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Master's thesis

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**PERFORMANCE MANAGEMENT OF AN OUTCOME-BASED PROJECT IN THE
MANUFACTURING INDUSTRY**

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ABSTRACT

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In the manufacturing industry setting the project business has been conducted using traditional methods. The case studied, however was an outcome-based five-year project with a benefit sharing scheme – a setting that was new to both two organizations involved in the project. The research was conducted after one year from the five-year contract period was completed. This thesis studied the performance management methods that are suitable when operating in an outcome-based setting.

The key results include ideas for agile project management, observations of the mutual target setting and the usage of knowledge-based management and data-driven development.

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Valmistavan teollisuuden saralla kehitysprojektit toteutetaan pääsääntöisesti perinteisin menetelmin, vesiputousmallisella projektijohtamisella ja noudattaen tähän liittyviä taloudellisia näkökulmia. Tässä diplomityössä on tutkittu kahden organisaation välistä viiden vuoden mittaista tulostalousprojektia ensimmäisen yhteistyövuoden jälkeisenä ajankohtana. Diplomityön tarkoituksena oli löytää näkökulmia ja parhaita käytäntöjä tulevaisuuden tulostalousprojektien toteuttamiseksi.

Tutkimustulosten perusteella voidaan tehdä muutamia yleistyksiä ja lähtökohtasuosituksia tulostalous-projektien toteuttamiseksi. Johtamismallin tulee tukea tulostaloussympäristössä esiintyvien muutosten hallintaa joustavasti ja tutkitussa projektissa noudatettu ketterä toteutusraami vastasi osaltaan tähän haasteeseen. Tässä diplomityössä otetaan kantaa myös yhteistyön perustana olevien avainmittareiden muodostamiseen ja yhteisen suuntaviivaston muodostamiseen. Tiedolla johtamisen näkökulmaa tarkastellaan tutkimuksessa tehtyjen haastatteluiden ja kyselyiden tulosten pohjalta.

FOREWORD

“Without labor, nothing prospers.” – Sophocles.

As I embarked on this journey in the fall 2018 I had only a faint idea of what lies ahead, even if I was prepared for the hard work and determined to finish on time and with style. What surprised me during the studies was the amount of comradery that developed over the two-year period. The study group I was lucky enough to be in, shared the same passion for excellent results gained through grinding the axe while not losing the humor and light heartedness that welds people together. Thank you all, especially Mikko, Lauri and Petri. The studies themselves opened new perspectives at different aspects of management, strategic thinking and innovative work culture.

Studying takes a toll on not only the student but private life stakeholders as well. I would like to thank my family for the support and tolerating at times a quite weary and tired student/dad at home. Tiina, I could not have done this without you.

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Helsinki 28.5.2020

Sampsa Kotilainen

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List of abbreviations

BU	Business Unit
CCM	Co-Creation Method
CCW	Co-Creation Workshop
COP	Cost of Production
CPS	Collaborative Project Scorecard
F&B	Food and Beverage (industry)
HQ	Headquarter
KPI	Key Performance Indicator
PM	Performance Management
PMBOK	Project Management Body of Knowledge
PMM	Project Management Method
PMS	Performance Management System
QG	Quality Gate
WIP	Work in Process

1 INTRODUCTION

Manufacturing industry along with the rest of society is seeing a progressing transformation that introduces ‘as a service’ -products developed at an increasing speed. This servitization could be defined as “The innovation of an organization’s capabilities and processes to better create mutual value through a shift from selling product to selling Product-Service Systems.” (Baines, et al., 2009, p. 547). Along with this trend, outcome-based thinking is gaining a foothold in the industrial landscape. In the outcome-based setting the aim of a partnership is set on creating additional value through its network of resources. These networked resources will aid in shaping competitive advantage of the interconnected firms (Lavie, 2006). The move from client–provider setting to networking partners or ecosystem companions, brings considerations for performance- and project management alike. The implementing of system-level control mechanisms and performance measurement tools in a network environment is important when attempting to manage the network (Pekkola & Ukko, 2016).

Performance- and project management are tied together and both aspects are to be put in the focus when striving for a long-term partnership and effective managing in an outcome-based setting. Transparent data for metrics and an adequate amount of dialogue is required to be able to execute knowledge-based management of projects and performance. In the era of digitalization, the new possibilities provided by emerging technology and tools should be examined and taken into use when an added value is expected from these tools. Transforming data into knowledge in designing and implementing a performance measurement system requires efficient use of IT infrastructure. (Pekkola & Ukko, 2016). An aspect that Saunila et al. researched was the human factor in value co-creation in a digital service environment (Saunila, et al., 2019). The human factor in this thesis shall be covered with semi-structural interviews and questionnaires.

1.1 Background

Based on the Authors experience of working on industrial projects for the past decade, there is a change towards increased utilization of implementations, digital twin, digital closed loop manufacturing and IoT-technology. The new technology and new business models, like the

outcome-based model create a need for analyzing which factors affect performance- and project management and how to leverage the most added value out of the combination in each project. The business model chosen must support value creation (Chesbrough & Rosenbloom, 2002). In the case studied in this thesis, the aim was to maximize the value potential of the customer's existing manufacturing equipment through a series of development actions ranging from new technology to a broad training plan.

To effectively manage the performance especially in the outcome-based business model, correct metrics become crucial. Using a continuous improvement approach, actions leading to little or no gain must be stopped or re-evaluated while actions bringing desired benefits should be standardized, scaled up or replicated, where possible. This requires suitable monitoring and assessment capabilities to be implemented. The continuous improving is not possible if the process cannot be measured or the level of performance defined (Sokovic, et al., 2010). For metrics to be implemented, the data gathering must be efficient, timely and structured. Implementation challenges regarding data access, data availability and time-consuming data collection have been reported in prior research (Ukko & Saunila, 2020) The use of solutions like IoT and automated dashboarding offer one solution to satisfy the need for transparent view of the data and metrics. In this thesis the gathering of the metrics data and the tools for presenting the metrics were studied by conducting interviews with chosen personnel from both organizations involved in the project. Two Senior Consultants of a Third-party Consultancy company, working on the case studied, were also interviewed to get input from a more impartial party.

Performance- and project management of an outcome-based project, where no schedule, delivery content or budget has been predefined presents a fertile soil for research. The decision whether to use a traditional industry standard like the waterfall method or some Agile form of management should be considered when entering a project with a new business model and the freedom to discover and develop the process based on the experiences gathered.

As the Author found out, the outcome-based business model requires from the partners the transparent exchange of information ranging from mundane to sensitive. For the information

sharing to work, the human factors of trust building and solidifying the partnership, rather than staying in the client-provider setting, is mandatory.

1.2 Research objectives and research questions

The knowledge gap identified lies in how performance- and project management of an outcome-based project differ from the time-tested traditional business model of order-delivery in a client-provider setting. The objective for this thesis is to outline an effective performance- and project management framework to be used when engaging in outcome-based projects in the manufacturing industry. Using a case study as the data source this thesis aims to identify best practices for defining metrics, manage an outcome-based project and study the human factors involved in building the trust needed for the partnership to be formed.

The term outcome-based project in this thesis refers to a setting where the monetary compensation for efforts is shared solely based on a KPI metrics change. The KPI change is directly related to the benefit leveraged out of the partnership and the gained benefit is shared according to the contract between the parties.

Arising from the research objectives, the research questions are formulated as follows.

The main research question is:

- *How to effectively manage the performance of an outcome-based project?*

Sub-research questions are:

- *What kind of project management model is effective in an outcome-based project?*
- *What kind of metrics should be utilized in an outcome-based project?*
- *How can data be transformed to information for management use in a manufacturing industry project?*

1.3 Research approach and scope of the study

The research strategy chosen for this thesis is a case study including qualitative research. The case study approach allows the examination of real-life activities and the use of multiple sources of evidence and information. The case study method has been criticized for the lack of generalization capabilities; however, the scope of this thesis is to research and analyze the effectiveness of performance- and project management methods applied in this case.

The data gathering for the qualitative approach is performed by semi-structured interviews, with a set of base questions designed while keeping in mind the research questions of this thesis. The interview questions are formulated to gain understanding of the views and opinions from the chosen managers and project team members. The data gathered is analyzed and compared against theory in order to reach conclusions in the end.

In this case study the management methods considered are the waterfall method and agile methods: scrum, kanban and scrumban. Project management methods outside of the fore mentioned are not a part of this study.

1.4 Structure of the thesis report

The most relevant input information and the resulting output for each chapter is presented in Figure 1. Structure of the thesis report. The visual structuring allows the reader to get an overview of how this thesis progresses from introduction to summary.

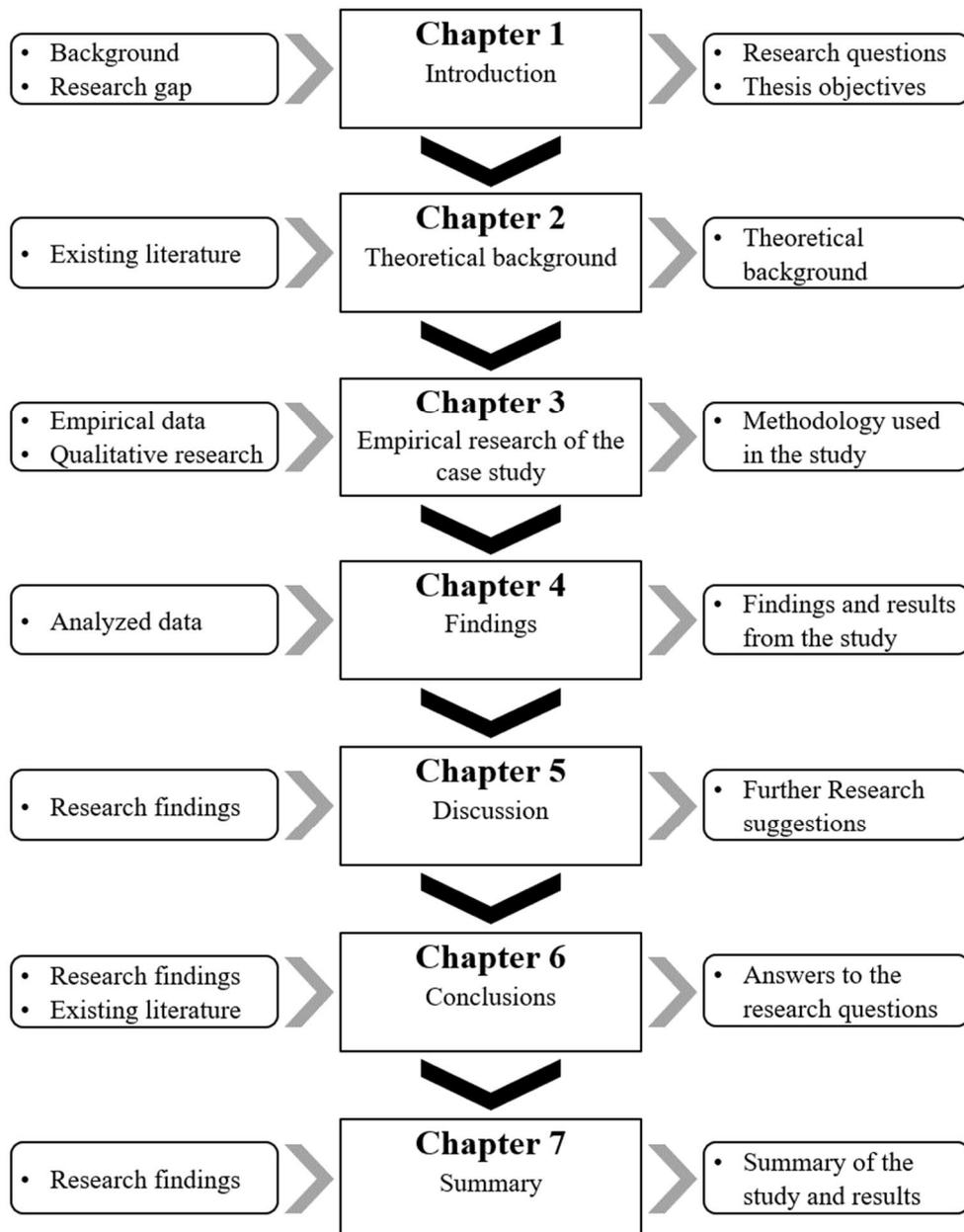


Figure 1. Structure of the thesis report

2 THEORETICAL BACKGROUND

A diverse theoretical background is needed for constructing an effective framework for successful project execution in an outcome-based business model environment; The aspects of project management method must be considered, i.e. agile vs. traditional waterfall -project management. The value proposition and measuring of value created must be assessed via relevant metrics and identify the most useful metrics definition and how to set up the information gathering environment. In an outcome-based partnership the ecosystem and human aspects are to be studied along with the data driven management aspects that guide the efforts.

In this chapter past research of the previously mentioned areas of project management, performance measurement and -management is reviewed bringing the needed theoretical frame for conclusions to be drawn from the interviews and findings in this thesis.

2.1 Theory of Project management methods

Project management is an essential element in executing successful projects, and selecting the right project management methodology (PMM) will increase the likelihood of success (Chin & Spowage, 2010). Even though it is identified that using PMMs the benefit gained remains little researched area thus far. (Wells, 2012). The term “project management methodology” is not clearly defined in literature but the core of it is in defining practices, standardized methods and guidelines to aid the projects to be delivered. In the larger scope Project Management Methodology includes wide range of tools and techniques that help the managing of different aspects of the project (Chin & Spowage, 2010). The use and effective implementation of PMMs does not guarantee a successful project and on the other hand a poorly performing project is not necessarily the result of a weak PMM implementation (Wells, 2012). One aspect of implementing a PMM is the relative autonomy from tacit knowledge. When a project is being governed with a defined method the informal project level tailoring can be minimized. Even if the informal tailoring is done by an experienced project manager, it is not formally described and remains highly subjective (Wells, 2012). The selection of a PMM varies as in some cases the desire is to ensure a successful delivery of a problematic project and in other cases the emphasis is more on the standardized approach with better control mechanisms. One particular

aspect is selecting a PMM in order to involve the users and customers in a more in-depth way (Wells, 2012). The study conducted by Wells found out that experienced practitioners do not gain optimal benefits from the use of any PMM. The benefits are mostly gained in the fields of monitoring and unifying the practices, that the assisting organizations and senior management are tasked with. Experienced project managers found the use of a PMM to be a tool for compliance and control, rather than for support and guidance (Wells, 2012).

2.2 Theory of waterfall project management method

The waterfall method was introduced in 1970 in software development environment by Winston Royce. The method followed the manufacturing and construction strategies of its time and is inherently rigid, some might even argue bureaucratic. As the name suggests the process of conducting a waterfall method project consists of linear sequences or steps that follow each other in a predefined order. The project moves on to the next step, only after fully completing the previous step, with little possibility to stray from the path. Emphasis in this model are in the requirements planning and check-list type quality gates (QG) using templates for documenting the work results. The stages of the waterfall method according (Petersen, et al., 2009) are visualized along with the quality gates in Figure 2. The stages of a waterfall method.

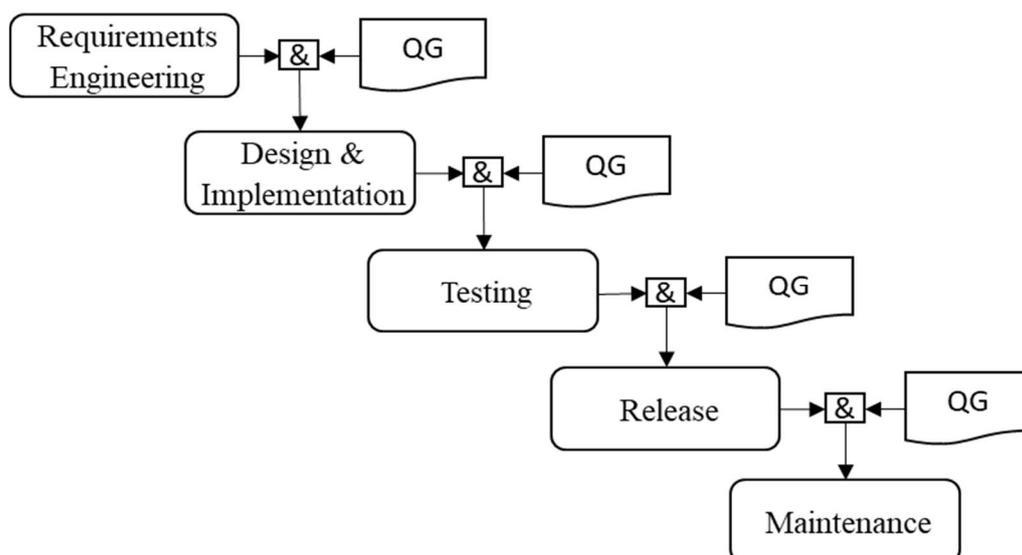


Figure 2. The stages of a waterfall method adapted from (Petersen, et al., 2009)

Petersen, et al. (2009) also highlight several problems that are associated with the waterfall method. Identified problems include the large amount of approval documentation, high cost of performing changes or rework in the project, lack of customer feedback during the project execution and the tendency to push identified problems onto later phases of the project. (Petersen, et al., 2009). In his journal article, Juyun Cho states that 16,2% of projects conducted using traditional methods, such as waterfall, were completed on-time and on-budget with all features and functions specified. 57,2% of the studied projects were over-budget and 31,1% were cancelled. (Cho, 2008).

The waterfall method also has its strengths. The method is applicable when the requirements are known and documented, the project aim is clear and stable and the technology is understood and tested (Verma, et al., 2014). Benefits in choosing waterfall method as the PMM also include that it is easy to implement and requires minimal resources due to its sequential structure. When the waterfall method is implemented properly, the documented quality gates guarantee that the project documentation will be comprehensive (Mahalakshmi & Sundararajan, 2013). Due to its rigid nature the waterfall method is suitable also for less experienced project teams.

2.3 Theory of agile project management methods

Agile – as defined by Merriam-Webster dictionary: “marked by ready ability to move with quick easy grace, having a quick resourceful and adaptable character” (<https://www.merriam-webster.com/dictionary>). From the definition alone one can note the nature of action targeted by using an agile method, be it in developing software or managing a project for example. The previously discussed waterfall method is useful when the requirements are known and the outcome is well defined, whereas the agile methods prevail under circumstances where the target might be loosely described and change of direction or pace must be quickly and nimbly manageable. The agile methods target simplicity and speed while maintaining the focus on the prioritized development actions, allowing the development to react rapidly to changes arising from technology or business needs. (Abrahamsson, et al., 2003). The number of agile methods is ever increasing, however in this thesis the focus is on the scrum and kanban methods, also combinedly called Scrumban. (Khan, 2014). The software engineers that developed the scrum method go even as far as stating that “agility is the most competitive advantage today.” (Swaber

& Sutherland, 2012). The claim can be backed up by surveys that show agile projects' success rate to be 42%, which is three times better than with traditional projects (Sutherland, et al., 2014).

Abrahamson, et al. (2003) defined the agile software development characteristic to be incremental, cooperative, straightforward and adaptive. Incremental refers to small rapid development cycles that in this thesis are later referred to as "sprints". Cooperative denotes the cooperation between organizations, not intercompany cooperation as such. Straightforward implies the ease of implementing and learning the method, and adaptive the capability of changing the course quickly i.e. to be able to react to changing requirements or surrounding factors. However, for any method applied to be efficient, project management is needed to enable the tasks that the programmers and developers need to perform in order to reach the goal. Thus, project management is a vital dimension of the development tasks. In many agile methods the support for project management is scarce making it a difficult decision for the project management to choose the most suitable method for the development. Project management collaboration with the whole development team (project team) is crucial in order to be efficient and nimble in the execution phase. In Figure 3. Comparison between Agile methods, the different Agile methods investigated by Abrahamsson et al. are compared on their characteristics regarding project management support, process descriptions and guidance offered. (Abrahamsson, et al., 2003)

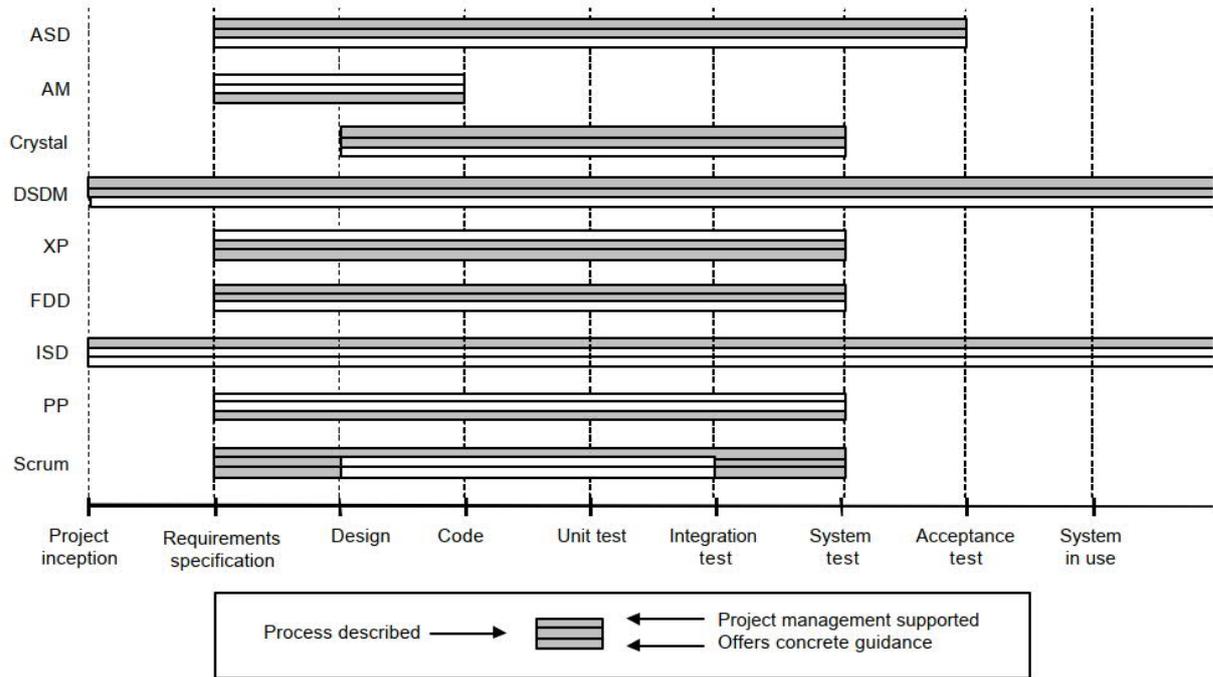


Figure 3. Comparison between Agile methods (Abrahamsson, et al., 2003)

2.3.1 Scrum

Formulated scrum process was born in 1995 at a conference in Austin, Texas, where Jeff Sutherland and Ken Schwaber presented a paper of the method they had outlined. Although before Sutherland and Schwaber formalized the scrum they based the ideology on production methods that Hirotaka Takeuchi and Ikujiro Nonaka had witnessed in automobile manufacturers' production lines already as early as in 1986. "Scrum, based on empirical process control theory, is an iterative and incremental project management methodology to control risk and optimize the predictability of a project." (Lei, et al., 2017, p. 60). Scrum method also recognizes the importance of customer involvement and transparent communication needs with all stakeholders. The transparent communication within the team, as well as with the customer, from the beginning through implementation to maintenance is a key factor in a successful agile project (Cho, 2008).

The scrum method consists of roles, artifacts and events, see Figure 4. Scrum method building blocks (Swaber & Sutherland, 2012). The team, called scrum team, is comprised of one product owner, scrum master and developers. The functions of these roles are:

- The Product Owner: Owns the backlog for the desired outcome. Decides what to develop in each sprint by prioritizing the backlog and has the power to approve the outcomes of each conducted sprint.
- The Scrum Master: ‘Project manager’ that manages the action in a scrum fashion. Gathers the scrum team for the task at hand.
- The Developers: Work force that realizes the development work in the sprints. Breaks down the envisioned outcome into increments into the backlog.

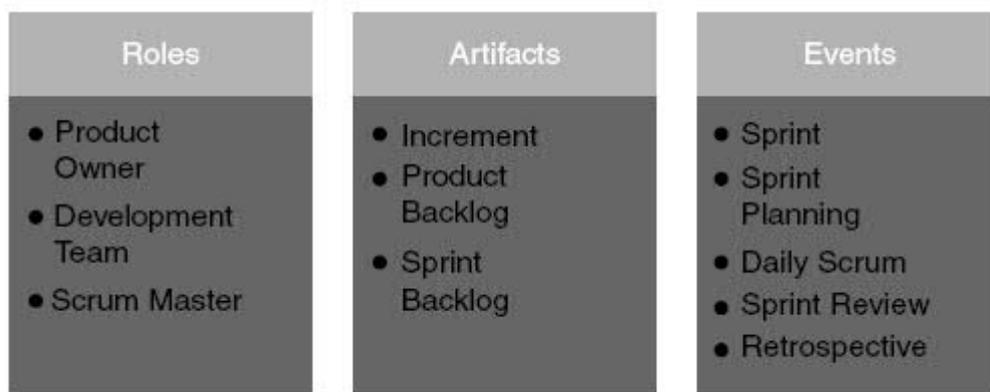


Figure 4. Scrum method building blocks (Swaber & Sutherland, 2012).

In the scrum process the vision of the desired outcome is broken down into pieces that make up the product backlog. For this to be possible the vision needs to be thoroughly explained and the aim clarified to the whole team. From the product backlog, items are lifted into sprint backlog which is the focus of the scrum team to finalized during the sprint. Only the items that the sprint team estimates that they can finish during the sprint are lifted to be executed in the next sprint. Should a task require too much time to be done in one sprint, the item needs to be broken down into smaller pieces. The definition of failure and success is also defined so the actions from the sprints can be either accepted or returned to the sprint backlog.

Ideally the scrum team can concentrate solely on developing and reaching the given target. Customer and other stakeholder meetings are not the scrum team’s priority. The productivity of the team is ensured by preventing interruptions of work. Internal meetings however are regular and scheduled. The daily scrum is a short stand up conducted every morning, where the

scrum team plans the work for the day ahead and relevant information between development team members is exchanged. The transparent sharing of information is vital for the development to proceed without hidden obstacles being discovered during the execution. At the end of the sprint a meeting called the sprint review is conducted. In the sprint review meeting the whole team reviews the previous sprint from the viewpoints of what was done, was the work efficient, is the outcome of the sprint useful and what part of the work can be deemed as accepted. The sprint review signifies always a point where decisions for the future are made. The decisions are to take into use what was accepted, decide which product backlog items are moved into sprint backlog for the upcoming sprint, or decide not to proceed and end the works. This limits the risk of misplaced efforts to one sprint at a time and value is still harvested from the completed sprint backlog items that have been accepted. After a sprint review meeting decision to continue the sprints in order to complete the product backlog, a sprint retrospective is held. The aim of the sprint retrospective meeting is to continuously improve the sprint execution quality by formulating improvements for the way working within the team. By commonly discussing the assessment of work efforts, blocking points, communication flow efficiency and clarify the aim the sprint team increases their creativity, effectiveness and productivity, thus continually improving the work life of the team. (Swaber & Sutherland, 2012).

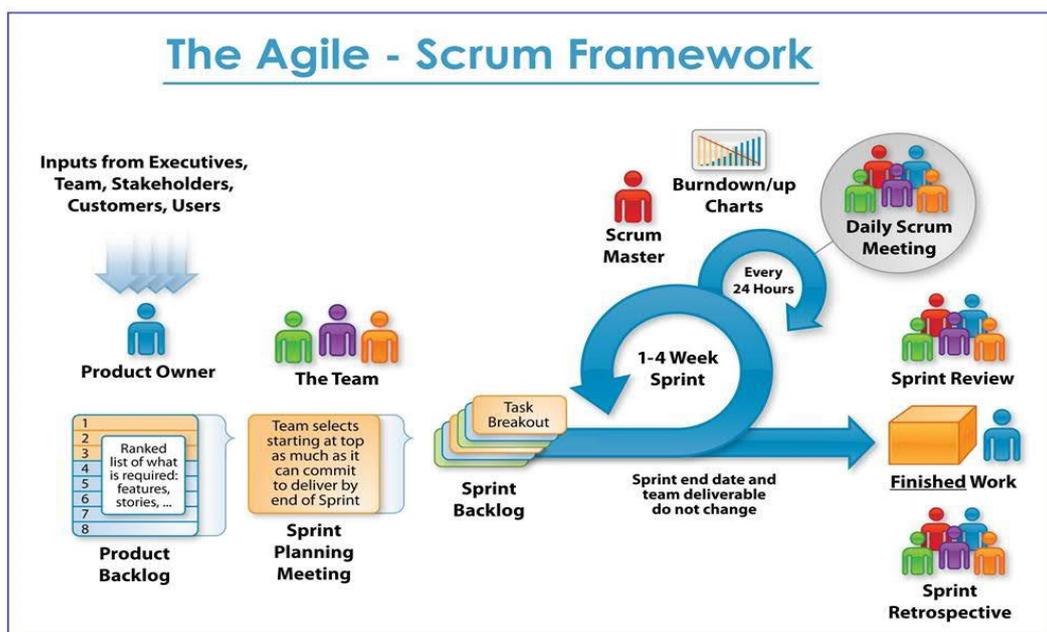


Figure 5. Agile scrum framework (Jose Lara 2018)

2.3.2 Kanban

Kanban is one of the agile project management methodologies, that has its roots in the Japanese car manufacturer Toyota's production method of eliminating waste and introducing a pull control instead of a push method of controlling (Sugimori, et al., 1977). Kanban focuses on visualization of the workflow of broken-down pieces for the work to be done. The work packages to be done are prioritized for the work to progress in schedule focusing on the most critical tasks to be undertaken at the right time. This also increases flexibility regarding the less important other tasks in the project. The process is started by focusing on the most value adding tasks and moving then on to the other tasks in the priority list. No unnecessary features of out of scope elements are added to the project. The aim is to eliminate waste by focusing on the right tasks at the right time and maintaining the aim of the project.

The basic principles of kanban PMM are:

- Limiting Work-In-Process (WIP).
- Pulling value through the development process.
- Making the development process visible.
- Increasing throughput.
- Using a fixed backlog.
- Embedding quality.

(Lei, et al., 2017)

Kanban method makes the progress visible by creating a "Card Wall". On the card wall all the steps and tasks required to implement the project are identified and displayed. The card wall can be visualized using sticky notes or electronic kanban boards. The backlog, and next priority tasks are on the left-hand side of the board from where the cards travel to the done/approved column on the right-hand side of the board. In the middle there are the steps that need to be completed for the whole task to be accepted as done.

The WIP is monitored and controlled by not allowing more than the agreed number of tasks to be allocated into any one step at a time. Once a task is finished in a step, it is moved downstream, i.e. towards the done column, allowing for a new task to be pulled from upstream. Should the

upstream task be filled with cards the already executed task must wait for a free slot to become available in the next step, or the card can be put on a queue between the steps. The queue also effectively visualizes the bottlenecks of the project. Should a queue contain several cards it is evident that the bottle neck is the next execution step in the progress. An overview of a kanban board is shown in Figure 6. Kanban process overview where the WIP limit for each step is two cards per step.

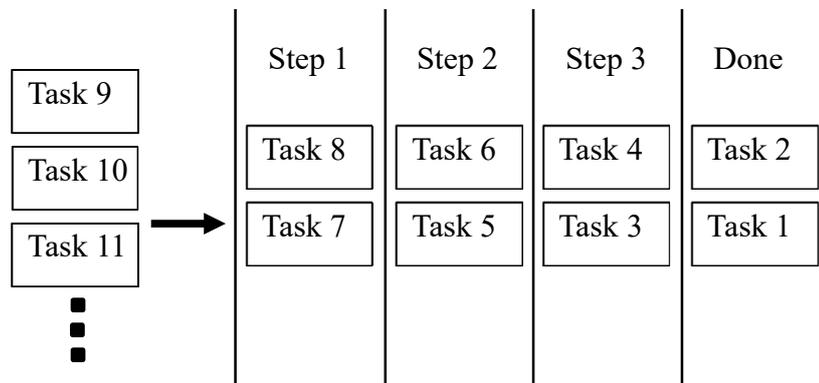


Figure 6. Kanban process overview (Lei, et al., 2017)

2.3.3 Scrumban

Scrumban, as the name suggests, is a combination of both scrum and kanban and therefore has elements of both methods. Scrumban can be viewed as either scrum with kanban elements or kanban with scrum elements, that are transformed to form a scrumban suitable for the requirements of the organization or team. (Khan, 2014)

The most important tool adapted from kanban is the visualization of the workflow. In scrumban the idea is to visualize the workflow that goes into the sprint as well as the flow out of the sprint. The bottleneck areas will become apparent to the team as well as the product owner (using scrum terminology) giving focus on where to aim additional development efforts when needed.

Scrumban uses work pull, instead of work push, which is the traditional scrum method where all work assigned from the backlog is completed during the sprint and pushed to the next stage at the end. In the scrumban method the sprint backlog can be revised when needed thus creating

more agility. Scrumban prioritization can be created by adding a second backlog with prioritized tasks between the principal backlog and work in progress stages. The items from the prioritized backlog are pulled into execution and assigned when a developer becomes available after finishing the prior task assigned to him or her. (Khan, 2014)

Work-in-progress (WIP) is limited in every stage of the scrumban process to accommodate the team's capacity to perform the tasks. The limiting of WIP items allows the team to focus on performing and finishing the on-going tasks. It is the experience of the Author that limiting 'visibility' to the other tasks or the next task improves concentration and produces results faster because the cognitive tax of switching from one task to another is kept to a minimum. In scrumban, once all the tasks of the sprint are completed, the developer shall focus on helping other team members in their tasks, rather than taking on a new task for him- or herself. This improves the team collaboration and builds up a more cohesive team. (Khan, 2014)

Scrumban planning and review meetings are more relaxed and less ceremonial, and focus is kept on defining and then working on the next most important tasks ahead making the development work leaner, more flexible and flow oriented (Khan, 2014). "In scrumban, development teams may adapt to production requirements and interests of the stakeholders, without being burdened by the project methodology." (Stoica, et al., 2016, p. 11).

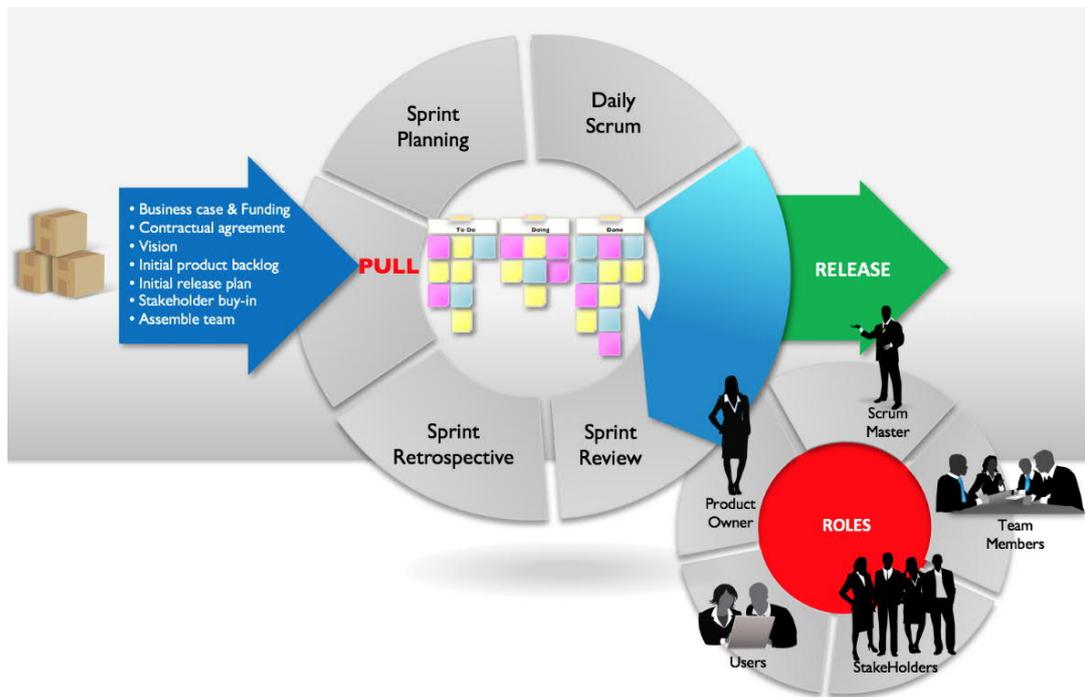


Figure 7. Scrumban framework (Peddisetty, 2015)

2.4 Theory of Performance management

Performance management is a continuous and ongoing process, where goals and objectives are set, the completion of tasks and objectives is followed and where coaching and feedback is exchanged. The actions performed must be aligned with the company's strategic goals so the performance management efforts will help gaining a competitive advantage. (Aguinis, 2013)

Performance management can be seen at least on two layers, one is the management of the employee's performance and the other is the performance of the organization. The first level has an affect on the latter as organizations are comprised of individuals. Ukko et al. (2009) constructed an operative level performance management system where the different layers are tied together in a combined framework. In their framework, six factors were identified that substantially affect the operational level performance management:

- PM Linkage to reward
- Possibilities to participate in decision making

- Understanding the linkage between individual's and organization's targets
- Interactive communication
- Clarification of job description
- Training

(Ukko, et al., 2009).

The performance related rewards should be linked to both financial and non-financial measures. The performance-related pay, however, does not axiomatically increase the employees' motivation. The employees should participate in defining the performance-related pay scheme, thus enabling the feeling of being able to affect the outcome. The PMS should be close and be familiar to the employees and communicated in a clear and understandable way. The understanding of linkage between individual and organization targets is a key motivator in managing the performance of an organization. Okkonen et al. (2002), also conclude that aligning the individual targets with the organization targets is important as the PM is a tool for implementing the organization's strategy.

The Performance Management System must be linked with organizational strategy and the same applies for performance measurement as performance management actions are based on information provided by performance measurement systems. There are several performance measurement frameworks on which a performance measurement system can be based, for example: Balanced Scorecard, Performance Pyramid and the Performance Prism. A performance measurement system can also be constructed without a specific model to suit the needs for which the measurement results will be used. (Ukko, 2009)

2.5 Theory of Performance management methods in projects

Project management consist of planned actions, that need to be taken, in order to achieve the desired outcome. The classic interpretation of project management constraints is the triple constraints structure. In this form the project constraints are time, cost and performance, which are interchangeable with other terms as well, for example terms like schedule, budget and scope. The balancing of these three factors is the basis for quality of projects (Rugenyi, 2015). The project management body of knowledge (PMBOK) has revised the view on constraints with a

more holistic approach. According to PMBOK, a project has input and output factors as well as process factors as illustrated in Figure 8. Constraints of Project Management. The input and output factors of a project are the traditional triple constraint factors of schedule, scope and budget whereas the process factors are risk, resources and quality. Project management must nurture all the aspects for the project to be a success.

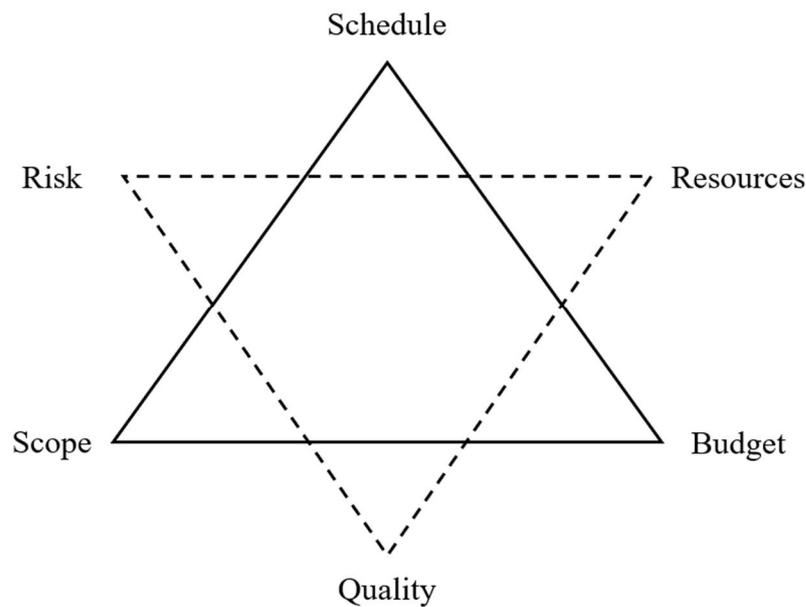


Figure 8. Constraints of Project Management

Project management consists of various reporting and documenting tasks and the management of interests of different stakeholder groups. The rise of communication tools and ease of data transferring makes it feasible to conduct projects in virtual environments, also when the project members might be scattered all over the globe. The virtualization and decentralization bring also a need for different type of network management. The setting of common vision and processes is vital for the management of a virtual team (Niebecker, et al., 2008). “Performance measurement of virtual teams is essential to evaluate the status and progress of a distributed project.” (Niebecker, et al., 2010, p. 330).

In order to be able to measure the performance of a collaborative project, a suitable method must be chosen. Niebecker et al. (2009) devised a Collaborative Project Scorecard (CPS) that ties together the common goals of cross company projects to a framework structure. The CPS is based on the business scorecard out of which the project scorecard is derived. The project

scorecard and strategic- and project goals of each partner are defined within their own projects and then fused together to form the collaborative project scorecard. The method allows for sensitive information to be kept from exposure while still ensuring an alignment on the partnership level, as only the agreed KPIs are controlled and monitored within the CPS. The combining of a CPS is shown in Figure 9. Organizational integration of CPS (Based on: Niebecker 2009).

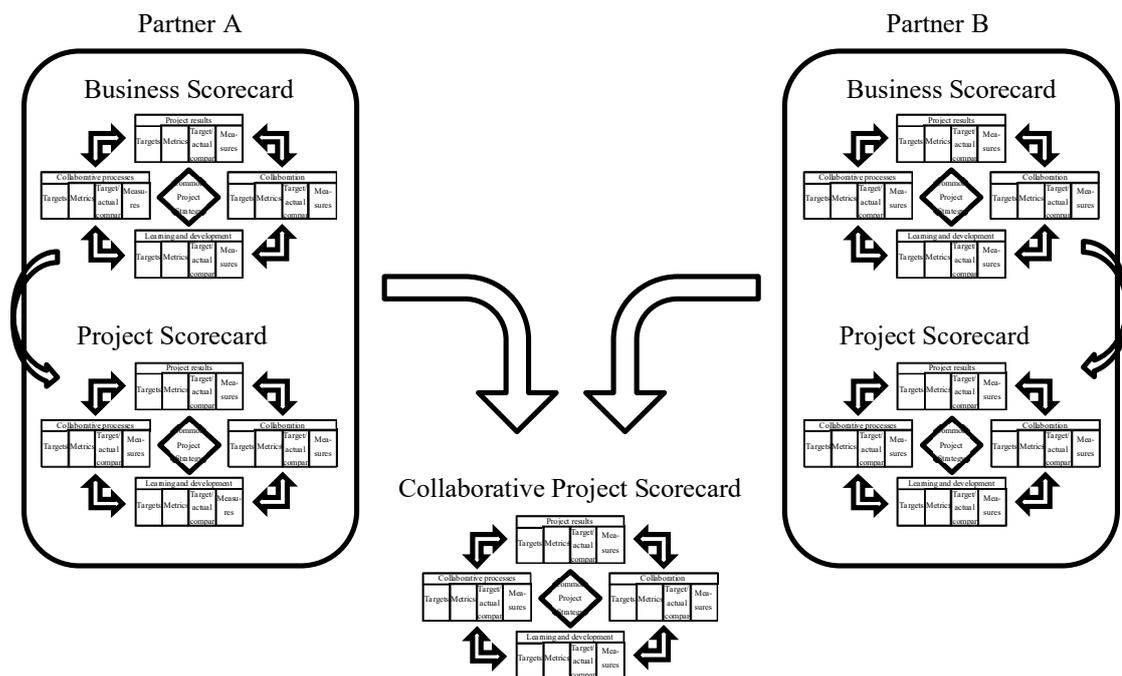


Figure 9. Organizational integration of CPS (Based on: Niebecker 2009)

In their article Niebecker et al. (2010) found the CPS to increase communication, reduce the risk of misunderstanding and decrease the project management response times, due to predefined set of measures of how to react to project specific situations and changes. The building of mutual trust is supported by using the CPS as the actual performance and metrics for the targets become transparent. The introduction of a strategic level tool like CPS needs a lot of attention in the implementation phase. The impact and importance of the tool must be communicated to all the team members. The people deeply involved in the operational level actions might view it only as unnecessary extra work if proper communication is not performed. Niebecker et al. (2010) also state that enabling the project management to control projects on a

holistic level is vital for a successful project. (Niebecker, et al., 2010). The structure of a CPS is shown in Figure 10. Structure of the CPS (Source: Niebecker, et al. 2008b).

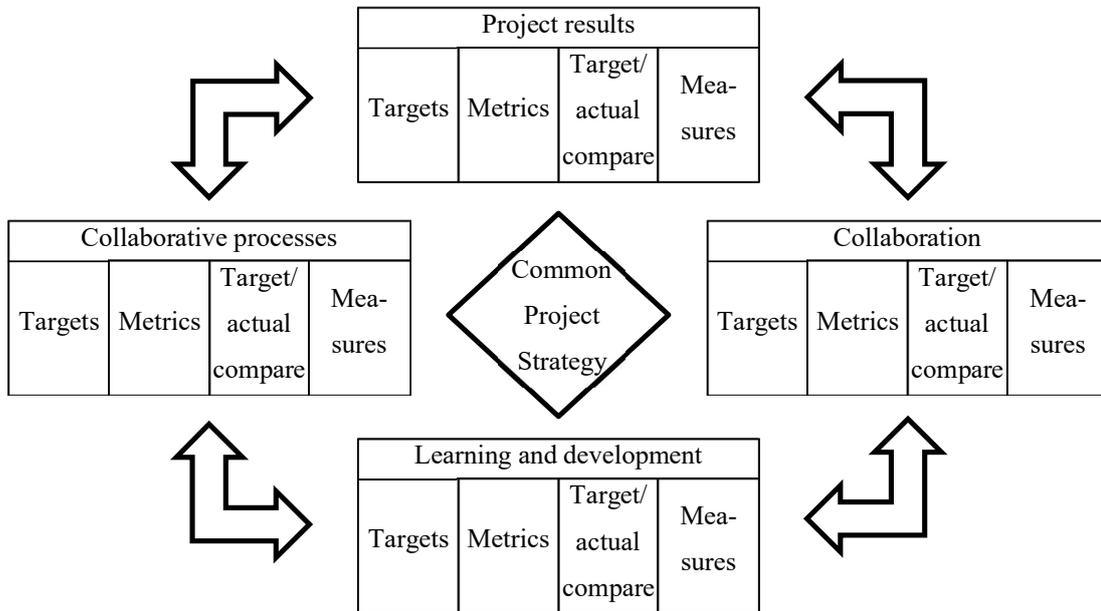


Figure 10. Structure of the CPS (Source: Niebecker, et al. 2008b)

2.6 Summary of the theory

The theoretical background sets the stage for the case study and this thesis' empirical research approach. The semi-structural interview questions will be based on the introduced views on the selected project management methods and performance management aspects.

The proposition of the Author is that the interviews will uncover empirical evidence to solidify the benefits of using agile project management methods in an outcome-based project environment and to verify their effect on performance management in the case studied. As Abrahamsson et al. (2003) concluded, the project management view cannot be neglected when the aim is to develop an effective agile environment for development actions (Abrahamsson, et al., 2003).

3 EMPIRICAL RESEARCH OF THE CASE STUDY

In this section of the thesis, the case studied is described in more detail. The project management method and the metrics applied are outlined and the research method introduced.

3.1 Case description

The case studied in this thesis, is a project called Phase 2 – project. It is an outcome-based five-year project, implemented by two international corporations in a manufacturing industry setting. One of the companies is a globally operating multi-field technology and solutions provider and the other company is a global leader in food and beverage manufacturing.

The business relationship between the companies started in early 2017 when it was decided on headquarter level, to launch an experimental project to study the best digitalization tools and methods available for improving the productivity one factory of the Manufacturing Partner. The project then started was later named “Phase 1” -project, as the outcome was a digital foundation, enabling further development and deeper integration of the digitalization solutions available.

The aim of the Phase 1 -project was to explore a different approach for conducting brown field projects, where the productivity of the existing utilities and production facilities should be increased using digitalization solutions, like closed loop digital manufacturing and digital twins. A brown field project differs from a green field project in many ways and this can be challenging, although it also has its benefits. In a green field project, the whole manufacturing facility is new resulting in more freedom in the execution phase as well as providing an opportunity for a new work culture development. In a brown field project, the facility and culture (most likely) already exists, and changes, especially substantial ones, may result in change resistance that needs to be thoroughly managed.

The Phase 2 project continues to build and experiment on the digital foundation established earlier. The Phase 2 case project is also an experiment of a new business model between the companies, where new technology and solutions are used to create benefit that is shared between the partners. The Phase 1 and Phase 2 project execution times and the period of

research for this thesis is illustrated in Figure 11. Project timeline and research period. Neither company has experimented with a completely outcome-based business model, where the only compensation to the provider is determined based only on KPI changes, with no fixed base fee. This poses a clear challenge for defining the metrics used for the benefit sharing. The factors, over which the provider has no influence, need to be restricted while at the same time the effects of actions performed need to be transparent in the metrics system for the model to be usable.

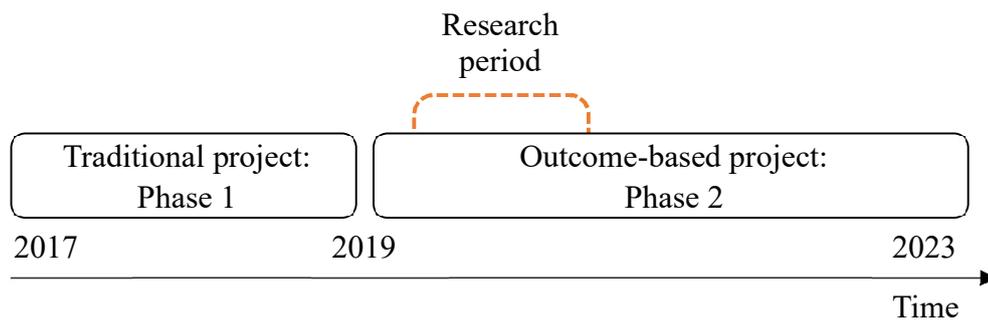


Figure 11. Project timeline and research period

The project management in the case studied differs from what the Author is accustomed to seeing and practicing in an industrial environment. Typically, projects have a defined budget, schedule and deliverables, whereas in this case none of these elements exist as such. The budget for development actions is not predefined since both parties invest in the implementation of agreed improvement actions. The return of investment will come from improvement of the KPIs that determine the resulting benefit to be shared. This shared benefit is the only revenue for the Technology Provider. The schedule in a traditional form does not exist, as all improvement actions are driven using a sprint model, with two-week sprints. The number of sprints needed to finalize the development actions is not known, therefore a detailed schedule cannot be defined. The deliverables, or scope of development actions and other tasks are defined together in co-creation workshops. In these workshops, the development areas are identified, and all ideas evaluated based on the estimated effect on the benefit sharing KPIs. Only the actions foreseen to generate value to the factory are financed and implemented together. The principle for driving the development actions is based on the continuous improvement cycle. Actions that do not bring the desired outcome must be stopped and the development resources

used for something productive bringing benefits to be shared. The continuous improvement principle followed is presented in Figure 12. Continuous improvement principle of Phase 2.

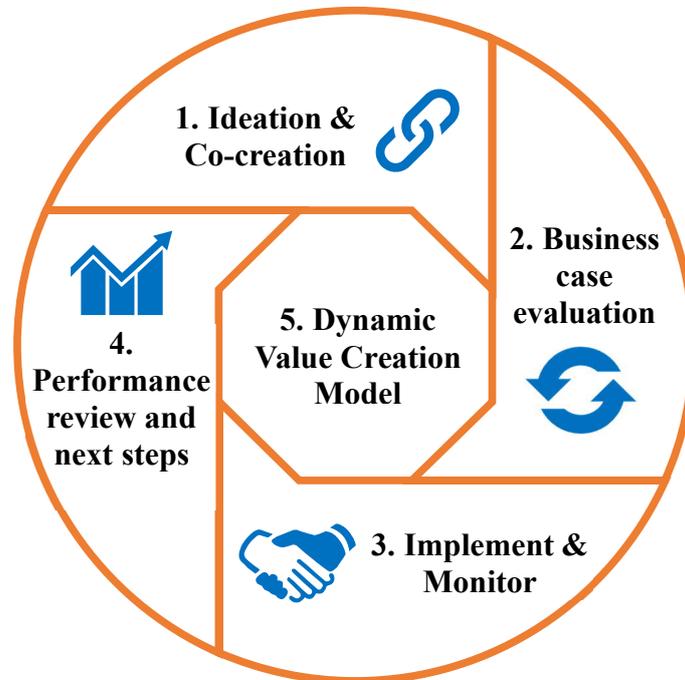


Figure 12. Continuous improvement principle of Phase 2

3.2 The project management method of the case project

In the very beginning of the Phase 2 project, the project management method chosen was still the traditional waterfall method, with its rigid scheduling, milestones and quality gate principles. The schedule was formulated in MS Project and presented to the Manufacturing Partner to get an approval for the idea of how the Technology Provider thought the project should be executed. The principle of an early stage scheduling is visualized in Figure 13. Early waterfall scheduling. The project kick-off meeting was held and both parties were content on the outlook of the coming five-year contract period. However, after a few months of running the project using the waterfall method, questions began to rise from the management stakeholders on both sides, asking what the gained benefit was and how the development efforts were proceeding. The difficulties of defining the actions transparently and being able to prove that the efforts of the team were spent on the most effective changes and development actions

began to take its toll. The project was brought to a brief standstill as the Technology Provider saw the need to change the approach. The chosen waterfall method simply did not seem to fit this type of project and business setting.

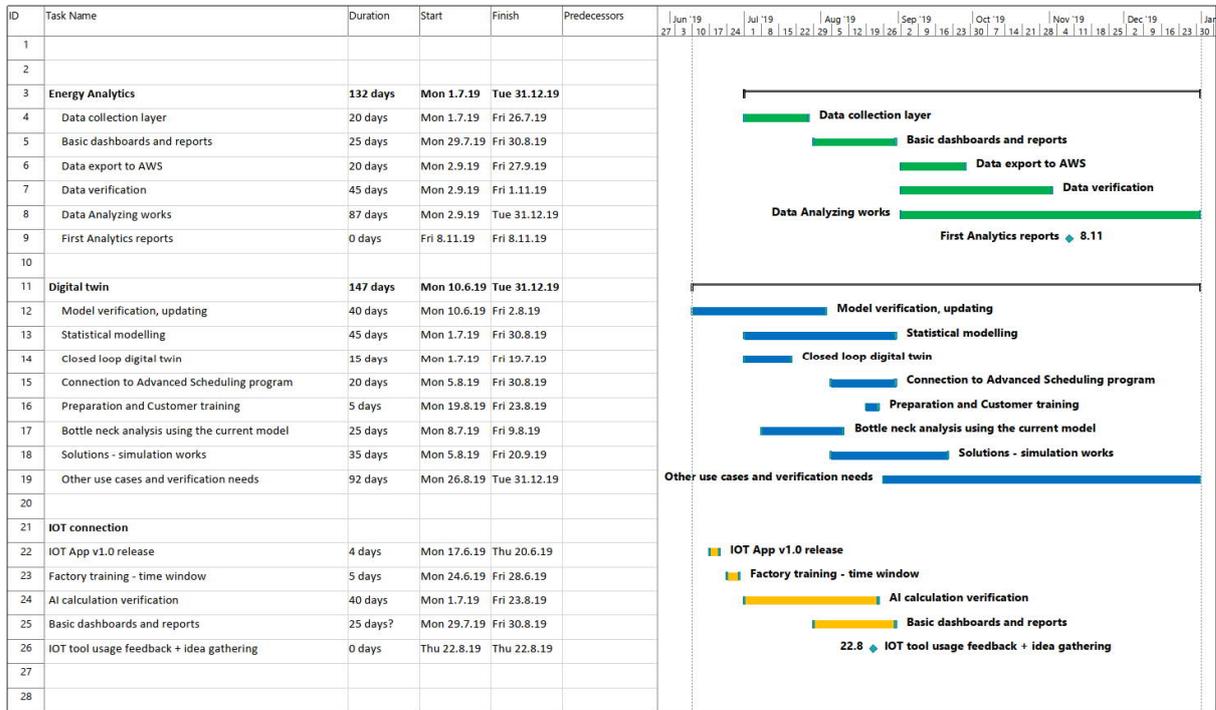


Figure 13. Early waterfall scheduling

The Technology Provider decided to bring in a Third-Party Consultancy company to aid with change management efforts as well as define a systematic and visualized way of defining and tracking the value creation through the development efforts.

In addition to initiating a restructuring of the project the first co-creation workshop was arranged by the Technology Provider. The co-creation workshop was arranged as a whole day event, with the factory manager and middle management present from the Manufacturing Partner’s side and the relevant experts and BU management from the Technology Provider’s side. The Third-Party Consultants participated to gain a better understanding of the task ahead. In the co-creation workshop, various co-creation methods were used to root out the most effective development actions needed at the factory. The development actions were voted by the factory personnel to ensure the buy in for the implementation of the tasks from the

Manufacturing Partner. It was commonly decided that the development actions would be performed using an agile project management method that would utilize sprint type development and kanban charts for following the tasks. The kanban principle taken into use is visualized in Figure 14. Template kanban board for sprints. The forming of three sprint teams and an early backlog for each sprint team took place at the co-creation workshop. The previous project management method was disregarded and the new agile one taken into use.

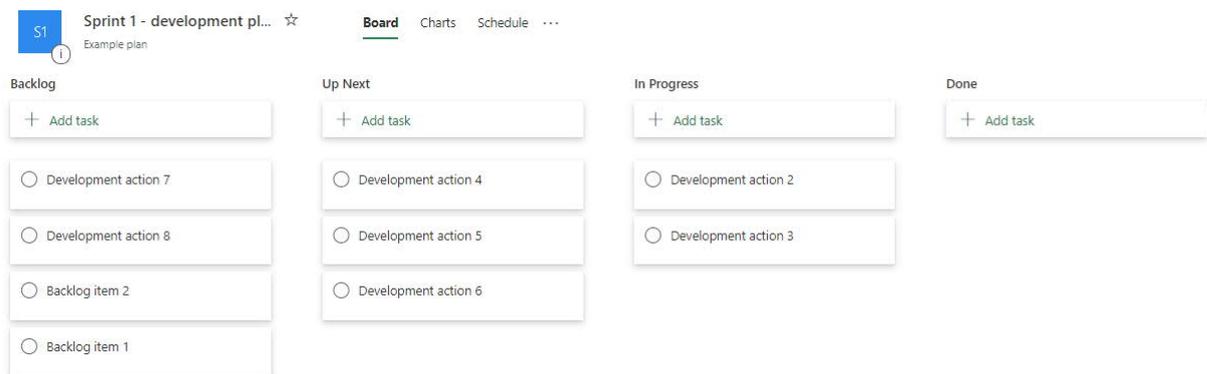


Figure 14. Template kanban board for sprints

It was decided that the scrum terminology would be used in the project and the scrum principles followed where it seemed to make sense. A two-week sprint cycle was jointly agreed on, and the three sprint teams formed would begin their work by defining detailed tasks to tackle the challenges identified in the co-creation workshop. The sprint teams were also asked to list ideas for metrics, to be used to measure the effect of the development actions on their area. As neither party was schooled in the ways of agile development, the consensus was that the methodology would not be the defining factor and it could be altered to suit the needs of the partnership and the outcome-based project.

3.3 Metrics of the case project

The outcome-based case project was contractually bound to only one KPI, The Cost of Production (COP), which is a high-level indicator of the performance of the factory. The COP is defined in €/kg produced and the value is calculated as an average value for all the different products produced at the factory. The COP of the factory is affected by many variables that are

outside the Technology Provider’s influence, such as the raw material price fluctuations. These factors were contractually frozen or excluded, creating a difference between the actual COP and the performance COP used as the basis for benefit sharing.

The development actions started by the Manufacturing Partner and the Technology Provider were done on the level of controlling technology along with a comprehensive training program to accelerate the knowledge transfer to all levels at the factory. It was decided that the actions performed would need to be measured in order to understand the effect the development actions had on the performance COP. To be able to find the cause and effect chains from the lower level actions to the high level contractual KPI, a systems model of the factory events was created together with the Third-Party Consultants. The Dynamic Value Creation Model included all the relevant cause and effect paths that were commonly identified. The outcome was then consolidated into one view shown in Figure 15. Dynamic Value Creation Model. Using Dynamic Value Creation model, three paths to influence the performance COP were defined and sub-metrics attached to the relevant nodes on the path. This created a visualized view of the leading indicators allowing to evaluate and anticipate the overall effect on the contractual KPI.

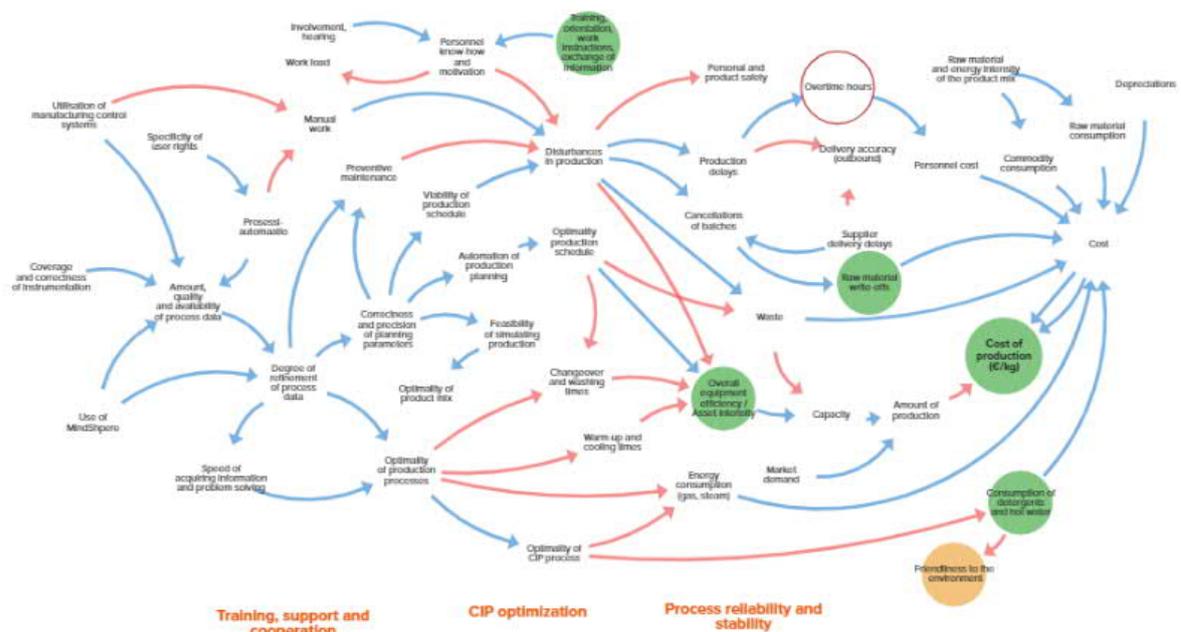


Figure 15. Dynamic Value Creation Model

Data used for calculating the contractual KPI was gathered from the factory bookkeeping in an open books fashion. The Technology Provider's costs for performing the development tasks were also presented in a transparent way to form the overall financial view of the project. Based on this information the benefit created could be calculated as the delta of the performance COP.

Sub-metrics were defined to indicate the effect of development actions on the factory floor level operations. The data for the sub-metrics was gathered automatically when possible but manual input of values was also possible. The automation system, along with its IOT based components and dashboarding, was used for consolidating the data for the sub-metrics. The production event data was available from the automation system while other type of relevant information, like the reasons for unplanned stoppages, needed to be entered manually.

3.4 Research method used in this thesis

To find answers to the research questions, a case study method along with semi-structured interviews was chosen. Case study is one form of qualitative research approaches. The case study method, when applied correctly ensures many viewpoints into the phenomenon researched. (Baxter & Jack, 2008)

Baxter in her article presents also a studied viewpoint of basing the case study on a constructivist paradigm. The constructivist's view the truth to be relative and dependent on the perspective of an individual. According to Baxter's article, the case study should be considered as a research method especially when the aim is to discover answers to questions "How" and "Why". A case study might also be considered as a research method when the contextual conditions are assumed to be relevant to the case being studied, and when the boundaries between the case phenomena itself and the context are not clear. (Baxter & Jack, 2008)

When planning and starting the research the question of research boundaries is highly relevant. The research is in danger of failing if the research questions are poorly or loosely defined, or there are too many objectives for the study. To better define the scope, one should limit the boundaries by for example: time and place, time and activity, or definition and context. (Baxter & Jack, 2008)

In this thesis the aim is to study and explore the case project and the real-life context surrounding, with boundaries set on time and activity. Multiple data sources are being used in this thesis case study: documentation, interviews, questionnaire and direct observations by the Author.

There are many interview techniques, ranging from unstructured to fully structured interviews. The unstructured interview suits a case where the interviewer has limited knowledge about the subject of the interview. In the unstructured interview the questions are open and even the theme might fluctuate within the interview, depending to where the conversation leads. The unstructured interview gains insight into the topic but is not the best method for gaining a consistent base of knowledge or for testing hypothesis. The structured interview method is suitable when the outcome is assumed to be known, and the interview rather serves the purpose of categorizing people and their responses into already known categories. The problematic aspect of structured interviews with closed questions is that the interviewer might ask the 'wrong' questions and the result will therefore lack valid content. The middle ground is a semi-structured interview where the theme is not changing and the questions presented are thought beforehand, but with a possibility to ask follow-up questions and try to gain further insight into the matter from different angles, depending on the situation. The semi-structured interview allows testing of hypothesis and qualitative analysis to be conducted based on the results from the interviews. "Semi-structured interviews allow respondents the chance to be the experts and to inform the research." (Leech, 2002). The semi-structured interview method was chosen for this thesis because the Author already had knowledge of the case when beginning the research.

3.5 Conducted interviews and data gathering

The interviewees were chosen among the persons working in the partner companies and from the third part consultancy company. The interviewees were chosen based on their participation in the project, and the aim was to cover a wide range of views to the case in order to gain a better understanding of the factors that contribute to a successful implementation of an outcome-based project. In addition to the interviews two rounds of online questionnaires were sent out. The first questionnaire recipients included personnel from the Manufacturing Partner,

Technology Provider and the Third-party Consulting Company. The second questionnaire was sent out only to the personnel of the Manufacturing Partner in order to better quantify the views regarding the case project from the end user perspective.

3.5.1 The chosen interviewees for the semi structured interviews

The following persons were interviewed from the Technology Provider's organization:

- Head of Technology for Digital Industries division

The Case project's digital architecture and the implementation of the closed loop manufacturing concept is mostly designed by the Head of Technology. Part of the solution was provided from the global technology divisions, but still weaved together locally to form the system delivered. The Head of Technology has participated in both project phases, the traditional waterfall modernization project and the outcome-based project, thus having a comprehensive view of the case.

- System Specialist, Digital Industries division

The role of the System Specialist has been to define the data collection methods and the technological solution for cross referencing the data and visualizing it in an IoT environment. The system specialist has also worked with the implementation of the digital closed loop manufacturing concept, where data gathered from the process is fed back into the planning and simulation tools. The implementation of the closed loop data flow will make it possible to train the digital twin constructed using data from the live process. The outcome business model relies heavily on the transparency created by the data.

- Customer services Business unit Director, Digital Industries division

The interviewed customer services business unit director is the owner of the project on the Technology Provider's side. The business unit director was highly involved in the outcome-based project's contract negotiations. As the project owner he has a strong vision for the outcome of this project and a desire to scale

the learnings to better the odds for successful execution of outcome-based projects in the future.

- Factory automation business unit director, Digital Industries division

The Factory Automation business unit director has participated in the traditional modernization project, where the installed equipment is a part of the factory automation product portfolio. In the outcome-based business model project, the factory automation business unit director is one of the two named persons from the Technology Provider's side in the common project steering committee.

The following persons were interviewed from the Manufacturing Partner's organization:

- Factory Manager

The factory manager took over the position at the same time as the negotiations for the outcome-based contract began. The factory manager possessed an 'open mind' as he was not involved in the previous steps taken at the factory during the traditional modernization project, Phase 1. As the factory manager he is the project owner on the Manufacturing Partner's side and possesses the power to make decisions according to the signature guidelines of the manufacturing company. The suggestions given by him, however, carry a lot of weight and are likely to pass the chain of decisions ending up in the implementation list.

- Production Manager

The Production Manager started in his position at the same time with the factory manager. The Production Manager, however, held another position within the factory at the time of the modernization project Phase 1 and therefore possessed knowledge of the traditions and culture at the factory.

- Production Shift Leader

The Production shift leader is a long-time employee at the factory. As the production shift leader, she had a strong knowhow of the production, the people at the factory and the culture within the work environment. The basic idea of the

outcome-based business is to share the benefits derived out of the new way of working, and the new way of working is likely to cause change resistance as the culture will change. The shift leader possessed change management power towards the people at the factory floor and played a critical role in generating a positive atmosphere towards the imminent changes.

- Quality Manager

The Quality manager is a long-term Food and Beverage (F&B) industry worker with experience in working at other F&B production sites for the manufacturing partner. She has worked for five years as the quality manager at the factory of the studied case. Part of the metrics, data collecting, and visualization capabilities installed in the project serve directly the product safety and -quality processes of the factory.

- Maintenance Manager

The Maintenance Manager has been working at the factory right from the beginning, that is for over twenty years. He knows the history, processes and the people like the back of his hand. The Maintenance Manager is also an important link between the middle management and the factory floor level.

The Third-party Consultancy company was contracted to work on specific parts of the project. Their work assignment was to gather the cause-and-effect viewpoints from both the partners and visualize the Value Creation Paths that influence the metrics. They also contributed to the change management efforts by planning and organizing workshops at the factory. The following persons were interviewed from the Third-Party Consulting company:

- Senior Consultant 1 – Metrics

The Senior Consultant 1 was tasked especially with the structuring of the Value Creation Model and implementing the visualization of the KPIs and the agreed metrics.

- Senior Consultant 2 – Change management

The Senior Consultant 2 was tasked with ensuring that adequate change management procedures are introduced at the factory. She held workshops with the factory personnel on the middle management level as well as on the factory floor level. In addition to the change management efforts she also helped the project managers to get started on the agile project management path by sparring and participating in the sprint review meetings in the beginning.

Table 1. Summary of interviewed persons

Manufacturing industry partner	
Factory manager	Project owner
Production manager	
Production shift leader	
Quality manager	
Maintenance manager	
Technology partner	
Customer services BU director	Project owner
Factory automation BU director	
Head of technology	
System Specialist	
3rd party consultant	
Senior consultant 1	
Senior consultant 2	
TOTAL	11 persons

3.5.2 The semi-structured interviews

The question structure of the interview was the same for all the chosen interviewees. The interview questions were designed to enquire views to four different aspects of the case:

Q1 The outcome-based / benefit sharing model project vs a traditional project

Q2 Metrics and performance measuring of an outcome-based project

Q3 Change management aspects

Q4 Data gathering and knowledge-based management

The Interview structure is enclosed in detail in Appendix 1 of this thesis.

3.5.3 The questionnaires issued

In addition to the conducted interviews, two Microsoft Forms based questionnaires were delivered to the project team. The first questionnaire issued with a deadline of 20.12.2019, dealt with questions of how the project team members from both organizations viewed the sprint type development. The second questionnaire issued with a deadline of 23.4.2020, dealt with general views of the outcome-based project, the agile project management and the success of the change management actions performed. The second questionnaire was designed to tie together and solidify the views from earlier case information gathered into a condensed outcome.

The Questionnaires are enclosed in detail in appendices 2 and 3 of this thesis.

4 FINDINGS

In this chapter, the findings from the semi-structured interviews and the questionnaires are presented. The interview structure is gone through and the answers and perceptions from the interviews is summarized for each set of questions. The questionnaire results are presented in a chart format along with the possible textual answers provided. The summary of key findings from the questionnaires are also presented.

4.1 Results from Questionnaire 1 – Developing the Sprint cooperation

The questionnaire 1 was issued at the end of 2019 to the three participant groups - the Manufacturing Partner, the Technology Provider and the Third-party consultants. The questionnaire enquired feedback for the agile project management method implemented. Neither side had previous experience in running an agile sprint-based project. To the Author, the agile methodologies and their concepts were equally a new area of project- and performance management. The Questionnaire was sent to 14 recipients and was answered by eight people. The questionnaire was answered anonymously to make it easier to express opinions and constructive criticism.

The results of question 1 – Your opinion of the sprint-development, are presented in Figure 16.
Q1 Sprint development opinions – Questionnaire 1.

	Strongly Agree	Agree	Disagree	Strongly Disagree	No opinion
We reach the desired goals efficiently using an agile project management method.	12,5%	75,0%			12,5%
The responsibilities within the sprint teams are clearly defined.		87,5%	12,5%		
I understand the structure of the agile project management method applied.	37,5%	50,0%	12,5%		
I would choose an agile project management method for future projects as well.	25,0%	62,5%			12,5%

Figure 16. Q1 Sprint development opinions – Questionnaire 1

The results of question 2 – In your opinion, what are the positive aspects of the introduced sprint development and why? are presented in Table 2. Responses for Q2 - Questionnaire 1.

Table 2. Responses for Q2 - Questionnaire 1

ID	Responses
1	The recurring sprint review meetings keep the development focused on creating value.
2	The sprint review meetings are held often enough. in the sprint review meetings, the whole team gets a good overview of what is happening in the other sprints as well.
3	-
4	Actions are focused.
5	The different development needs are brought to attention. The actions are followed systematically and in a repeating fashion.
6	Common goals.
7	The clearly defined sprint teams, their responsibilities and following of actions. A fast way to develop and make progress.

8	Clearly defined sprint interval during which the selected development actions need to be finalized. This way of working makes the development more controlled.
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The results of question 3 – In My opinion the sprint actions could be developed in the following ways, are presented in Table 3. Responses for Q3 - Questionnaire 1.

Table 3. Responses for Q3 - Questionnaire 1

ID	Responses
1	The way of working must evolve based on the experiences we gather. That is, we must continuously evaluate what works in this setting and what does not.
2	We shouldn't go through all the sprints in such a detail level.
3	-
4	We should have more meetings within the sprint team during the sprints. For example, the team I'm in has not had any meetings apart from the Sprint Review meetings. Of course, we must keep in mind that the daily business (of running the factory) keeps us quite busy as well.
5	The last Sprint Review meeting was quite un-focused – what was the aim, and what was it we were trying to get done? Where are we going to find the time to perform all these development actions?
6	The communication and scheduling should be improved, at least within the Sprint Team that I am a part of.

The results of question 4 – I need more information and answers to the following questions, are presented in Table 4. Responses for Q4 - Questionnaire 1.

Table 4. Responses for Q4 - Questionnaire 1

ID	Responses
1	Are all the tasks to perform during the two-week sprint agreed in the Sprint Review meetings, or can the team add more tasks during the sprint?
2	-

3	How do we enforce the decisions made? How have we agreed that the development costs are split between the parties?
4	I would like to know how the other members are proceeding in their actions, do they need support / information that I could provide to help them somehow?

The results of question 5 – Other feedback, are presented in Table 5. Responses for Q5 - Questionnaire 1.

Table 5. Responses for Q5 - Questionnaire 1

ID	Responses
1	Full throttle, onwards!
2	-
3	Now it seems that the train is moving too fast, even. Do we really have enough time to perform all the tasks affecting the over all situation?

Summary of questionnaire 1

The results from the questionnaire 1 seemed to come from a team that is motivated and curious to work with the agile method introduced. The recurring sprint review meetings were brought up as value adding elements and developing the production of the factory was mentioned as a common goal and actions to achieve this were focused. The agile method, which at this point was more scrum than scrumban, was well understood even though there was one respondent who had no opinion on the matter. The excitement of the team led to a set of fast-moving development actions. One respondent expressed the view of tightening the focus still and limiting the number of simultaneous tasks performed, i.e. limiting the WIP.

4.2 Results from the semi-structured interviews

The results from questionnaire 1 and the practical experiences in the project after issuing of said questionnaire, were considered in designing the questions of the semi-structured interview. The frame for the interviews is presented in appendix 1 of this thesis.

Q1 The outcome-based / benefit sharing model project vs a traditional project

The first set of questions dealt with the viewpoint of outcome-based agile project vs a traditional project. The set of questions was answered by nine participants. Three persons regarded themselves not in the position to reflect on the matter.

The positive aspects of the outcome-based model were seen to be especially the increased level of communication, transparency and the improved reaction speed to changes. The business model forces the participants to be transparent on the financial side because the benefit is shared based on a high level KPI, which in this case like explained in Chapter 3.3 is the Cost of Production €/kg (CoP). The culture change brought along by the project led to the understanding on both sides that only through open communication and working closely together can the partnership thrive, and a cohesive team be formed.

The project being a pilot for both companies brought with it a lot of things that could be used to learn and amass experiences. The commonly developed practices for following the contract principles, and the willingness to develop the co-operation were a positive learning experience on both sides.

“This is an extraordinarily visionary project! One which allows us to jump 10 years into the future and learn what could be possible in coming years in the service delivery business in the B2B setting.” - Service Delivery BU Director, 27.3.2020.

The improvement needs on the other hand seemed to rise from the substance. Although the reaction speed and transparency were in place, the content of work done and the linkage of the work to the benefit sharing principle were at times seen weak. The controlling of actions within the sprint teams along with suppressing the additional ad hoc side-tracks was a challenge. The information sharing to employees that were not a part of any sprint team was viewed lacking.

From the contractual setup point of view the model was seen to be too rigid. The project management and development action were driven in agile sprints but the contract and its benefit

sharing mechanism was set in stone and changeable only via a Steering Committee decision. The Manufacturing Partner's factory manager:

“The changing environment should also be reflected dynamically in the contractual atmosphere.” – Factory Manager 10.3.2020

The created value and the linkage of development actions to created benefit should have been more transparently drawn out and documented. Even if the trust and openness existed the Technology Partner needed to justify the right to the benefit to be shared. During the contract negotiations the partnership was in its early stages and the transparency and common exercises of simulating the future outcome using different scenarios was missing. This was viewed as one lesson learned topic. The contract ownership was thought to be too vague. A lighthouse project between two massive corporations gathers a lot of interested parties, and therefore the protection of the contractual ownership was seen important and should have been conducted better.

“It is fairly difficult in finding the common ground between two huge global corporations and developing the communication culture when negotiating a new, experimental, business model.” - Factory Automation BU Director, 6.4.2020.

The views on the corrective actions performed to remedy the challenges encountered with the contract were diverse, which was also expected as the interviewees operated on different levels and roles within the cooperation. The management saw the corrective actions performed largely as efforts to ensure the higher management buy-in for the project and fitting the stakeholder interests together. As corrective actions the management also mentioned the relieving of pressure from the execution level by reassuring that a pilot project has its peculiarities and there are only lessons to be learned, that are not to be perceived as failures. Management saw the procedure of “writing the bigger story” for the steering committee as a beneficial way of unifying the views within the country level of operations. On the project execution level, the corrective actions were seen to be the agile sprint type project management that was introduced and the method of creating the back log for the sprints with a co-creational workshop concept developed by the Technology Partner. On all levels the ever-increasing transparency and

information exchange, with online environments like the Microsoft Teams was also viewed as a corrective action. The established chain of escalation to be used if necessary, brought along a sense of seriousness and professionalism in a positive sense.

“The discussions within the sprint teams and escalation to upper level have helped in unblocking progress at times. I find this to be a welcome possibility to get things up to speed.” - The Factory Production Manager, 25.3.2020.

When viewing the possible needs for further improvements on the challenging aspects, the views were relatively similar on all levels. Sharing of more information of not only the progress, but also of the aim and target of the cooperation was regarded as the most important action still to implement. Sharing the status to a larger audience within the Manufacturing Partner’s employees was a view expressed by a few interviewed people.

“The aim is to share created benefits. The development actions implemented need to be viewed from the KPI point of view rather than the technology point of view and this should be done in a systematical way.” - Service Delivery BU director, 27.3.2020.

Q2 Metrics and performance measuring of an outcome-based project

The next questions in the interview aimed at finding out how an outcome-based project should be measured and what, if anything, the people viewed to be different in an outcome-based project setting when comparing it to a traditional project. The question set number 2 was answered by seven people. The metrics and performance measuring actions as topics were not so familiar to this group of interviewees.

The case study is of a project that is, for both partners, novel in its business logic and execution method. Therefore, the first question of the set was aimed at discovering how the metrics of a traditional project is viewed amongst the interviewees. The answers revealed that traditional project metrics were seen to be focused on the project triangle’s two cornerstones: schedule and budget. Further consideration was given also to the quality and safety aspects, that certainly

play a role in all activities in modern industrial environment. The Third-party Senior Consultant 1, however, viewed the question from a different point of view and concluded:

“There really is no ‘normal’ way of defining project metrics, even in a traditional setting. By definition, a project is a one-time effort, thus unique. This is also true for the project metrics – there is no typical way to define metrics for a project.” - Third-party Senior Consultant 1, 23.3.2020.

The second question, in this set of questions, opened a variety of views on the topic of metrics, when thinking solely of the case project. The benefit shared is based on one single contractual high level KPI. For the Factory Manager this posed a point to ponder, since there were literally countless ways to influence the KPI. The difficulty therefore lied with how to attribute the changes in the KPI to the various development actions that were ongoing. The people participating in the sprints themselves pointed out that, the development sprint teams had sub-metrics defined for the tasks they were performing. However, according to the Factory Manager, there was a gap between the sub-metrics and the main KPI followed. Also, the knowledge-based management was seen to be in its early stages.

“I think that the data gathering for the metrics is in good shape. However, to define the next steps based on the sub-metrics and systematically follow the metrics changes is still lacking.” - Factory Manager, 10.3.2002.

This view was echoed by the Third-party Consultant who viewed the project organization not to have been in the state where conclusions derived from the data would have automatically trigger a proper response or led to new or revised development action plans. From the Technology Partner’s view, the contractual KPI was viewed as a real ‘game changer’ since it put the added customer value right at the center of focus.

“The project is an outcome-based benefit sharing experiment; therefore, the one metric is solely based on the value produced!” - Factory Automation BU director, 6.4.2020.

The Phase 1 project had given a deeper insight into the factory's culture, way of working and the special circumstances of this single factory.

“A truly in-depth understanding of a client's setup and business logic might not be common under normal circumstances, therefore the starting position (for Phase 2) was already fruitful” - viewpoint expressed by the Maintenance Planner 1.4.2020.

The challenges regarding metrics of the outcome-based project were seen to be related to the lack of transparent causality from the actions to the metrics values. In part the difficulty was seen to lie in the way different people interpreted the aim, and therefore the metrics. The high level KPI [€/kg] could be affected in two ways that were almost opposite in direction: by inducing savings or by adding capacity. To achieve significant savings through technological changes in a manufacturing environment was quite difficult and therefore not the preferred method from the Technology Provider's point of view. On the other hand, the adding of capacity would not bring benefits if the market conditions were not favoring the product being produced.

“The metrics have to be determined only after really understanding, on both sides, what we can truly influence with the development actions and technology. The metrics have to be defined so that they are better tied to the development actions.”
- Factory Manager 10.3.2020.

In the interview the Third-party Consultant 1, however, brought up the fact that defining the metrics in an outcome-based case should be straight forward because the desired outcome is known, i.e. the target of the project.

“In an outcome-based project the goal is already set. The benefit sharing principle and mathematics behind it are known, so attaching relevant metrics to that goal should be easier a task than it is in many other cases.” Third-party senior consultant 1 23.3.2020.

A challenge identified by the Production Manager at the factory was the inability to observe the metrics development from an automatically generated report.

“I would like to see the metrics from a tool or get an automatically generated report, where the development of the KPI is visualized.” - Production Manager 25.3.2020.

Regarding actions that should be taken to improve the identified challenges the interviewees had ideas ranging from day to day operations to more philosophical ponderings. The changing business environment and market conditions were identified as change inducing mechanisms that should affect the contractual aspects as well.

“When the business model is purely outcome-based driven, it is very challenging to balance the contract in a way that both sides win equally. The understanding of the customer’s business would need to be very detailed. This is truly a challenge. The idea is for both sides to benefit from the contract, and to make a contract based on one KPI alone... it is a risk. If something is misunderstood, the balance is offset which will lead to dissatisfaction and cause friction. I think a hybrid model with a fixed compensation for the Technology Provider and an agreed benefit sharing dimension to boost the interest, would be a more balanced model when now viewing the current situation.” - Customer Service BU director 27.3.2020.

From the day to day operations point of view, the basic principles of metrics defining would need to be clarified.

“All the sub-metrics we have would have to be owned by someone. Currently it is unclear who should update some of the metrics and how often. The motivation to update and follow our progress would be increased if the aim and the necessity to have transparency is better explained to the factory personnel on all levels. We need to have more communication of the business model and its targets.” - Production Manager, 25.3.2020.

To better clarify the causalities, a system modeling of the production events was created by the Third-party Consultant company. The model linked production events and the positive or negative influence of them to paths leading to the main KPI being followed.

“I think we should utilize the Dynamic Value Creation model more in the planning of the actions. It would also clarify the aim of the project – a vision which has changed a bit due to business environment changes during this project.”

- Factory Automation BU Director 6.4.2020.

Q3 Change management aspects

The third set of questions targeted the views on change management or the need thereof, when engaging in this new business model. Eight participants out of the 11 that were interviewed answered this third set of questions. Change management’s first step is relaying information, formulated the receiving audience in mind, of the purpose and aim of the change. The flow of information should be continuous and wide ranging in the beginning and more focused once the possible change resistance starts to decrease. The first question was unanimously answered in favor of change management actions needed.

“The aim of the project might seem to be too high up for the workers at the factory floor. Unless enough information is given, the feeling that a common worker cannot influence the process might prevail.” - Third-party Senior Consultant 1 23.3.2020.

A viewpoint also expressed in the interviews was that not only the business model was new but the new digital tools to use for harvesting the benefits were new. A comprehensive training program was needed to familiarize the people with the digitalized way of working. Overall the amount of change resistance at the factory level was viewed to be quite low even if everyone agreed that the business model was new for all and the change therefore imminent.

“We have the possibility to change the culture. We should aim to see the forest from the trees and improve the way we do things – we’ve been doing this

(production) for 20 years but still, we can change the culture and do thing even better.” - The Production Shift Leader 25.3.2020.

The need for change management in an outcome-based project was confirmed by the interviewees and the follow up question aimed to discover what actions were performed in the area of change management. The already established buy-in from the higher management and headquarter (HQ) support from both sides alleviated some of the pressure from the project itself but the day to day operations would, nevertheless, be amid a series of changes. The sharing of information of development or change actions to the factory floor was started with so called “Info screens”. These info screens were PowerPoint slides that were displayed in the factory’s coffee room info display as a part of a revolving set of other slides informing the production workers of the general activities and statistics of the factory. Through the info screens the Technology Provider tried to inform the workers of the timeline and type of actions planned, and furthermore how the actions were thought to affect and benefit the factory. As a change management procedure this was viewed necessary but not far-reaching.

“The info screen type of information sharing is the first step of change management, but it does not necessarily cause the people receiving the information to commit to the change.” - Third-party Senior Consultant 2, 20.3.2020.

The exchange of correct, valid and timely information in any project setting is important. In an outcome-based environment it could be argued to be crucial. As a change management procedure, the Technology Provider asked the Third-party Consulting Company to arrange a set of workshops to the factory personnel, with focus on the information exchange aspect. In the workshops, the factory floor level and middle management were coached and made to realize how easily a message can be misinterpreted and how quickly the information flow is disrupted. The interviewees from the factory side all stated that the workshops came to bear fruit.

“The information exchange within the factory, with our stakeholders and partner got a boost out of the workshop. We have also realized that our internal resource

issues play a big role in ensuring the continuous flow of information.” – Factory Maintenance Manager, 1.4.2020.

As a part of ensuring that the development actions affected the productivity a co-creation workshop was arranged together with the Manufacturing partner’s and Technology provider’s middle management and technical experts. The third-party consultants participated in the workshop from a spectator role. In the one-day workshop several co-creation methods were used to expose the ‘low-hanging fruits’ that should be tackled first as they were seen to bring about the fastest change and the most positive outcome for the effort invested. The co-creation workshop was thought as an effective method for nurturing the understanding of the business model and involving both teams in planning the development actions. The actions to be included in the agile sprint development cycle were voted by the factory personnel only as they had the best overall picture of the situation even if the transparency towards the Technology Provider was excellent.

“The Co-creation workshop made us realize the possibilities we have within reach and we uncovered new ideas as well. I believe we really understood that the 20-year-old way of running things would need changes.” – Factory Production Manager 25.3.2020.

As a final question in the question set three, the interviewees were asked what they thought that should still be done to make the cooperation even more fruitful. The answers revealed a plethora of action items that could still be done. At the time of the interviews, March and April 2020, the contract had been in place for over a year and the interviewed people had had time to note things and think how some of the difficulties might have been avoided with sharper action and communication. The management level saw that the contract principles and the clarifying of the aim on a holistic level was still an issue that needed effort.

“Our efforts should be focused on the implementation of the benefit sharing model ideology. The way a traditional project brings benefits is different from the benefit sharing model, and this should be clarified to everyone so the actions could be

focused in the right way. We have the Dynamic Value Creation model available, that could be a tool in conveying the message.” – Factory Manager 10.3.2020.

All the participants still thought that actions to improve information flow should be continued. However, within both organization the information exchange was noted to have been improved and the dialogue between management and middle management at the factory had become daily practice, still needing more structure and clarity. In the corporate environment there were many interested parties due to the new business model being experimented on - if the business model proved to be a success, it could be scaled on a global level. The interest towards the project was felt on both sides and it should also be managed.

“The stakeholder network has evolved during the contract. New stakeholders have been introduced and some have pulled away. I think we should analyze the stakeholder network of today and plan together how to keep everyone informed. We should also ensure the buy in from the new stakeholders as well.” – Factory Automation BU Director 6.4.2020.

In the interviews with both the Senior Consultants the issue of change management was covered quite widely as initiating the change management was one of their tasks. When change is not managed it leads to frustration, and in the end, to change resistance. The consultants had observed that the groups targeted with timely information were the middle management and upper management. The factory floor workers should have been included in the process earlier than was done in this case. The steps of change management were not considered in the beginning and a part of the actions performed seemed to be in vain due to the lacking foundation on this aspect. The handing of coded information, such as manuals and work instructions, is not as fruitful if the recipients are not made aware of the need and the overlaying purpose of the transformation. The notion was echoed in the interview with the Production Shift Leader:

“The operator level at the factory should have been more involved. I feel that the reasons behind all the fuzz have not been opened to the production people.” – Production Shift Leader, 25.3.2020.

The strategy for implement efficient communication was not formulated in the beginning. The Senior Consultants, basing their views on multiple change management assignments, suggested to focus on involving more people from all groups on both sides to overcome the obstacles that were now being tackled. Following of the “frustration index” could serve as a ‘metric’ to track the effectiveness of the change management actions. As the project was affecting a large group of employees it was not feasible to talk to everyone individually, and this would have to be considered when planning the strategy of engaging people.

“If the information could be handed to one person at a time, it is likely that everyone would understand. This, however, is not a realistic possibility in the real world. The spreading of information in an understandable and easily digestible form to a heterogenous group is actually quite difficult.” – Third-party Senior Consultant 1, 23.3.2020.

Q4 Data gathering and knowledge-based management

The fourth and last set of questions aimed to discover how the interviewees saw data gathering and knowledge-based management performed in the case project. The interviewees were also asked what to improve to make the case project even more data driven. Nine participants out of the 12 interviewed answered this fourth set of questions.

The participants saw that gathering data was a positive aspect, as more data gave a better insight into the production events, and the consequences of development actions could be analyzed using the data. Not only did the data bring transparency and possibilities for cross referencing and finding correlations between events but it was also a powerful tool for changing the culture.

“As the data has been gathered and visualized, a lot of questions and ideas have started to pop up – why are we doing it like this, when the data shows this and that, or how could we improve this that or the other? The data is a good tool also when used in communicating the development needs – it is data, it is not an opinion of a person.” – The Production Shift Leader, 25.3.2020.

The upper management view was more concentrated on the financial aspects of the project. If the financial data was being easily gathered, the outcome-based project's benefit to be shared could easily be determined using the contractually agreed mathematical formulas. The Technology Partner's technical experts saw the data gathering in the case project also as positive highlight. According to them, the data gathering was well structured and repeatable making the decisions based on the data reliable. In their view the start for the gathering of data and the decision to store the data in an IoT environment was proven to be the right choice, since much of the gathered data was unprocessed, raw data. The gathering of raw data enables the post processing, cross referencing and recombining the data in a flexible way, which would not be possible with preprocessed or pre-analyzed data. In the ever-changing environment, the ability to visualize the findings in customizable dashboards, was in their view adding value to the project as the information needs of the production personnel are not the same as those of e.g. a factory manager.

“The decision to gather data into an environment, where datamining is flexible, and the usage of the data on a high level, proved to be the correct choice – even if we did not have all the specifications in the beginning.” – System Specialist, Digital Industries division 12.3.2020

“The measuring of production events and data gathering in a larger scope, really enable the knowledge-based management and data driven decisions.” – Quality Manager of the factory, 31.3.2020.

The next question enquired the interviewees opinion of areas that could have been done differently in the case project regarding gathering the data. Many expressed the same view that the beginning of data gathering should have been better planned and planned together. The data sources were picked by the Technology Provider, and no specification nor a clear vision for the usage of all the data existed at the start of the project.

“The chosen data sources were our best guesses of the data that is relevant for improving the production. Many guesses were correct, but at the same time some data sources were missed in the beginning. We didn't have a list of prioritized

targets and the client's input to this phase would have been valuable. We, as the Technology Provider, can estimate what is possible and how to realize those possibilities, but the client should define the actual use case we should solve. The defining of use cases and exchange of ideas should have been done together.” – Head of Technology for Digital Industries division, 12.3.2020.

Some of the data sources were measured for a longer period but not all, which especially the management saw as hindering the project. The value of some improvement actions was seen difficult to estimate, since parts of the data was not available from the time prior to the contract start. The collaboration regarding data analyzing, drawing conclusions or suggesting development actions, was a point the Manufacturing Partner felt that could have been done better.

“We expected more ready made and knowledge-based development action ideas from the Technology Partner. However, the collaboration on this regard was not active straight from the beginning and needed to be kicked-off together.” – Factory Manager, 10.3.2020.

Based on the areas for improvement they had identified, the interviewees were asked what further development actions, in their opinion, should be implemented. The linking of data collection to metrics systems was brought up by the factory management as well as the Third-party Consultants. The notion of defining starting baselines for different metrics, based on historical data collected in the past, was an idea the factory management saw fruitful in defining metrics for the future development actions. The aim was to improve the production, using data analytics to find the development areas, and this would have to be in the center focus of actions. The new digitalized tools were a step forward but implementing them was viewed to be only half-way done, thus the full potential was not yet harvested.

“The data analytics and visualization tools are good, but we'd need more training on how to use them effectively. The analyzing of data is still done by the factory employees and knowing how to use the tools would make a big difference in speed and quality. Another point from this topic is the continuous development of the

tools – I feel we are not informed of the changes within the release versions, and this causes uncertainty here at the factory.” – Quality Manager of the factory, 31.3.2020

The Technology Provider’s technical experts also saw potential areas for development. The integration of various data sources was largely missing, making it more difficult to thoroughly analyze the production events. Connecting data sources, like production anomalies or the warehouse stock level system, would in their view be the next issues to tackle, to cover even larger portion of the factory’s main functions. During the contract period the focus had shifted from maximizing the production capacity to reducing the cost and even though both these aims affect the benefit to be shared the mechanism is quite different.

“There has been a shift from capacity driven- to savings driven way of thinking. From the data collecting point of view new and different data sources will need to be integrated if we are to make efficient data analytics and provide the correct tools and views for the factory. It might be good to pause for awhile, use the data gathered to draw ‘the big picture’ and base the development sprint actions around the ideas that aid in reaching the new goal.” – Head of Technology for Digital Industries division, 12.3.2020.

The views on data usage from the financial point of view were also enquired from the interviewees. Many of the opinions and thoughts echoed the earlier discussions, bringing forth ideas of using the data for validating the best possibilities for savings or capacity increase.

A couple of persons interviewed were contemplating the possibilities for using the data for preventive maintenance purposes. This would allow the factory to plan the maintenance periods more accurately and perform the maintenance only when needed. This would for example minimize the overtime costs that were usually associated with unexpected events at the factory. Preventive maintenance would in the Maintenance Planner’s opinion also streamline their spare part acquisition process and lower the need to invest in spare parts that would not to be used in a short period of time. Based on the data analytics, only the spare parts needed would be purchased, thus lowering networking capital. The technical experts were considering more

sophisticated algorithms for optimizing the production, using larger data lakes to find correlations from the data gathered, in hopes of finding the ‘golden production batch’ parameter sets. The Factory Manager saw an opportunity for better data usage in an outcome-based business model by creating automated reports with analyzed trends and use these to lower quality related challenges. In his opinion, the analytics could also point out what parts of the process could be further automated in order to reduce manual labor. Yet another view on the matter was presented by the Third-party Consultant 1, when he saw that the data gathered could be used as a motivational tool.

“The Dynamic Value Creation model depicting the value paths, using systems approach methodology, could be used in motivating the production personnel. When the development actions performed are visualized, everyone will see the affect the changes have, and be able to see the path to a more productive and economically viable factory. Along with this, the factory could use the data also in other ways not thought of yet – what about the raw material purchasing or the financial controllers – could they get novel ideas from what has been gathered and visualized? As a third option, could you as the Technology Partner utilize the data in other projects as well? Are there some patterns or mechanisms that could be used elsewhere as well?” – Third-Party consultant 1, 23.3.2020.

The next topic in the interview was the views on data gathering and analyzing, as a tool for better project- and performance management in a traditional setting vs the outcome-based setting. The traditional project setting gained very few thoughts on the subject. The only idea brought up, was to use data or data analytics to validate warranty period success in a traditional project. The outcome-based agile project setting however sparked ideas from many. The data collecting was seen to support the agile project management and curtail ambitions that lead to over-quality that rarely pays off - a view expressed by the Factory Manager. The scrumban way of working could be improved if data would be utilized more when deciding whether a task is defined to be ready. The sprint review procedure was noted by two persons from the factory as an area, where data driven actions could really boost the performance of sprint teams. Especially the long-term productivity metering and data visualization was one of the managerial

viewpoints into the matter. Many development actions affect the main KPI with a time constant, that could also be very long.

“By utilizing the data gathered in an outcome-based project, the foundation for benefit sharing can be created and validated. The validation material is constantly being gathered, it is effortless and serves all parties.” – Service Delivery BU Director, 27.3.2020

As the final question in the interview, the persons were asked how the usability of new technology and solutions could be evaluated in an outcome-based setting. The question was intentionally broad. The Author hoped to get unorthodox answers and out-of-the-box thinking to support conclusions on how this type of project could be replicated in the future, when the now implemented tools would already be replaced with novel ideas and technology.

Many interviewees saw no real benefit in introducing technology just for the sake of introducing new technology. Whatever the new implemented solution would be it would have to have a clear link to the benefit sharing metrics and the system that was setup. The Factory Manager pointed out, that as a global operator, the Technology Provider should better utilize the lessons learned from other projects around the globe to avoid some challenges encountered in the case project. When operating in a business environment, the showcasing of technology should not be in the center focus.

“Technology is needed to make benefit sharing possible, but the business aspect will have to be the ultimate focus. The Technology Partner has to scale the implementation to be in line with the reality of the case and the level of daily operations capabilities.” – Factory Manager, 10.3.2020.

One consideration brought up was to think of the system being implemented from a more holistic view – how different data sources and tools link together, and how to leverage the best out of the construction. The case project was seen lacking in this aspect as similar information was available in many tools, and the “forest could not be seen for the trees”. The Third-party Consultants saw, that when evaluating a new case, the modeling of the value creation paths

should be thought of in advance and the ‘granule size’ better determined, in order to select or develop the correct solution for the case. The interviewees saw that the outcome-based business setting needed data gathering, knowledge-based and data driven management, and this would not be likely to change in any future cases.

“In order for the outcome-based setting to work, a neutral ground is needed. The neutral ground is the data. All the reporting, transparency and status metrics are based on the neutral, validated data – in my opinion this will not change. The consolidation of historical data and the new data is still something to keep in mind when building the neutral foundation.” - System Specialist, Digital Industries division, 12.3.2020.

4.3 Results from Questionnaire 2 – Outcome-based project overview

The questionnaire 2 was sent to eight recipients on 20.4.2020, and it was answered by six persons. The answering was anonymous to make it easier to express opinions and constructive criticism. The questionnaire was sent to the Manufacturing Partner’s employees only to get a better understanding of the realities of the outcome-based project at the factory. Most of the questions were formulated as statements and the participants were asked to rate, on a scale from 1-5, whether they agreed with the statement or not. “1” signifying - I do not agree with the statement and “5” signifying - I completely agree with the statement.

The Questionnaire 2 was divided into three separate sections:

- 1) Outcome-based business principle.
- 2) Project management method.
- 3) Change management and communication.

In addition to the statements, each section of the questionnaire had a free text field for written feedback, should recipients choose to add further comments.

4.3.1 Results of Section 1 – Outcome based business principle

The results for questions 1-4 are presented in Table 6. Q1 – Q4 rating - Questionnaire 2, along with the average for each question. The questions asked in this section were:

Question 1 – I understand the objectives of our Phase 2 -project.

Question 2 – The metrics defined are transparent and help planning the next improvement actions.

Question 3 – The data gathered in the project is used in planning the development actions.

Question 4 – Outcome-based model is an effective way of deepening the partnership and cooperation.

Table 6. Q1 – Q4 rating - Questionnaire 2

Rating from 1-5				
ID	Question 1	Question 2	Question 3	Question 4
1	4	5	3	4
2	4	4	4	3
3	2	2	3	2
4	4	3	3	3
5	4	2	3	5
6	4	3	3	4
Av.	3,67	3,17	3,17	3,5

The responses for question 5 are presented in Table 7. Q5 Free text answers - Questionnaire 2.

Question 5 – Other feedback of the outcome-based / benefit sharing model.

Table 7. Q5 Free text answers - Questionnaire 2

ID	Free text field
1	“Surely a solution suitable for our Global society.”

4.3.2 Results from Section 2 – Project management method

The results for questions 6-8 are presented in Table 8. Q6 – Q8 rating - Questionnaire 2, along with the average for each question. The questions asked in this section were:

Question 6 – Information flow and transparency is improved by the agile (sprints) project management method when compared to the traditional project management methods.

Question 7 – Tools like Teams and Planner help implementing the project actions.

Question 8 – Sprints are an effective way of realizing the actions in a cooperative fashion.

Table 8. Q6 – Q8 rating - Questionnaire 2

Rating from 1-5			
ID	Question 6	Question 7	Question 8
1	5	5	4
2	5	4	4
3	3	4	3
4	4	4	4
5	1	2	3
6	3	4	4
Av.	3,5	3,83	3,67

In question 9, the recipients were asked to prioritize a set of pre-defined improvement actions. The result of prioritization is listed in Figure 17. Q9 priority order - Questionnaire 2.

Question 9 – Please rate the following actions in the order that you feel would make the project more efficient.

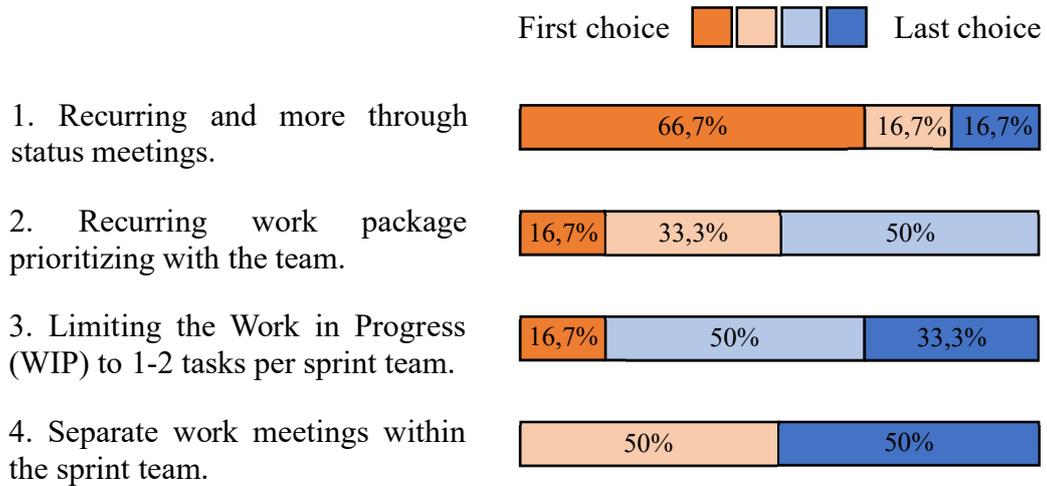


Figure 17. Q9 priority order - Questionnaire 2

The responses for question 10 are presented in Table 9. Q10 Free text answers - Questionnaire 2. Question 10 – Other feedback of project management method:

Table 9. Q10 Free text answers - Questionnaire 2

ID	Free text field
1	“Teams might be a good way of exchanging information, however, every time I log on to our Teams group it seems that nothing has been added or altered. Is the Teams even in use anymore?”

4.3.3 Results from Section 3 – Change management and communication

The results for questions 11-14 are presented in Table 10. Q11 – Q14 rating - Questionnaire 2, along with the average for each question. The questions asked in this section were:

Question 11 – Adequate amount of information has been shared of the project’s target and the project management model.

Question 12 – The active information sharing, and communication should still be continued.

Question 13 – The sharing of information and communication as part of change management procedures has helped me to understand the needs for the development actions.

Question 14 – Co-creation workshop is a usable tool also from the viewpoint of change management and information sharing.

Table 10. Q11 – Q14 rating - Questionnaire 2

Rating from 1-5				
ID	Question 11	Question 12	Question 13	Question 14
1	4	5	5	4
2	4	4	4	4
3	3	4	3	4
4	3	5	4	4
5	1	5	2	4
6	3	4	3	4
Av.	3,0	4,5	3,5	4,0

The responses for question 15 are presented in Table 11. Q15 Free text answers - Questionnaire 2. Question 15 – Other feedback of change management and information sharing in our project:

Table 11. Q15 Free text answers - Questionnaire 2

ID	Free text field
1	“There has been no information sharing to people who are not participating in the sprints.”

Summary of questionnaire 2

Based on the answers, the outcome-based business principle i.e. the core of the project was well understood by the team at the factory and the respondents saw this business principle to also aid in deepening partnership and cooperation. The results regarding data driven operation and KPI guided actions could be interpreted to be slightly on the positive side, however, there was room for improvement.

On the project management side, the adapted scrumban and tools for conducting the project were welcomed. There, however, were indications of need to tighten the control of how the teams themselves were working on the development actions during the two-week sprints.

The communication and flow of information was targeted in the interviews and questionnaires to better understand the conditions under which an outcome-based project could be best managed. The performed change management actions were positively reviewed but the answers revealed the clear need to still better the communication regarding the project targets and the aim of the development actions. The continuous improvement model and its first step of identifying development areas using a co-creational workshop received positive feedback.

5 DISCUSSION

5.1 Overview of the findings

The prior research on agile project management indicated that close collaboration between the project parties is essential in order to reach satisfying results. M. Mahalakshmi and M. Sundararajan point out that an agile scrum type project requires a higher level of dedication from the team and the ability to work seamlessly together. These are attributes that do not play as a significant a role in the traditional waterfall type of project management (Mahalakshmi & Sundararajan, 2013, p. 195). As the research done in this thesis indicates, the teams saw an increase in transparency, both within their organizations, as well as within the partnership formed. The mainly positive comments regarding the collaboration, and the fact that 87,5% of the respondents would choose to work in an agile way in other projects as well, paint a picture of high level of cohesion achieved. Further research could be done on the long-term effect of agile development efforts in an outcome-based partnership setting. During the research period there were subtle indications, that working simultaneously on development actions and running the daily operations at the factory, were starting to take its toll on the project team. Niebecker et al. (2008) propose adherence to predefined regular project meetings as an indicator of the team satisfaction. Some responses in the interviews and questionnaires indicate that some of the development team members were not very actively participating in the sprint team's internal meetings, which based on Niebecker et al. (2008) might be interpreted as an indication of dissatisfaction within the team.

Based on the research done by the Author, the performance management of the case studied had some challenges- The outcome-based project was contractually bound to only one very high-level KPI, with a plethora of cause-and-effect chains linked to the KPI change. The common alignment on expectations and scenario-based outcome possibilities were found lacking. Niebecker et al. recommended to create several scenarios for the future development, ranging from optimistic to pessimistic (Niebecker, et al., 2008). The building of these scenarios in a cooperative way between the partners could have solved some of the noticed misalignment issues. The lack of these scenarios i.e. why they were not built, might have been a result of the very positive attitude on both sides towards the coming cooperation and the anticipation to

benefit from the contract in a genuine win-win approach. The reality of the time-factors affecting the performance management KPI were, however, discussed on the management level throughout the research period. As can be seen from the interviews, the higher management expectations of focusing more strictly on the outcome-based revenue generation were continuously present. This might indicate that a better profit was expected than what was the reality at the time. As Pekkola and Ukko point out “it is not common to share risks and benefits amongst the participants in the supply chain” (Pekkola & Ukko, 2016, p. 1413). In the case researched, the risks were somewhat mitigated in the contractual setting, still leaving both sides to carry a tangible risk of what implementing a new business plan holds. Further research could be done on how the expectations are managed in a cooperative way in an outcome-based business model: does the maturity level of the partnership indicate a high change of success or should the outcome-based setting be avoided, at a given time.

The research done for this thesis also focused on discovering how transforming data into knowledge-based management actions should be efficiently performed. The usage of data played a big role in ideation for development actions, as well as served as an important tool for bettering the communication and knowledge sharing between the partners. The expectation on continuous improvement actions being drawn from the data alone, was observed to have been higher than what was realized in the case project, at the time of the research. Niebecker et al. (2008) studied a collaborative project scorecard implementation and how continuous improvement can be incorporated into controlling of the actions. Better use of a data driven approach, together with a continuous improvement model, could be an angle where more research could be done. The research could aid the future endeavors into benefit-sharing collaborations.

5.2 Fast changing environment and project management

The fast-changing business environment with multiple stakeholders led to a scenario where the team needed to adapt quickly to the changes, to keep the productivity from falling. Petersen et al. conducted research comparing the waterfall method against an agile project management method and found that the waterfall method is not suitable to be used in a large-scale development and an agile method should be used instead of the waterfall (Petersen, et al., 2009).

The result of the interviews conducted for this thesis is aligned with Petersen et al. as 12,5% of the respondents strongly agreed and 75% agreed with the statement, that the goals are being reached efficiently using an agile project management method. Similarly, the desire to work using an agile project management method in the future was also indicating the seen improvement from transferring from waterfall method used in the Phase 1 project, to an agile method used in Phase 2 project. 25% of the respondents strongly agreed and 62,5% agreed with the statement that they would choose an agile project management method for future projects as well.

The Author did not come across any previous studies discussing the selecting of project management method in an outcome-based setting. Based on the practical experience of having worked on many traditional the projects and having worked as the Project Manager for the Phase 1 project, the development- and management method needed to be examined for the Phase 2 outcome-based project. In their Study Abrahamsson et al. (2003) have compared different agile development methods and analyzed their contribution to the guidance provided by the various methods, the embedded process description for development in the methods and the way different approaches offer support for the project management. Their study suggests that scrum type of development supports the project management throughout the coverage of the method, while allowing the execution phase to flow without boundaries set by the method itself, (Abrahamsson, et al., 2003). For the new business model and the new technical solutions implemented in the project, the freedom, agility and emphasis on communication provided by scrum was a suitable solution. In his article Cho (2008) states that Scrum recognizes the importance of communication and provides means to achieve this, while also stating that the communication with the customer can be problematic, (Cho, 2008). Based on the results from interviews and the questionnaires, the effectiveness of the method for communication was found to confirm the statement by Cho. However, based on the interviews, a conclusion could also be made, that information sharing outside of the project team, to all stakeholders should be emphasized on the Manufacturing Partner's side. The free text answer Questionnaire 2 Q15: "There has been no information sharing to people who are not participating in the sprints." Based on the study and the Author's experiences in leading the project, the information flow within the project could be visualized as shown in Figure 18. Information exchange links".

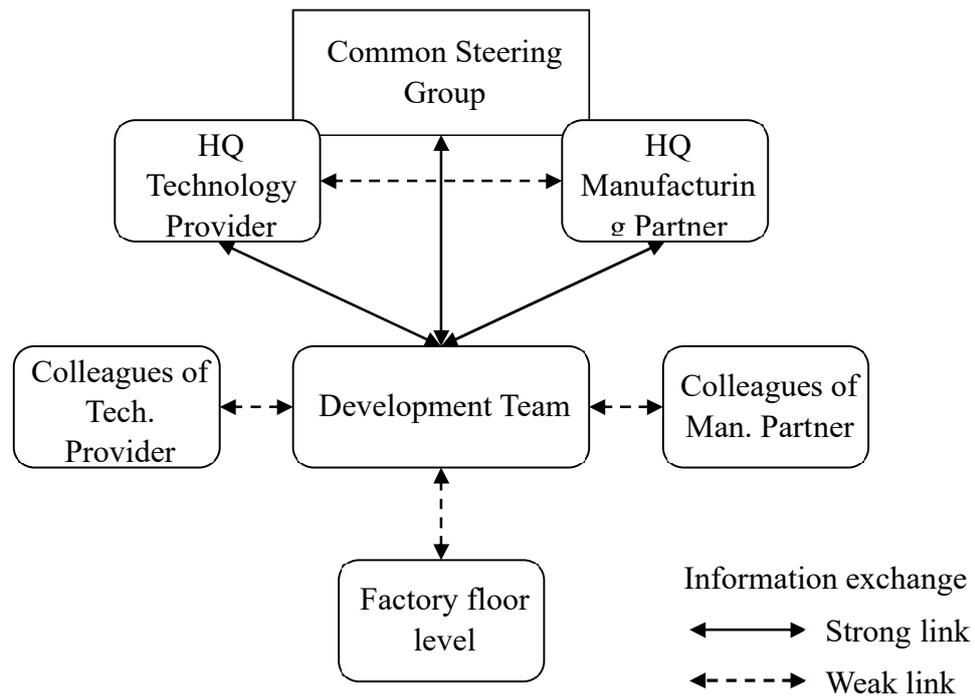


Figure 18. Information exchange links

The development team, comprised of both partner's employees, was not familiar with working in an agile way, and the development tasks were not solely focused on software development for which the scrum method was originally developed. Answers received for Questionnaire 1 revealed the confusion of some of the team members on how to approach the development and how to handle the work packages. In the research done by Khan (2014), the pull method used in kanban and scrumban was concluded to be an effective way of handling the backlog (Khan, 2014). In the early stage of the case project, based on the answers from Questionnaire 1, the project management method was altered from scrum to scrumban, thus abandoning the strict rules imposed by scrum on the management of work packages. The full transformation to scrumban was not completed during the research period. The Questionnaire 2 provides indication that the transformation and implementation of the method needed more focus and management. The kanban side of scrumban suggests limiting the WIP in order to tighten the focus and speed up the progress. However, the limiting of WIP in Questionnaire 2 Q9 was not seen as the most important topic on which to focus.

5.3 Collaboration expectations and defining the goals

In an outcome-based setting, the performance management should arguably be the most important focus area for the management. Outcome-based, in the case studied, was defined as sharing of the benefit created by the collaboration. Therefore, increasing the benefit created was of high interest to both parties. The literature studied for the theoretical background concluded that performance management should focus on, e.g. the common success factors and expectations for the future (Pekkola & Ukko, 2016), aligning the vision and expected project results and objectives (Niebecker, et al., 2008) and linking the performance management to individual's and organization's targets (Ukko, et al., 2009).

Niebecker et al. in their 2008 study devised a method for merging interests and strategic goals between partners into collaboratively defined KPIs, without exposing vulnerable or classified Intellectual Property of either company (Niebecker, et al., 2008). In the research for this thesis, the inter-company interests and the focus of the project were revealed to have been interpreted differently on each side of the partnership. The county management on both sides saw that the project's common steering committee had difficulties interpreting the progress made, and also challenges to agree on the status, as the common understanding of affecting mechanisms and the vision for the future were interpreted differently. During the research period, the business environment was seeing changes due to outside factors affecting the market. It is the conclusion of the Author that a CPS would have been a valuable tool, not only in the phase 1 and laying the foundation for the collaboration of Phase 2, but also later, when a change of course was necessary.

The CPS as an information distributing tool between layers of management, both in inter-, and intra-company respect, could be an area for further study. The change management actions performed in the case project varied, from providing low level information via info-screens at the Manufacturing Partner's factory to management meetings with road map visions by the Technology Partner. One conclusion of the change management actions performed, was that the actions were concentrated on the employees of the Manufacturing Partner, leaving the Technology Provider's personnel out of the focus. In an outcome-based setting the aligning of both sides, on all levels, was stated to be important but based on the interviews this could have

been implemented more effectively. The need for re-analyzing the stakeholder landscape was brought up by the management of the Technology Provider, along with the notion that the common steering committee should be better aligning on the facts and goals of the project. The conclusion of the Author is that information provided was interpreted differently on the higher management level within both organizations and the effect was visible in the steering committee meetings. The implementation of a CPS could have been helpful, since the targets of the project would have been based on the strategic goals of both partners, commonly agreed and aligned.

5.4 Data driven management and continuous improvement

To be able to perform data driven continuous development actions, not only does the data need to be efficiently available, but it must also be clear from the beginning, what to measure and how to measure. In their article “Designing a performance measurement system for collaborative network”, Pekkola and Ukko highlighted the importance of defining a network’s reporting principles and data sources, which from the viewpoint of the Author, is key also for data driven management. In the context of this thesis, the network is formed between the two partner companies. Pekkola and Ukko concluded that especially in the network context the information system integration into the measurement processes makes the using of data and management more efficient and effective (Pekkola & Ukko, 2016). During the research period for this thesis, the information system integration was still being developed, and fully completed only between the automation system and the production scheduling system. The linking of these systems made the production more transparent, enabled planning of development actions and the calculation of production related KPIs automatically.

The implementation of the Value Creation Model displayed in Figure 12. Continuous improvement principle of Phase 2 aimed also to bring the data driven management and development efforts into a visual form. The model highlights the numerous cause and effect chains that affect the KPI, based on which, the benefit created was calculated. The answers from the interviews and questionnaires reveal that data driven management was being conducted in the case studied but there was room for improvement. The rate of approval for the statements regarding transparent metrics and data-based development actions was 3,17 (Questionnaire 2, Q2 and Q3). This led to the conclusion that implementing a fluent, data-driven

management concept and project execution was still in progress, and the efforts on the issue should be increased in the future.

6 CONCLUSIONS

The relevant finding and conclusions of this thesis are presented in this chapter. The results are presented first for each of the three sub-research questions and in the end for the main research question.

6.1 Answers to research questions and practical implications

What kind of project management model is effective in an outcome-based project?

The business environment in which this study was conducted is relatively fast changing where emerging customer needs and consumer trends shape the landscape continuously. In addition to the business landscape changes, in the case studied, the factory was on its way in transforming from traditional manufacturing concepts into the digitalized world, with new tools and possibilities. In a situation where decisions are made without the possibility to rely on past experiences, the need to change course might arise often. When developing a new manufacturing culture in a volatile business landscape with an outcome-based contract, it is the tried and tested conclusion of the Author, that a long-term rigid planning with the waterfall method is not a suitable solution. The changing environment and need to react to input from various sources led to the necessity of being agile. The case studied first used the waterfall method, then scrum, and evolved later to scrumban type of agile project management, having characteristics from both scrum and kanban. The scrumban method provides the means to support project management, relay information in a transparent way and the possibility to stop and start new development actions in an agile way. Scrumban being less ceremonial and elastic than pure scrum proved also to be easily implemented and accepted in organizations with little or no previous experiences in agile methods. The kanban charts were implemented using Microsoft Teams and the MS Planner, where all the tasks were detailed and formulated in the kanban fashion. Questionnaire 2, Q7 enquired whether the use of these tools was of help in implementing the actions and the approval rating 3,83 / 5 leads to the conclusion that the use of these online tools was welcomed by the team.

What kind of metrics should be utilized in an outcome-based project?

The question of metrics in an outcome-based project, was not an easy question to which find answers. However, based on the study performed by the Author some conclusions could be drawn. Metrics are used to track changes in selected areas or of selected indicators, which enable a long-term visibility for the area of interest. In the case studied it became challenging to attribute the changes in the contractual KPI to any one single development action performed. The actions could be argued to have had an effect and the possible path could be visualized on the Dynamic Value Creation model, but the time constant from development action to KPI change could be very long (up to years) and actual effect very difficult to measure. To compensate this the development sprint teams were tasked to make a list of metrics, and ways to measure them, for each development action category planned. These sprint sub-metrics provided a lower level indication of the effect of actions. The information provided by the sub-metrics could be used for management decisions, such as, whether to continue or discontinue the specific development action, or as evidence to justify further investments on a topic. Use of the sub-metrics as tool for communication to the stakeholders was also observed.

Based on the research, the Author would conclude that in an outcome-based project as complex as the case project, there should be more than one KPI. The KPIs should be linked to the actions in a clear and transparent way so the development effects could be reliably followed. Furthermore, for the measurement to be more effective, the information needed to form a KPI should be gathered automatically by an information system. Only as an exception should the KPIs that affect the benefit shared in an outcome-based setting, be calculated and entered manually. The neutrality of automatically gathered values will increase trust between the participants and make the result easier to accept as the real state of things.

How can data be transformed to information for management use in a manufacturing industry project?

In the case studied, the data collection was emphasized to satisfy the transparency requirements on two levels: the operative level and the financial level.

The Phase 2 project was managed without the traditional project management triangle principle. The project had no predefined budget, scope nor a traditional schedule. The development actions were solely based on the continuous improvement principle, visualized in Figure 12. Continuous improvement principle of Phase 2. The continuous improvement cycle is dependent on data, that can be analyzed in order to determine whether a preformed action should be discarded or discontinued, standardized or further improved. In the case study, the data collected was continuously transformed into information using an IoT based environment implemented by the Technology Provider. The data collected was factory automation system raw data, information of factory floor level operations, and other supporting data from relevant information systems. In the IoT environment the data could be combined, cross-referenced, categorized and displayed on dashboards in desired ways. Based on the interviews and questionnaires, the opinion was that the data transparency and data driven development actions were welcomed and seen as a step in the right direction. However, in the spirit of continuous improvement, it can also be stated that the transforming of data to information could still be improved by emphasizing knowledge-based management principles.

Along with concrete development actions, the data was used also as a part of the financial calculations. The monetary compensation for the partners in this outcome-based setting was determined only by an agreed benefit sharing scheme. The financial data, however, was collected and calculated manually as the financial information systems used by the partners were not integrated. The full integration of the financial data would reduce manual labor in forming of the reports and benefit calculations. The financial data turned into information was not witnessed to significantly affect the planning of the development actions. In an experimental project the financial outcome is important, but some actions were also subsidized by the head quarters. The closed loop feedback from financials to concrete actions might have a higher time constant and the effect will be more noticeable later. The case study took place after one year, out of the five-year contract period as shown in Figure 11. Project timeline and research period, so future research could be conducted on this area at a later stage of the project.

How to effectively manage the performance of an outcome-based project?

The main research question gathers the analyzed views from sub-research questions under its umbrella. As discussed in chapter 5.2 Fast changing environment and project management, the project should be run with a suitable agile method to bring the needed flexibility into managing the project. If the works are performed in an industrial setting and consisting of various actions related not only to software development, based on this study the scrumban method would be the recommended solution.

Effective managing of an outcome-based project requires clearly defined and commonly aligned targets. In the case studied, the alignment between the partners had room for improvement. Even though the contractual setting was straight forward, the management on both sides saw the need to adapt the contract due to changes in the business environment. The Collaborative Project Scorecard (CPS) with a seamlessly incorporated performance measurement system is a combination that could solve many of the issues uncovered in this case. The commonly agreed KPIs derived from the strategies of the partners, with automated gathering of the information needed for the metrics, would lay a solid foundation of managing an outcome-based project.

When considering a partnership between organizations and the decision to enter an outcome-based project, the openness and trust must be on a high level for the endeavor to work. In order to analyze the state of the partnership the Author suggests that a partnership maturity level assessment would be conducted. Pekkola and Ukko in their 2008 journal article describe a process for assessing a network's interaction maturity level (Pekkola & Ukko, 2016). The network interaction maturity level categorization by Pekkola and Ukko can be seen in Figure 19. Network interaction maturity levels (Pekkola & Ukko). The assessment of the interaction maturity level, before entering the outcome-based contract could reveal whether the partnership should be further developed to increase the chances of mutual success.

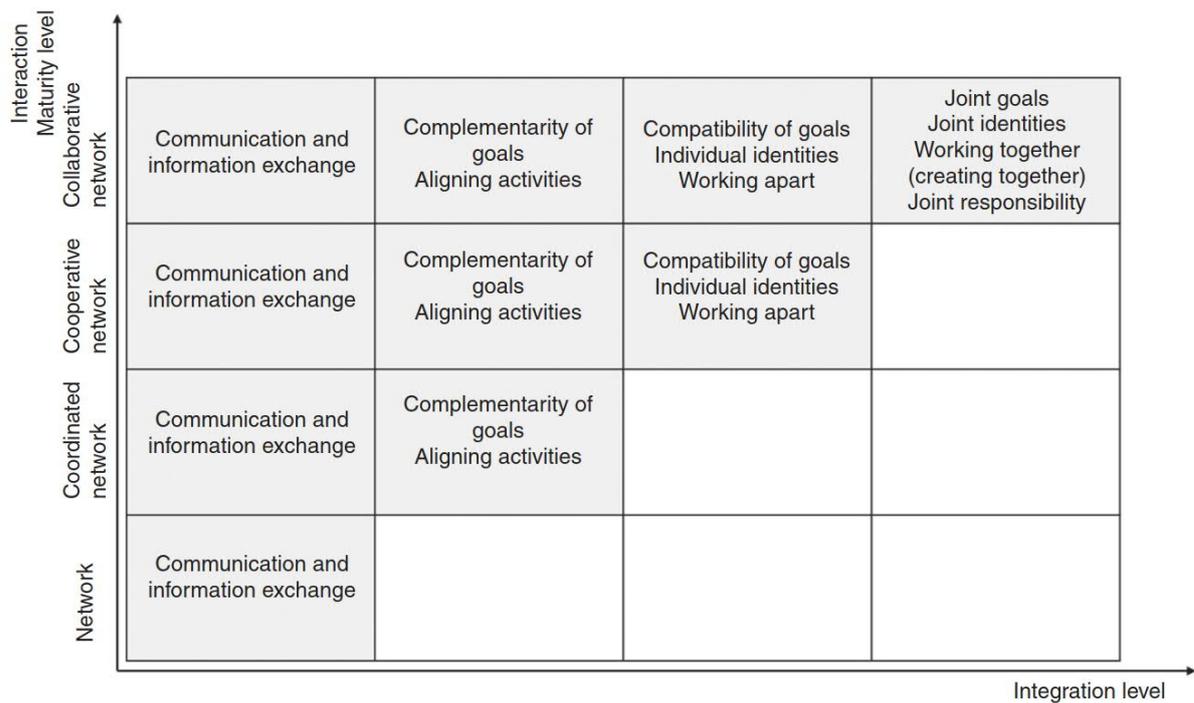


Figure 19. Network interaction maturity levels (Pekkola & Ukko)

The sharing of benefits between private corporations requires open information exchange, high level of trust and financial transparency between the partners. The data must be trusted, and the intentions and strategic goals aligned. The stakeholder management and large-scale change management procedures play a crucial role in managing this type of project efficiently and successfully. In the case studied, the change management procedures were conducted on all levels of the Manufacturing partner's, organization. As a finding from the study, it could be said that it is important that change management is conducted in all the organizations participating in the outcome-based business. In this case the Technology Partner's engineering staff was left out of the change management program. The Author experienced that this caused some misaligning and change resistance within the Technology Partner's engineers because information of the goals, status and strategical aspects of the contract was not clearly conveyed. For an effective management, no party should be excluded from change management actions and the information flow must be even and timely. Further research could be done on effective change management actions in an outcome-based setting.

As practical implications based on the research for this thesis, the Author suggests at least the following elements to be included in the playbook for outcome-based projects:

- Analyze the level of maturity within the partnership.
- Emphasize the use of co-creational methods.
- Define common KPIs, and targets and document them in a CPS.
- Arrange the information needed to follow the KPIs to be collected automatically by integrating information systems when needed.
- Select and implement a suitable Agile management method.
- Initiate change management measures and analyze the information exchange links to make sure the project targets and goals are known by all the relevant parties.

Finally, managing the performance in an outcome-based setting should not be measured by the financial outcome alone. It is the opinion of the Writer that the softer side of the collaboration should also be incorporated into the status analysis and managed alike. Factors like customer satisfaction and employee wellbeing could be useful metrics to follow and management actions should be derived also based on the development of these factors. The financial success of one project should not be more important, than managing the partnership in a way that creates more business for all participants and a win-win scenario for the foreseeable future.

7 SUMMARY

The business environment is changing landscape with new business models developed constantly. The strong emphasis on ‘as a service’ business has been ongoing for several years and there is an ever-increasing number of items, solutions and services on the market that can be rented/leased as a service from a service provider. The outcome-based and benefit sharing ideas have also existed for some time now but far fewer business cases seem to be based solely on the compensation derived from the generated benefit being shared. In this thesis, a case study was conducted of a project that is financed exclusively based on the benefit created and shared between the partner companies.

The aim of this thesis was to research methods, tools and best practices for managing the performance of an outcome-based project. The findings can be used as a starting point and further developed in possible projects in the future. The research was done by conducting a semi-structured interview with chosen individuals from both partner’s organization and with two Senior Consultant’s of a Third-party Consulting Company. In addition to the interviews the Author sent out two questionnaires to the Manufacturing Partner’s employees to discover how the outcome-based project was perceived through their eyes and what they thought needed improving and in which endeavors the partnership had succeeded.

The findings suggest that open communication and transparent information sharing between the participating organizations is the foundation on which a successful outcome-based project can be built. A thorough analysis of the relationship should be conducted and a tool like the Common Project Scorecard used to define the common goals rising from the strategies of the partnering organizations. For the project management method to use, the Author concludes that in an outcome-based business, agile methods are superior to waterfall type of project management. The agility allows for a faster startup of development actions when there are numerous uncertainties, and changes and new requirements are expected to frequently surface during the project execution. The outcome of the project and effect of actions need to be followed with an adequate amount of KPIs, that are linkable to the actions performed. This link will close the loop for continuous improvement, with a fast-enough response from action to control. The gathering of data from relevant events and connected systems should be done in

an automated way to further emphasize the speed and neutrality of following the actions and benefit created.

More research should be conducted on the agile methods when dealing with manufacturing industry and a project with development actions performed on processes, equipment level and software alike. Also, the use of Collaborative Project Scorecard in an outcome-based scenario could merit future research efforts.

The Author was surprised by the amount of work that the research and analyzing the case took. In the end, however, the Author feels that the findings give a solid base for engaging in future outcome-based projects and benefit sharing scenarios.

REFERENCES

- Abrahamsson, P., Warsta, J., Siponen, M. T. & Ronkainen, J., 2003. *New Directions on Agile Methods: A Comparative Analysis*. Portland, Oregon, USA, s.n., pp. 244-254.
- Aguinis, H., 2013. *Performance Management (third edition)*. s.l.:Pearson.
- Baines, T. S., Lightfoot, H. W., Benedettini, O. & Kay, J. M., 2009. The servitization of manufacturing: A review of literature and reflection on future challenges. *Journal of Manufacturing Technology Management*, 20(5), pp. 547-567.
- Baxter, P. & Jack, S., 2008. Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers. *The Qualitative Report volume 13 number 4*, pp. 544-559.
- Chesbrough, H. & Rosenbloom, R. S., 2002. The role of the business model in capturing value from innovation: evidence from Xerox Corporation's technology spinn-off companies. *Industrial and Corporate Change, Volume 11, Number 3*, pp. 529-555.
- Chin, C. M. M. & Spowage, A., 2010. Defining & Classifying Project Management Methodologies. *PM World Today (vol XII, Issue V)*, pp. 1-9.
- Cho, J., 2008. Issues and challenges of agile software development with Scrum. *Issues in Information systems, Vol. IX, no 2*, pp. 188-195.
- Khan, Z. A., 2014. *Scrumban - Adaptive Agile Development Process*, Helsinki: Metropolia University of Applied Sciences.
- Lavie, D., 2006. The Competitive Advantage of Interconnected Firms: An Extension of the Resource-Based View. *The Academy of Management Review*, 31(3), pp. 638-658.

Leech, B. L., 2002. Asking Questions: Techniques for Semistructured Interviews. *Political Science and Politics*, Vol. 35, No. 4, pp. 665-668.

Lei, H., Ganjeizadeh, F., Jayachandran, P. K. & Ozcan, P., 2017. A statistical analysis of the effects of Scrum and Kanban on software development projects. *Robotics and Computer-Integrated Manufacturing* 43, pp. 59-67.

Mahalakshmi, M. & Sundararajan, M., 2013. Traditional SDLC Vs Scrum Methodology - A Comparative Study. *International Journal of Emerging Technology and Advanced Engineering*, Volume 3, Issue 6, pp. 192-196.

Niebecker, K., Eager, D. & Kubitzka, K., 2008. Improving cross-company project management performance with a collaborative project scorecard. *International Journal of Managing Projects in Business*, Vol. 1 No3, pp. 368-386.

Niebecker, K., Eager, D. & Moulton, B., 2010. Collaborative and cross-company project management within the automotive industry using the Balanced Scorecard. *International Journal of Managing Projects in Business* Vol. 3 No.2, pp. 328-337.

Nylen, D. & Holmström, J., 2015. Digital innovation strategy: A framework for diagnosing and improving digital product and service innovation. *Business Horizons* (58), pp. 57-67.

Okkonen, J., Pirttimäki, V., Hannula, M. & Lönnqvist, A., 2002. *Triangle of Business Intelligence, Performance Measurement and Knowledge Management*. Stockholm, Tampere University, pp. 1-14.

Peddisetty, S., 2015. *Where Scrum Falls Short, Scrumban Comes To Rescue*. [Online] Available at: http://sridharpeddisetty.blogspot.com/2015/09/where-scrum-falls-short-scrumban-comes.html?sm_auiVV7msNDpF6pBjRjTRKNjKHWR8RV1

Pekkola, S. & Ukko, J., 2016. Designing a performance measurement system for collaborative network. *International Journal of Operations & Production Management*, vl. 36, pp. 1410-1434.

Petersen, K., Wohlin, C. & Baca, D., 2009. *The Waterfall Model in Large-Scale*. s.l., Springer-Verlag Berlin Heidelberg, pp. 386-400.

Rugenyi, F., 2015. Assessment of the Triple Constraints in Projects in Nairobi: The Project Managers' Perspective. *International Journal of Academic Research in Business and Social Sciences*, 5(11), pp. 1-16.

Saunila, M., Ukko, J. & Rantala, T., 2019. Value-creation through digital service capabilities: the role of human factors. *Information Technology & People Vol. 32 (No 3)*, pp. 627-645.

Sokovic, M., Pavletic, D. & Kern Pipan, K., 2010. Quality Improvement Methodologies – PDCA Cycle, RADAR Matrix, DMAIC and DFSS. *Journal of Achievements in Materials and Manufacturing Engineering*, 43(1), pp. 476-483.

Stoica, M., Ghilic-Micu, B., Mircea, M. & Uscatu, C., 2016. Analyzing Agile Development – from Waterfall Style to Scrumban. *Informatica Economică vol. 20, no. 4*, pp. 5-14.

Sugimori, Y., Kusunoki, K., Cho, F. & Uchikawa, S., 1977. Toyota production system and Kanban system Materialization of just-in-time and respect-for-human system. *The international journal of production research*, pp. 553-564.

Sutherland, J., Harrison, N. & Riddle, J., 2014. *Teams that Finish Early Accelerate Faster: A Pattern Language for High Performing Scrum Teams*. Hawaii, IEEE, pp. 4722-4727.

Swaber, K. & Sutherland, J., 2012. *Software in 30 days*. Hoboken: John Wiley & Sons, inc..

Ukko, J., 2009. *Managing through measurement: A framework for successful operative level performance measurement*, Lappeenranta: Lappeenranta University of Technology.

Ukko, J., Pekkola, S. & Rantanen, H., 2009. A framework to support performance measurement at the operative level of an organisation. *Int. J. Business Performance Management, Vol. 11, No. 4*, pp. 313-335.

Ukko, J. & Saunila, M., 2020. Understanding the practice of performance measurement in industrial collaboration - From design to implementation. *Journal of Purchasing and Supply Management*, p. Journal in press.

Wells, H., 2012. How Effective Are Project Management Methodologies? An Explorative Evaluation of Their Benefits in Practice. *Project Management Journal, Vol. 43, No6*, pp. 43-58.

Verma, J., Bansal, S. & Pandey, H., 2014. Develop Framework for Selecting Best Software Development Methodology. *International Journal of Scientific & Engineering Research, Volume 5, Issue 4*, pp. 1067-1070.

SEMI STRUCTURED INTERVIEW

Q1 The outcome-based / benefit sharing model project vs a traditional project

- What are your perceptions and feelings regarding this outcome-based project?
 - o In your opinion, what has worked well in this project?
 - o In your opinion, what could have worked better or needs adjusting?

- How would you compare this outcome-based project to a traditional delivery project?
 - o In your opinion, what, compared to a traditional project, is positive in the outcome-based model?
 - o In your opinion, what, compared to a traditional project, is challenging in the outcome-based model?

- What actions were taken to tackle the challenges you identified?
- In your opinion what kind of corrective actions should still be initiated?

Q2 Metrics and performance measuring of an outcome-based project

- What are the steps that are normally taken to define a traditional project metrics?
- In your opinion, how does the case project differ in defining the metrics, if at all?
- In your opinion, what challenges are posed in defining the metrics in an outcome-based project?
- How have the challenges been tackled and what should still be done?

Q3 Change management aspects

- In your opinion, does this business model require change management procedures to be initialized?
- What change management procedures were done in this case?
- In your opinion, what change management procedures should still be initiated?

Q4 Data gathering and knowledge-based management

- Regarding the data collection in the case project:
 - o In your opinion what has worked well?
 - o In your opinion, what could be done differently in the future?
 - o In your opinion, what should be further developed in this case?
- In your opinion how should the leveraging of the data be further developed?
- In your opinion, how can data be best used in the project management efforts?
- How can the data be best used in the managing of an outcome-based project?
- How would you estimate the usability of new technology in a new business model, such as the outcome-based project business?

QUESTIONNAIRE 1

1. Your opinion on Sprint actions

	I agree	I partly agree	I partly disagree	I disagree	I have no opinion
We reach the desired goals effectively using agile (sprint) form of project management.	<input type="radio"/>				
The responsibilities within the sprint teams are clearly defined.	<input type="radio"/>				
I understand the structure of the agile method being applied.	<input type="radio"/>				
I would choose an agile method for future projects as well.	<input type="radio"/>				

2. In your opinion what is positive and working well in the sprint model? Why?

3. In my opinion the Sprint actions could be developed into the following ways:

4. I need more information and answers to the following questions:

5. Other feedback:

QUESTIONNAIRE 2

Section 1

...

Outcome-based / Benefit sharing model

1 = I do not agree with the statement

5 = I agree with the statement

1. I understand the objectives of our phase 2 -project.

1 2 3 4 5

2. The metrics defined help planning the next improvement actions.

1 2 3 4 5

3. The data gathered in the project is being used in planning the development actions.

1 2 3 4 5

4. Outcome-based model is an effective way of deepening the partnership and cooperation.

1 2 3 4 5

5. Other feedback of the outcome-based / benefit sharing model.

Enter your answer

Continues

Project management method

1 = I do not agree with the statement

5 = I agree with the statement

6. Information flow and data transparency is improved by the Agile (sprints) project management method when compared to the traditional methods.

1 2 3 4 5

7. Tools like Teams and Planner help in implementing the project actions

1 2 3 4 5

8. Sprints are an effective way of implementing the actions in a cooperative way.

1 2 3 4 5

9. Please rate the following actions in priority order you feel would help the project in the best way to be more efficient.

Recurring and more thorough status meetings.

Limiting the Work in Progress (WIP) to 1-2 tasks per sprint team.

Recurring work package prioritizing with the team.

Separate status meetings within the sprint team.

10. Other feedback of Project management method:

Enter your answer

Change management and information sharing

1 = I do not agree with the statement

5 = I agree with the statement

11. Adequate amount of information has been shared of the project's target and the project management model.

1 2 3 4 5

12. The active information sharing and communication should still be continued.

1 2 3 4 5

13. The sharing of information and communications as part of change management procedures has helped me to understand the needs for the development actions.

1 2 3 4 5

14. Co-creation workshop is a usable tool also from the viewpoints of change management and information sharing.

1 2 3 4 5

15. Other feedback of change management and information sharing in our project.

Enter your answer