roll-out work underestimated</li> <li>- Commitment and time allocation of BA:s too low</li> <li>- Finding suitable product owners and developers challenging</li> </ul>
<b>Key learnings</b>	<ul style="list-style-type: none"> <li>- Stakeholders and end users should be involved more, more communication required</li> <li>- More focus should be put on representing ideas to developers and users</li> <li>- Knowledge of systems need to take in to account in resourcing</li> <li>- Role of project manager is very essential</li> </ul>	<ul style="list-style-type: none"> <li>- More attention should be paid on partner selection</li> <li>- Discovery work before the actual development work is essential, "<i>should this even be done?</i>"</li> <li>- Resource needs of agile project, especially in the core group</li> </ul>	<ul style="list-style-type: none"> <li>- Role of PO is essential</li> <li>- Agile cadence and planning sessions are important to follow precisely</li> <li>- Backlog refinement is challenging and needs more resources</li> <li>- Roll-outs and MA communication: change and expectations management require resources</li> <li>- It is ability to postpone critical decision not time or cost savings that should drive to agile projects</li> </ul>

## APPENDIX D: MANAGERS' MAIN FINDINGS OF INTERVIEWED THEMES

	Project A	Project B	Project C
<b>Technical</b>	<ul style="list-style-type: none"> <li>- In such a small project group tools do not play a big role, only add complexity</li> <li>- Unified practices and commitment to the usage of tools important</li> </ul>	<ul style="list-style-type: none"> <li>- Tools can be taken too far where they are not serving agility anymore</li> <li>- Drawing and storytelling are the most important things in agile</li> </ul>	<ul style="list-style-type: none"> <li>- More business-oriented users might find technical boards etc. tools too heavy and complicated</li> <li>- PI (Program increment) planning, agile cadence and backlog refinement key practices enabling succeeding</li> </ul>
<b>Management</b>	<ul style="list-style-type: none"> <li>- More systematic approach to daily management would have helped.</li> <li>- Decisions should be validated more with stakeholders</li> <li>- In such a short project team should not change</li> </ul>	<ul style="list-style-type: none"> <li>- Dispersing decision making as close to customer as possible is essential.</li> <li>- Core team's dispersion rate was unexpectedly high which harmed the project</li> <li>- Top-down decisions might be forced even though they don't meet economic criteria</li> </ul>	<ul style="list-style-type: none"> <li>- In addition to self-organizing teams, managers and owners need to be actively networking with other project streams</li> <li>- Clear commitment to tasks in planning with rather collaborative than "we pay you" attitude is seen as positive</li> </ul>
<b>Communication</b>	<ul style="list-style-type: none"> <li>- Not so systematic, stakeholders not involved and committed enough and too late</li> <li>- Decision tracking and documentation should be improved</li> </ul>	<ul style="list-style-type: none"> <li>- Communication focus should be in the product instead of individual allocation</li> <li>- Remote and concurrent work are constraints in agile projects</li> </ul>	<ul style="list-style-type: none"> <li>- Scrum communication pattern is complex but handy</li> <li>- Ways to unformal communication are essential: cases should be solved immediately, not waited to formal meetings</li> <li>- Suitable level of end user input should be found: too much is not good either</li> </ul>

# APPENDIX E: SUMMARY OF CHALLENGES

