Applying agile approaches in public construction and civil engineering projects

A study to identify opportunities for a more flexible project management process

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KTH Industrial Engineering and Management

Master of Science Thesis
Stockholm, Sweden 2016

Tillämpa agila tillvägagångssätt inom offentliga bygg- och anläggningsprojekt

En studie för att identifiera möjligheter till en mer flexibel projektledningsprocess

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I ett ständigt utvecklande affärsklimat, med nya projekt som tillkommer som aldrig förr, är behovet av en effektiv projektledning inom alla områden nödvändig. Kärnan i projektledning är att noggrant planera, organisera, motivera och kontrollera resurser för att uppnå ett önskat resultat och för att uppfylla projektets mål. Traditionell projektledning ger en tydlig projekt ram som är skapad för att gälla för nästan alla typer av projekt. Att arbeta med projektfaser i traditionella bygg- och anläggningsprojekt har en tendens att vara alltför stelbent och tidskrävande för dagens dynamiska affärsmiljö.

Projektledning handlar inte längre om att hantera de olika stegen som krävs för att slutföra projektet i tid, det handlar om att systematiskt involvera kunden, skapa ett disciplinerat sätt att prioritera insatser och lösa kompromisser. Samtidigt kunna arbeta inom alla aspekter av projektet i multifunktionella team. Genom att studera agil projektledning möjliggörs just detta.

Genom agila tillvägagångssätt kan projektets process vara en mer levande och en kontinuerligt uppdaterad process. Agil projektledning ger projektledare metoder, verktyg och framförallt tillvägagångssätt för att underlätta både projektledaren och projektbeställarens möjlighet att engagera sig på ett mer effektivt sätt, vilket möjliggör mer öppen kommunikation, bättre återkoppling och viljan att fullfölja ett gemensamt mål mot framgångsrik projektledning.

Syftet med denna studie var att undersöka om projektledning inom bygg- och anläggningsprojekt, som hittills mestadels har utförts på ett traditionellt sätt, skulle kunna dra nytta av att använda agila tillvägagångssätt. Genom att studera både traditionell projektledning och observera hur projekt genomförs på WSP Management, samt intervjua erfarna projektledare, identifierades att agila tillvägagångssätt kan utföras.

Att kombinera den traditionella betydelsen av projektledning med agil projektledningsteori, dess värderingar och principer samt intervjuer med agila experter – blev det uppenbart att möjligheterna att använda och dra nytta av agila tillvägagångssätt inom bygg- och anläggningsprojekts industrin är möjlig.

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Approved	Examiner	Supervisor Johann Packendorff
	Commissioner	Contact person

In an ever-evolving business climate, with new projects emerging like never before, the need for efficient project management within all areas is highly stressed. The core of any project management is to carefully plan, organise, motivate and control resources to achieve a desired outcome and to meet project objectives. Traditional project management provides a project design frame that is uniformly constructed to apply to almost any type of project. Working with project phases in traditional C&CE projects have a tendency to be too rigid and time consuming for today's dynamic business environment.

Project management of today is no longer about managing the sequence of steps required to complete the project on time. It is about systematically incorporating the voice of the customer, creating a disciplined way of prioritising effort and resolving trade-offs, working concurrently on all aspects of the project in multi-functional teams. Studying the concept of Agile Project Management allows for just that.

Agile approaches allow the project management process to be a vivid and continuously updated. Agile project management provides project managers with methods, tools and approaches to aid both the project manager and project client to engage in a more efficient manner, allowing for more open communication, feedback sessions and the notion of pursuing a shared goal towards successful project management.

The purpose of this study was to investigate whether project management within the C&CE industry – which so far mostly has been carried out in a traditional way – could benefit from utilising agile approaches. By studying both traditional project management and observing how projects were run at WSP Management, as well as interviewing experienced senior project managers, the identification of possible agile approaches was identified.

Combining the foundation of knowledge about the traditional sense of project management with agile theory, value & principles and interviews with agile experts – it became evident that the possibilities of utilising and benefitting from agile approaches in the C&CE industry is viable.

Conceptual explanations

Civil engineering projects	Projects relating to the design and construction of roads, bridges, railways etc.
Construction projects	Projects relating to the design and construction of buildings.
Project manager	Responsibility of planning, procurement and execution of a planned project.
Turnkey Contract	A project that is constructed so that it could be sold to any buyer as a completed product.
Contractor	Private or public company which produces goods or services for a project in the execution phase.
Partnering	Intended to jointly (all involved actors) assist project teams with setting goals, revolving disputes and improving project outcomes collectively.
Project client	Order and sponsor of projects, in this study denoted as the customer.
Supplier	Represents those groups who will design, develop, facilitate, procure and implement the project (the project management organisation).
Agile Methods	Collection of flexible project management methods derived for the IT-sector.
Agile Approaches	Traits found in all agile methods, attributes of being agile.
Sprints	Time-boxed iteration cycles.

Abbreviations

APM	Agile Project Management
C&CE	Construction and Civil Engineering
IOR	Inter-organisational relationships
PMI	Project Management Institute
PMBOK	Project Management Book of Knowledge
KPI's	Key Performance Indicators

1. Introduction

The introductory chapter contains the background to the chosen research field, followed by a problematisation of the research matter to allow the reader to contextualise the problem. The purpose, research questions and delimitation for the study is also addressed in this chapter.

1.1 Background

In an ever-evolving business climate, with new projects emerging like never before, the need for efficient project management within all areas is highly stressed. Since the definition of a project is, "A project is unique in that it is not a routine operation, but a specific set of operations designed to accomplish a singular goal" (PMI, 2016), there are many different kinds of project management. According to Nokes and Kelly (2007) the current trend in project management is a rapid consolidation on a few global standards, and a major growth in professionalisation of project management. As part of this trend, one of the main emerging world standard is the Project Management Institute's approach, known as the Project Management Body of Knowledge or PMBOK guide. The PMBOK guide will further be denoted as traditional project management in this study.

The core of any project management is to carefully plan, organise, motivate and control resources to achieve a desired outcome and to meet project objectives (Wysocki, 2011). Traditional project management provides a project design frame that is uniformly constructed to apply to almost any type of project. The process is as follows; Initiating, Planning, Executing, Monitoring & Controlling and Closing of a project. This process should aid the project management in delivering the desired result of a product/service on time and within budget. To illustrate and overview the different constituent parts of a project each process is divided into phases. Working with project phases in C&CE projects have a tendency to be too rigid and time consuming for today's dynamic business environment (Karrbom and Gohary, 2012). With a traditional project management approach, it can take months before the project client (customer) receives any results, which in turn leads to no added value of the project until the final phase of delivering a certain solution.

Over the last few decade traditional project management within industry for C&CE has looked more or less the same (Yllén, 2012). The design to apply to every project in a uniform way should ensure robustness and applicability to a wide range of projects, from the small projects to more complex and large ones (Špundak, 2014). Unfortunately, in the fast-paced society of today, one size does not fit all. A more transparent and respondent way of managing projects is necessary.

Project management of today is no longer about managing the sequence of steps required to complete the project on time. It is about systematically incorporating the voice of the customer, creating a disciplined way of prioritising effort and resolving trade-offs, working concurrently on all aspects of the project in multi-functional teams, and much more (Maylor, 2010). "Much more" could be interpreted as the uncertainty of what might occur throughout a projects life span. Therefore, uncertainties and sudden changes in a project must be better handled. That is why it is of great interest to study if other, more effective, approaches to handle uncertainties and to incorporate the customers voice could be applied in the C&CE industry. Such sought after attribute's is incorporated in Agile project management.

Agile project management is an iterative process that focuses on customer value first, interaction over tasks, and adapting to current business reality rather than following a prescriptive plan. The agile approach is about breaking down large and complex deliverables into many partial deliveries in an incremental way. This is done to receive feedback from the project client, which leads to the incorporation of the customer's voice. This allows the customer to influence the development of the project, as well as controlling and regulating the structure of the project. It is also highly flexible in its interactive manner.
In the book *Making Sense of Agile Project Management* by Cobb (2011) the author highlights some strengths of agile approaches:

> "The ability to create and respond to change in order to profit in a turbulent global business environment"
>
> "Use of evolutionary, incremental, and iterative delivery to converge on an optimal customer solution"

Agile project management is a collection of methodologies, such as Scrum, Extreme Programming (XP), Crystal etc., these were all designed initially for the system development industry (Conforto et al. 2014; Jansson 2015). But, the foundation of agile rests upon a set of values, principles and attitudes which allows for applicability in many other working environments (Gustavsson, 2013). Values and principles such as the ones agile project management pose could be applicable to most kind of project management situations. However, it must be practically possible to incorporate such approaches onto the current working environment of C&CE projects which shares little resemblance to software development.

1.2 Problematisation

The problem is that due to the complexity and size of C&CE projects, the need for a well based structure in the project management process is considered to be high, which in turn leads to the utilisation of traditional ways of project management. The projects involve a lot of complex planning and coordination of many different stakeholders. The common set-up of a public C&CE project usually follows three categories

- The project client, has the task to order and prepare a project. In this preparation, a resource requisite is performed in order to determine if the project should be carried out internally or if external support is needed. If external support is needed, the project client must consider incoming proposals by consultancy companies that is best suited for performing the planning and management of the project
- Contractors, usually building companies that implements the chosen execution plan for the project
- The public/end-user, which consists of all those affected by the intended changes of the project

Within each of the above categories there are a lot of different stakeholders involved. Furthermore, there are numerous external dependencies such as laws and permissions to abide to. The Swedish industry for C&CE projects are tied to the laws and regulations that fall under Swedish law, which in turn often governs a projects formation. This is a factor that, at times, hinders a project from being effectively managed – an external dependency that complicates the progression of the project. One such law is the Public Procurement Act (PPA). PPA is installed to assure that public government funds are invested in the most cost and time efficient form. PPA is defined as; *"The choice of supplier shall be made on a commercial basis and based on which provider offers the best product or service in the best conditions"*.

However, the governing factor of PPA often boils down to which supplier can offer the best price. This is important to stress since this study's case company (WSP Management) has, to a large extent, public projects where the customer is a client project organisation. This type of client organisation can look vastly different, but it has grown more popular to have a quite slim client organisation where most of the responsibility is put on the hired consultancy firm. Therefore, depending on the project at hand a project client (customer) can be hard to identify. Some client organisations follow a strict hierarchical organisation where members in the organisation structures solely communicate with their immediate superior and with their immediate subordinates. Structuring organisations in this way could, and most often does, hinder communications in different levels of the people involved in a certain project. A consultancy firm does not need to structure its organisation in such a strict fashion, however, usually the project client has their own type of project model which defines a projects scope – hence a similar project organisation is built for the consultancy firm as well. Consequently, traditional project management is often made up of large and scattered organisations that lack a tight project follow-up and support during as well as after a delivered service/product.

Agile approaches, in its managing of projects process, pose compelling possibilities to address such issues. Using an agile way of thinking should, according to Gustavsson (2013), give tools to cope with uncertainties and sudden changes in specifications of a project as well as incorporating the customer/project client into the process of delivering a successful final product/service.

Another aspect when addressing this subject is traditional ways of working, projects in this industry have been carried out more or less the same way the last decades (Yllén, 2012). Therefore, project managers could find it challenging to change old working habits. As of today, agile project management fails to demonstrate a dominant appliance outside of the IT sector, even though it has been argued to apply to any industry, the success stories are still quite few (Conforto et al., 2014). Project manager within the C&CE industry lacks proof of concept of adapting agile approaches onto traditional project management. This in turn leads to a reluctance to change working ways and work with business as usual best practices within this industry.

1.3 Purpose

The purpose of this study is to investigate whether project management within the C&CE industry – which so far mostly has been carried out in a traditional way – could benefit from utilising agile approaches. Since earlier studies (Yllén 2012; Bahceci and Holmgren 2014) have been concerned with agile project management in the design phase of a project, this study will look at agile approaches independently of a projects phases, with emphasis on the overall implications of utilising agile approaches in C&CE project.

Agile project management is a concept that has existed since the early 90's, however not yet named agile at that time, it started out as a collection of methodologies to better handle fast-paced development IT-projects. Attempts have been made to apply these methodologies in other industries, without fully understanding the implications of such working ways. What has become more evident in later years is that the values and principles of agile should be seen as approaches and not utilised too methodical or interpreted too literally (Gustavsson, 2013). The study will therefore clarify how agile potentially could be applied outside of software development projects.

1.4 Research questions

Main research question for this thesis,

> *Could agile approaches be applied autonomously of the phases in C&CE projects, which normally utilise a traditional project management?*

To support the main research question, the following sub-questions will be further investigated,

> *What are the prerequisites in order to apply agile approaches?*

> *What kind of effects would these new ways of working have?*

1.5 Delimitations

Denoting traditional projects management as solely the structure of PMI is a chosen delimitation due to the large extent of many project-specific project models at different project client organisations. These can follow many different structures and have other phases than the once presented in this study.

This study will not be looking into an implementation of agile approaches since that would entail organisational change, change management and new education forms within the organisation. All in which is beyond this study's scope. The study will also refrain from involving political influences of how some projects within the C&CE industry is steered.

The interviews will provide data focusing primarily on the working environment, different project management approaches and more practical managerial issues. Not involving technical aspects of certain project tools nor project management software.

The conclusions of this study are such that focus on the general approach towards applying agile approaches in a non-software development environment. The study will not investigate implementation strategies of APM, nor will it present new tools. Each agile method or agile tool could be further investigated separately to achieve in-depth information of practical usage in the C&CE industry.

2. Method

This chapter contains the methods that have been used for the data collection process. The overview of data collection is firstly presented followed by a more descriptive manner of the process. The different sections included in this chapter will each contain the suitable method/methods to use in order to gain the most valuable data for the corresponding objective. The chapter is concluded with the researchers reflection of the research quality of this study.

2.1 Methodological approach

This study has been carried out on the basis for how a large global consultancy firm operates on the Swedish market within C&CE projects. The research has been stationed at WSP Management which is a division at WSP Sweden that focuses on the project management and consolidation of the resources needed for a project. In conducting this research, the approach was to access data in an open-minded manner, this was mainly because of the fact that the research area is highly subjective. Therefore, the method of Grounded Theory (GT) was utilised. GT aims to discover what factors are relevant to the studied phenomenon and to examine the relationship between these factors, i.e. find relevant pattern from which new theories and models can emerge. Based on these factors and observations, hypotheses could be made and tested (Guvå & Hylander, 1998). These hypotheses were tested during the primary data collection for the study. GT can also be used to add new aspects and thus contribute to the development and renewal of existing theories. Since previous studies had been carried out in similar fashion as this study, the further development of already existing theories was of great importance. At the early stages of the study, the problematisation for this research was mapped out and illuminated in order to identify possible gaps. Thereafter an indication of what possible gap fillers might look like was imagined, these are defined only on the basis of a certain issue specifically made for this study.

As recommended by Guvå and Hylander (1998), possible gap fillers were imagined on the basis of certain issues so that the researcher at hand does not in advance know nor have a finished image to pursue. There is no right or wrong ideas that can be connected, such is the methodical approach of GT, there must exist lots of different ways in shaping the outcomes of a study such as this. GT is commonly used in the unexplored areas of concern, where the relevant variables have not yet been defined or formulated. The nature of agile approaches is such that should not be too strictly defined. It is the researcher's task to discern, define and build a body of knowledge of the material available.

Since this is a qualitative study of collecting data in social science context, it falls under the interpretivist paradigm. Interpretivists attempts to minimise the distance between the researcher and that which is being researched. The researcher interacts with that being researched, which was a distinct approach during the interviews in order to achieve a deeper understanding of the studied phenomenon. Throughout the research an iterative approach was utilised, in which the problem formulation, purpose and research questions were continuously updated as new knowledge was gained (Blomkvist and Hallin, 2015).

2.2 Data collection

The method used for this research will follow a qualitative data collection approach, which implies that the data collected is transient and understood only within the research context (Collis and Hussey, 2013). In the early stages of this research the focus was heavily on meetings with the supervisors at WSP Management combined with a comprehensive literature study. The literature study aids the researcher as a means to gather secondary data for this thesis and the meetings with the supervisors helped to regulate and find valid material to collect. The thesis will be built on both primary and secondary data, primary data will consist of interviews and the literature study will provide secondary data. Combining these data collection methods tends to reduce bias in data sources and methods used in other research (Collis and Hussey, 2013). Also, an advantage of using primary data was the collection of information for the specific purposes of this study. In essence, the interviews conducted where tailored to elicit the data that would foster this study.

2.2.1 Literature review

In the earliest stages of conducting this study, the researcher aimed to capture the context of the involving theories that is going to be included in this research. Initially a thorough literature study was carried out, aimed to understand the basis of the studied phenomenon. The theoretical field of agile methods and approaches is enormous, but at times not too scientific (Jansson, 2015). Therefore, sorting out qualitative data that have gone through peer reviews and been scientifically declared was of upmost importance to attain an objective and holistic view of the found material. Also, gathering and sorting out valid information was done before interviewing people who work with agile, since they tend to be biased towards their approach.

The literature review allowed the researcher to have a more critical view to the involving aspects of a theory/subject and that sort of attitude is imperative in the beginning of a research to not get too influenced in a specific direction. A literature review is not merely a description of previous research collected during the process, but a critical analysis of the relevant literature for the conducted research.

2.2.2 Conducting research questions

The literature review worked as a means to strengthen the secondary data for the thesis, the deeper knowledge of the matter at hand is used to create semi-structured interview questions. The researcher had the opportunity to conduct the study at WSP Management in Solna, therefore daily observations was made of day-to-day work for project managers. This allowed the researcher to acquire practical knowledge and experience in daily challenges that project manager's face, which in turn allowed the researcher to create well-based semi-structured research questions for the interviews. According to Collis and Hussey (2013) the main function of semi-structured interviews is to understand what the interviewee thinks, does, or feels towards certain concepts and for this study, ways of working.

Semi-structured interviews allow the researcher to ask additional questions to explore new issues or when more detailed information is needed (Collis and Hussey, 2013). The interviews will provide primary data focusing on the working environment, different project management approaches and more practical managerial issues. The interviewees targeted;

- Traditional project managers and team members
- Agile coaches and entrepreneurs
- Professors in project management
- Developers of project management models and tools

By using a semi-structured approach with open-ended questions, the involving theories and practises can be encapsulated by specialists and experts in their respective field. The information obtained from the interviews will allow the purpose and research questions for this thesis to have more ground and validity. Since the main research question aims to provide a more concrete answer for how to incorporate new approaches – and to benefit from those – the sub-questions are concerned with aspects to *what* is considered as prerequisites for utilising such approaches and what effects such outcomes would bring.

On top of a detailed literature review and knowledge about traditional project management within the industry for C&CE projects, as well as agile approaches, further observations were conducted at WSP Management. These observations entail everyday work, meeting structures, involvement in seminaries, internal education and mini-interviews to sort out project management concepts. This allows the researcher to not only explore but also understand the ways that best practise is used today in project management.

The primary data collection consisted of observations done by the researcher, as well as interviews with project managers and team members. The interviews conducted will be open-ended questions regarding best practise and general approaches to traditional projects in the past. The observations combined with the interviews will then be analysed and reviewed to try to identify possible gaps where agile methods would be appropriate to use for more efficient project management. The observations also provide valuable information for creating a theoretical generalisation of traditional project management.

2.2.3 Interviews

For the collection of primary data for this thesis, six interviews have been conducted. The interviewees have been carefully selected and examined to assess valuable knowledge about project management. All the interview's conducted with traditional project managers has been at a senior project manager level. A senior project manager has extensive multiple years of experience with large and complex projects. The interviewees were selected for a long list of interesting interviewees that could aid the study in its empirical data collection. The researcher along with the supervisors at WSP Management and the supervisor at the researcher's university together mapped out interviewees that obtain certain aspects that would aid the researcher in reaching a desirable result in answering the research questions.

The mapping of different competencies and knowledge turned into an interviewee short list in which six names was left. Four interviewees from a traditional project management background, with each interviewee baring its own special competence to build a strong foundation in understanding PM's in the C&CE industry. To acquire the appropriate knowledge about APM, two official experts was chosen. One in the consultancy industry who has great insights in incorporating agile approaches in everyday work and therefore possessing grounded knowledge of APM. The other one being an author in the field of APM as well as teaching effective project management at a university level brought authenticity to the theoretical aspects of APM. The interviewees are described in short below:

- Senior project manager at WSP Management with special support in large or difficult projects. Professional background in legal issues such as contractual and licensing, also a great deal of experience in housing projects. The interviewee provided this study with the understanding of certain barriers to what could hinder the flourishing of agile approaches in the C&CE industry. Interviewee had no prior experience with agile project management but had general knowledge of the concept agile.

- Senior project manager at WSP Management, chief of staff in a large highway project. Supports team leaders for each technical area with right type of knowledge and experience. Has been working with many C&CE projects for decades. Interviewee provided this study with understanding of how top management works with traditional project management. Interviewee had no prior experience with agile project management but had general knowledge of the concept agile.

- Senior project manager and senior consultant at WSP Management, educates organisations in project management and supports project managements systems. Main field of work is quality management and the creation of a framework to unify working ways in *Project Slussen*. Provided this study with insights to how traditional project management is being educated to other organisations and the creation of project framework. Interviewee had no prior experience with agile project management but had general knowledge of the concept agile.

- Senior Technical Director of Environmental Impact Assessment and Strategic Environmental Assessment, Project manager and research manager for internal urban planning research at WSP Civil Engineering. Provided this study with experience in actual practical utilisation of a Scrum-based approaches in a high-speed railway project.

- Chief of Consultants at Wenell Management AB. Wenell Management AB was founded in 1967 and is today one of the leading consultancy and training companies in the Nordic region. Wenell seeks to help their clients to succeed with their projects and with their leadership. Works as an agile advisor in organisations as well as educational environments and holds inspirational agile seminars. Provided this study with agile expertise for the empirical fact-finding.

- Lecturer at Karlstad University, runs a master's degree program with a specialisation in project management. Author of award winning book “Agile – how to finish projects” and “Agile Project Management”. Provided this study with agile expertise for the empirical fact-finding.

2.3 Research quality

The quality of the material collected was quality approved continuously by two supervisors at WSP Management as well as the researcher's university supervisor. The qualitative methods used to collect empirical data must be analysed. Since this study is designed to seek depth and richness of data at some point the scope will have to be limited. According to Collis and Hussey (2013) when analysing qualitative data limiting the scope of the study will bring more focus and help to sort out what is no longer interesting. It is however important not to do this in a too early stage since embracing ambiguity is a powerful assessment. Data reduction is a form of analysis that sharpens, sorts, focuses and discards data in such a way allows the final conclusions to be drawn and verified. Making sense of the empirically qualitative collected data could only be well executed when one is highly familiar with the collected data.

In conducting this study, the researcher has been carefully selecting which literature to involve in the literature review chapter, only concerned with involving literature that corresponds to the subject field that the problematisation, purpose and research question specify. According to Blomkvist and Hallin (2015) this is how validity is achieved.
Studies with a qualitative approach tend to have low reliability as interpretations and observations depend on how the researcher explain and understand the reality (Collis and Hussey, 2013). Reliability therefore carries little weight in an interpretivist study, this is mainly because the result of such studies are hard to replicate and achieve the same results. It is therefore important to try and establish protocols and procedures that establish the authenticity of the findings. The findings from the interviews were structured in such a way that all the answered questions was put in tables that overviewed the findings and from which interviewee the answers or statement came from. This way the researcher could allow to identify patterns in different findings to establish authenticity in the various statements.

For each interview, some questions were reoccurring but also combined with a new set of questions in order to match the respective field of the interviewee. Before each interview, all the created interview questions were quality assured by the researcher's supervisors at WSP Management to allow for a higher degree of validity. The validity is the extent to which the research findings accurately reflect the phenomena under the study.

3. Literature and theory

This chapter helps positioning this research in the already existing body of knowledge in the field of project management. The literature and theories that will be needed for conducting this research is shortly described and the chapter concludes with a reflection of the reviewed literature and a thematic framework.

3.1 Traditional project management

Since the definition of a project is; “A project is unique in that it is not a routine operation, but a specific set of operations designed to accomplish a singular goal”, there are many different kinds of project management. This is due to a wide variety of aspects. These could be different projects scope, organisational structure & beliefs, industry specific and best practises. Usually, project client organisations have their own specific project model which is produced and developed to suit the organisations overall mission, vision and working ways. However, for the sake of this study and to avoid incoherency, PMI’s PMbok will define traditional project management. Often, PMbok functions as a basis for many organisation’s project models.

3.1.1 Overviewing Traditional Project Management approaches

A projects lifecycle is a collection of project phases, usually following a sequential order and with a stage-gate principle. A stage gate principle is set in place in order to control the progress of the project, and steer the project in the desired direction. Specific deliveries and activities are managed as tasks with a corresponding milestone to achieve. Often, but not always, milestones have to be achieved for the project to continue (PMbok, 2008).

In the early stages of traditional project management, cost and personnel levels are quite low and is considerably higher as the project goes into its execution phase, see figure 1. Another feature of the early phase of a project is that stakeholders influence, risk and uncertainties are high. These factors are controlled by careful planning and is estimated to decline as the project progresses.

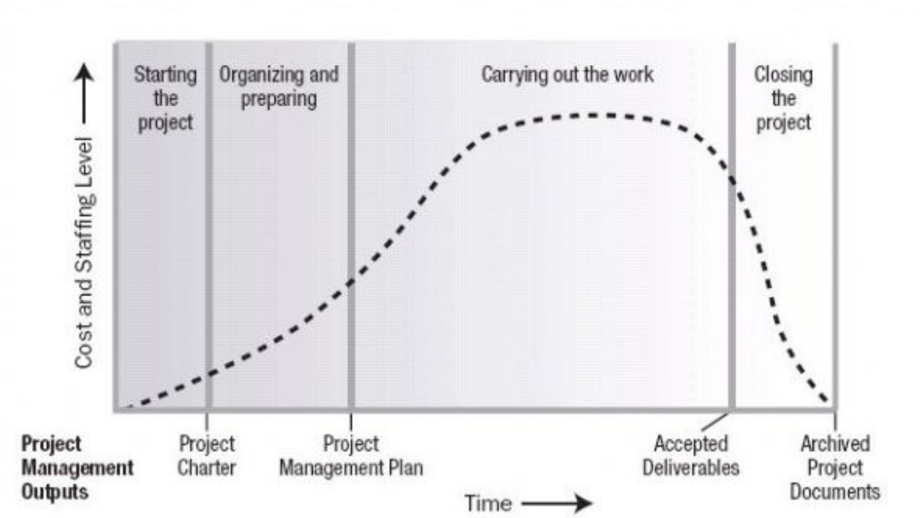

Figure 1 - Overviewing Project Management Outputs according to PMBOK (2008)

Project phases exists so that a project could be managed and additional steering is supposed to aid the completion of a certain large delivery. A large delivery could be a technical solution within a particular area that the project needs to progress, often referred to as a milestone. This refers to the earlier described stage-gate principal. The project phase structure exists to formalise a foundation for decision making, the project phases are listed below;

1. Initiating
2. Planning
3. Executing
4. Monitoring & Controlling
5. Closing.

Project management is, according to PMbok (2008), the overall perspective to utilise a uniform method to steer and cover all aspects of a projects scope and goals. This uniform method should be one that envelops the project plan of the organisation that is the sponsor of the project (a project client's organisation).

1. Initiation phase

The initiation phase of a project is to identify all possible stakeholders for a certain project, e.g. how and why people or organisations are affected by the project. In this phase the project client develops a project charter as well. The first point in a project charter is a Project Statement of Work (SOW) that clearly states the business need of the project – based on market demand, technological advance etc. The SOW concludes with a strategic plan which includes the organisations strategic goals. The initiation phase proceeds to the next phase when all documents are in place and an investment basis for contracting an external party to plan the project (supplier of a project).

2. Planning phase

In the planning phase, the project plan is designed. The project plan should comprise a comprehensive list of project requirements, define the scope and processes of the project, defined tasks and sequential order of task execution, a detailed resource assessment, tasks allowed duration and a task time scheme. In accordance to this, the projects risks, costs and quality assessment needs to be fully analysed as well. The planning phase will function as the foundation of how the end-result of a product/service will look like, in the execution phase this solid foundation is about realising the specified product/service.

3. Execution phase

In the execution phase all gathered data for the project plan acts as a foundation for the management process of the given project. In this phase quality assurance of the process needs to be set, resource allocation with right skillset must be recognised, develop teams, manage teams, distribute information, handle stakeholder's expectations and lastly find suitable contractors to carry out the physical construction of the project.

4. **Monitoring & control phase**

Monitoring and controlling the project is the phase where progression is traced, reviewed and regulated to assure that project goals are met. The project management steers the scope, time allocation, costs and quality to meet project client's satisfaction.

5. **Closing phase**

The closing of the project is the last phase and the notion of handling over a finished product/service.

3.1.2 Project triangle

The project triangle aims to display the varieties in trade-off's between how a project could be steered in one direction and thus lacking quality in another, see figure 2. Certain limitations are always found in a project. A project with no restrictions would be easy to lead but unfortunately a typical project is limited by at least one of the factors of scope, time or cost. Sides of the triangle show the relationship between these factors in a project (PMbok, 2008).

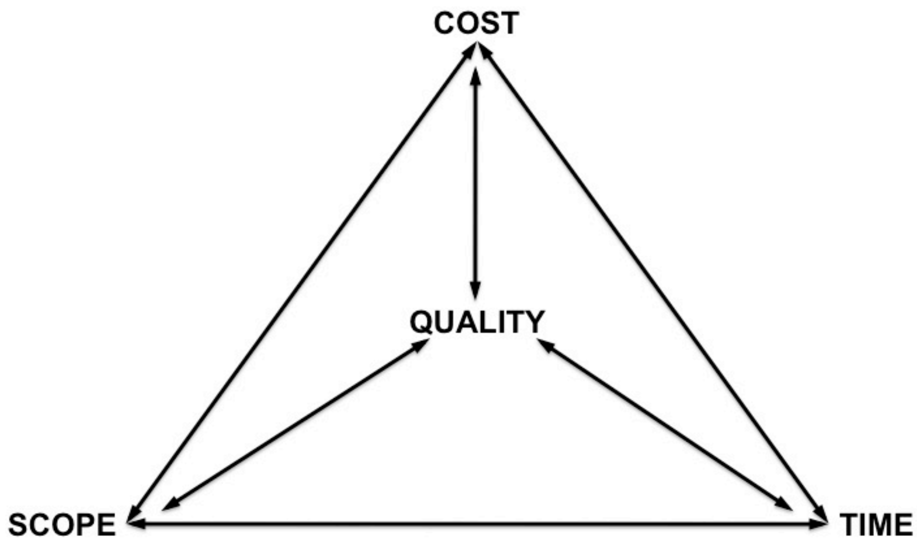

Figure 2 Project triangle illustrating main drivers for project management

As the illustration of the triangle show, all sides of the triangle point towards the quality/results of the project. If one side changes, the other sides of the project triangle are affected. If the projects scope increases, that is, if the project is commissioned to deliver more, it will probably take longer, and perhaps at a higher cost. In almost all projects, at least one of the sides fixed. If the scope is fixed, the project must deliver a specific functionality. If time is fixed, the project must be completed by a specific date. If cost is fixed, the project cannot exceed the established budget.

3.2 Agile project management

"Agile methods are based on the central to see the actors' innate ability to learn from experience, to find creative solutions, and to spontaneously seek to derive mutual benefit from each other. The agile methods are therefore directed to create situations where players are able to communicate very informally and can govern themselves"

-Tomas Jansson, PhD & Professor of Project Management at Karlstad University

Agile project management was developed to better handle and cope with emerging change and uncertainties in any type of project. Change can come in many forms, change in project scope, specifications, management etc. Project managers, or anyone who has ever been involved in working with projects, knows that unwanted change always emerge in some form. It is inevitable to evade due to many factors, but one in particular is that every project is unique and therefore each new approach is different. As written in the introductory chapter to this thesis, projects can nor should be processed in a uniformed way. An agile approach towards project management could allow for a more respondent and innovative way of handling project management in an otherwise conservative industry.

"In all projects there always exists an amount of uncertainty about a particular product/service, if uncertainty did not exist we would not have projects at all, we would solely be working with processes"

- Tommy Olin Agile coach at Wenell Management

3.2.1 The Agile Manifesto

Due to many different methodologies floating around in the software development industry during the 90's. A lack of structure of these methods spurred 17 method developers to create a common set of principles and values to represent the vast majority of the methodologies. During a meeting taking place in 2001, the Agile Manifesto was created. The agile manifesto was the birth of the term agile. However, working in an "agile" way was expressed differently in the existing methodologies. Therefore, these 17 method developers who represented different agile methods saw the need to concretise these flexible, adoptable and always evolving approaches as well as giving it a name. The result was 12 principles that together would represent the term Agile, the principles are (Beck et al., 2001);

- Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.
- Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.
- Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.
- Business people and developers work together daily throughout the project.
- Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.
- The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.
- Working software is the primary measure of progress.

- Agile processes promote sustainable development. The sponsors, developers and users should be able to maintain a constant pace indefinitely.
- Continuous attention to technical excellence and good design enhances agility.
- Simplicity—the art of maximising the amount of work not done—is essential.
- The best architectures, requirements and designs emerge from self-organising teams.
- At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behaviour accordingly.

Extracting the essence of these principles, agile boils down to a set of values when utilising agile approaches. Out of the 12 principles came four main values that best encapsulates agile, these are;

Individuals and interactions	**over**	**processes and tools**
Working software	**over**	**comprehensive documentation**
Customer collaboration	**over**	**contract negotiation**
Responding to change	**over**	**following a plan**

It is important to understand that these are values and not prioritisations, the values to the right side is needed but the left side holds greater value when it comes to being agile (Gustavsson, 2013). Dingsøyr et al. (2012) wrote in their article *Towards explaining agile software development* that the principles of the agile manifesto are not a formal definition of agility, but are rather guidelines for delivering high-quality solutions in an agile manner. At its core, agility entails the ability to rapidly and flexibly create and respond to change in the business and technical domains.

Individuals and interactions **over** **processes and tools**

The Agile Manifesto focuses on the people who develop solutions and how they communicate rather than primarily how they work and with what kind of tools. The importance of having strong teams where everyone collaborates and performs is often better than a team where the skillset exists only by few individuals who do not share their experiences. The tools used to create a solution are important but before new expensive tools are purchased, the team should test the existing ones and use what is already available. It is important to develop the team and make the group dynamic aspects in front of the technological solutions, let the team create their own working environment and identify the necessary tools needed (Martin, 2003).

Working software **over** **comprehensive documentation**

Traditionally, a projects design is to set up a goal to deliver the project results of the entire project at one point somewhere in the far future. The agile way of doing things is instead - the process of dividing tasks into short cycles and at the beginning of each cycle there is an opportunity to both review the past cycle but also thoroughly plan the upcoming cycle. At the end of each cycle a useful part of result is presented.

As the title imply, working software entails information of applicability in the software development industry, however this does not mean that it cannot be applied to any other industry. By simply re-writing it into “Workable project results over comprehensive documentation” (author’s translation) it holds the same strong value for other industries as well (Gustavsson, 2011).

Customer collaboration **over** **contract negotiation**
Software development as opposed to any project is not just a process. Thus, it is difficult to negotiate contracts with fixed frames early on with the hope that they will be fulfilled. It is not uncommon that a contractual framework is outdated when the project starts. This is because of long time periods that occurs between the project specification and the project outcome. Instead, the manifesto advocates that the work is instead controlled by close contact with the customer in order to achieve the desired product (Martin, 2003).

Responding to change **over** **following a plan**
The longer a project progresses, the more experience and common understanding is shared, by both the customer and the supplier. Incorporating change into a product or service could be the perfect finishing touch to a successful outcome. Although planning is important, according to the agile methodology, the plan changed so often that there is no value in spending time on extended planning. Instead, planning should only be done for short periods of time and the remaining part of the project should be planned as little as possible for the work to continue.

3.2.2 Overviewing Agile methods

Four of the most common agile methods are presented in this section to illustrate the roots of agile and the birth of the most commonly used agile method called Scrum (see section 3.2.3). These methods are intended for the software development industry, mainly because they are hard to scale to big projects. It is however important for this study to be aware of the origin of agile approaches. Also, as a reader of this study keep in mind that these methods were created before the agile manifesto, the agile manifesto became an umbrella to cover the varieties of methodologies. All methods in this section are described accordingly to Jansson (2015) thorough doctoral study of all existing agile methods and working ways to date.

Extreme Programming (XP)
XP revolves around incremental planning, simple documentation, short development time and frequent informal communication between participations. The method is based on a number of fundamental values and principles, these concern;

- Simplicity (what is the simplest solution that could work)
- Frequent feedback on performance
- Courage (to be patient, to dare to be sincere and to seek real answers) and mutual respect.

The method provides techniques and tools primarily on how the work of the team should be arranged. An example of this is the Project Manager - facilitates communication within the team and between the team and the business environment, Product Manager - facilitates communication between the team and the client, and is responsible for the description and prioritisation of the functions to be developed, Coach - which will encourage independence.

Techniques and method components may vary for each individual project, how and in what way they are implemented, as long as they reflect the underlying values and principles. Independence is central to XP. The method can be described as a system of starting points (values), principles and proposals for concrete arrangements to accomplish everyday situations reflecting valuations. XP is, however, primarily applicable on small teams and the task of creating the program. The focus is clearly limited to systems development, since these values are hard to reach in scaled organisations.

Feature Driven Development (FDD)
FDD identifies three types of challenges to overcome. Language and communication problems between different individuals and parties around the project, the complexity that must be managed at the system and the difficulty to balance internal quality against external (i.e. technical quality against functional). The strategy to address this is not described in detail. Primarily, success is achieved with skilled individuals' commitment and ability, and secondly through the access of relevant processes and technologies. As a method, FDD is structured as best practices, defined roles and processes. The processes divide the workflow into five phases, where the first three create a comprehensive model of the system, it translates to the features needed and then to a rough plan for future work. The last two, a sequence of design and development per feature, iterated until all features are complete and the system is complete. An important point is to find a right abstraction- or level of detail for a certain feature; it must not be greater than it is possible to develop within two weeks, preferably significantly smaller. FDD also propose predetermined forms for documentation of features, and the use of standardised stage-gate meetings for monitoring the progress.

Crystal Family
Is a family of method variants in the form of coarse templates adapted to different project situations. The strategy behind the family Crystal Method is based on frequent deliveries, reflection, improvement and close informal communication. The product in question should be developed incrementally and the teams should be conducting reflection workshops, at least before and after each increment which discusses and decides on ongoing adjustments of the method to be applied.

In addition to the basic principles of frequent deliveries, reflection and improvement, and the close informal communication, four principles are listed and considered central to success but not always possible to completely satisfy; Individual security (to express concerns without risking harsh criticism), Focus (knowing what to do and having the time and working environment to be able to do it), Access to expert users, Technical environment with automated testing, versioning and frequent integration of systems. The strategy can be described as creating natural opportunities for close informal communication between the parties involved.

Adaptive Software Development
The team is gathered around a mission that indicate direction, inspires and guides decisions. All work follows three cyclic steps: Speculate, Collaborate and Learn. The term speculate is chosen to emphasise that complex tasks cannot be planned in the traditional sense, it is, instead, to formulate the direction (mission) and a kind of work hypotheses on how to proceed. Collaborate is aimed at work and Learn emphasises that all work generates learning and new conditions that can be used in Continued iteration of the steps. Timebox is an important concept, it is the term used to define a certain task within a certain time frame, where the time frame has a specific deadline that cannot be budged. Timeboxning forces the balance between internal and external quality, short and long-term perspective, it forces pragmatism and learning.

3.2.3 Scrum

Scrum is the most commonly utilised agile method, according to VerisionOne's yearly *State of Agile survey* (2016). The Scrum process, created by Ken Schwaber and Jeff Sutherland, saw the need for a more flexible project management, initially in IT-projects. Since Scrum is the widely most executed agile method, a more thorough description of the involved roles, process and meeting structure will be further explained.

3.2.4 Scrum – Roles

The process involves having clear roles such as Scrum Master, Scrum Team (consisting of a maximum of 12 people) and Product Owner. Setting time-fixed tasks utilising Timeboxning, and continues feedback from the customer in combination with tight follow up.

A Scrum master has the responsibility to coach and assist the team. An important task for the Scrum Master is to remove obstacles, both practical issues as well as lack of training for new team members. A Scrum Master's role is similar to the traditional project manager, this person should act as an enabler for the scrum team by ensuring that the agile values and practices that exists are adhered to as well as remove all possible impediments. The Scrum Master's role in the scrum team is to hoover over the team and enable them, not control them.

The Scrum Team should consist of cross-functional team members who work on the project full time. In Thomas Gustavsson's book *Agile project management* (2013) he describes why cross-functional teams are of great importance "The aspect of expertise within the group is due to the fact that change in projects is inevitable, it must be handled in the best possible way within the group's expertise". Henrik Kniberg (2009) defines cross-functional teams as "Cross-functional teams mean that the team as a whole has all skills needed to build a product or service, and that each team member is willing to do more than just their own thing". The team should also be self-organising, meaning that the leadership role within the team is not fixed and changes depending on the needs of the specific iteration (sprint) in process at the time. Having cross-functional team's means that the team members should be composed of peoples with different skills so that the exchange of knowledge within the team allows for continues learning, evaluation of solutions and effectiveness in work produced. The team should be put together by individuals that can collaborate well with each other, not simply because of acquired skills for that particular project.

The Product Owner is typically a functional unit manager who knows what needs to be built to enable the project and how the sequence of builds should progress. The Product Owner should incorporate the customer's voice in everything that is carried out. Schwaber (2004) describes the role as "having the responsibility of being a proxy for a sponsor or a customer". The most important tasks are to prioritise and clarify requirements to help the team in delivering the most important parts of the project result first. It is important that the product owner is both familiar with the organisation and interests of the person/s who formally commissioned the project. It is also important that he or she is available for reconciliation and issues occurring during the project. Having a sufficiently present product owner is critical for the agile project success, many agile projects falls on this point when the customer informed that they can not devote as much time to the project. Therefore, the most important aspect of a product owner is – availability (Gustavsson, 2013).

3.2.5 Scrum – Process

Once all roles are defined and fully understood, the scrum process can begin. The Scrum process is first triggered with a wish list of prioritised requirements drawn up by the product owner, named Product Backlog. The product backlog is made to reflect the needs or business objectives of the customer. Unlike a traditional project, this list is managed and owned by the product owner. The product backlog is created during one or more meeting/s together with the aid of the scrum master.

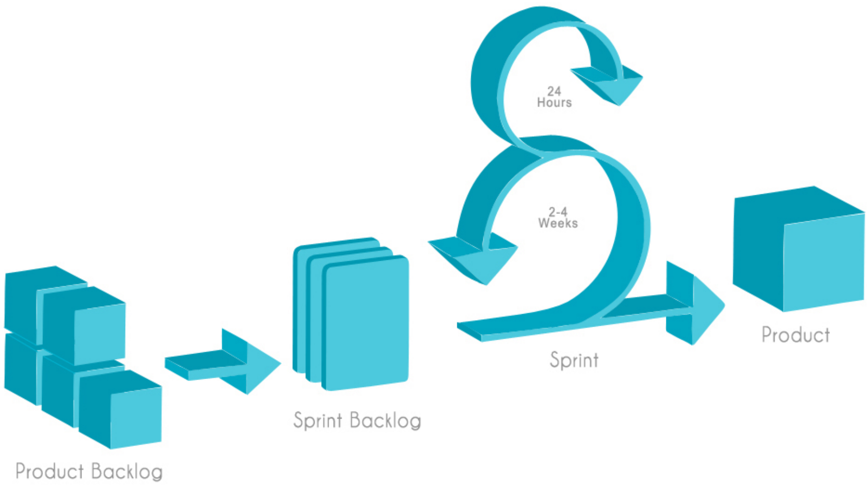

Figure 3. The scrum process (The Scrum Alliance 2016)

Next, the Sprint Backlog is created. This is a list of to-do items from the product backlog translated into activities for the scrum team to execute. The sprint backlog visualises the activities that needs to be performed in order to progress with the project. Each sprint in the sprint backlog is given a duration for completion, a task description and designated person/s to complete the task. These are called Scrum Cards and can have different designs depending on a projects scope, scrum cards are often referred to as Visual Planning. Visual planning is utilised to more explicitly visualise what needs to be attention in a project and which time duration is allowed for certain tasks. A sprint is the duration that the team takes to complete the tasks selected in the sprint backlog. A general sprint duration lasts for about 2 - 4 weeks. Once the sprint backlog is up, the team starts work on the sprint.

In producing the sprint backlog, the estimates of the prioritised work from the product backlog are specifically intended to be forecasts and not exact measurements. The estimation includes placing the backlog item/s into a size category. This is done in order to discuss the *story points* of an item. Story points are a relative measure of the complexity of a particular feature within the project. Story points are used to estimate the amount of hours or days of work that will be involved to complete the particular item.

Based on this estimation, a collective decision can be made that establishes the team's velocity or amount of effort that can be reasonably handled during one sprint. Similarly, the sprint backlog is the subset of product backlog items that are defined as part of the work for a particular sprint. However, unlike the project backlog, the sprint backlog is created only by the Scrum team members. Ideally the sprint backlog is updated every day and contains no more than 300 tasks. The team may need to break down a task if it is determined that it will take more than 16 hours. Furthermore, the team may determine that items may need to be added or subtracted from the sprint but this is the team's decision, it is not something that is directed by the product owner. Scrum intentionally focuses on work done through the use of burn down charts. A goal of a burn down chart is to provide information in an easy to comprehend manner. As such, each task is typically represented in terms of time (the x-axis of the display grid) and duration (the y-axis). The dotted line represents the optimal pace of executing certain tasks as well as setting the deadline for tasks to have been completed.

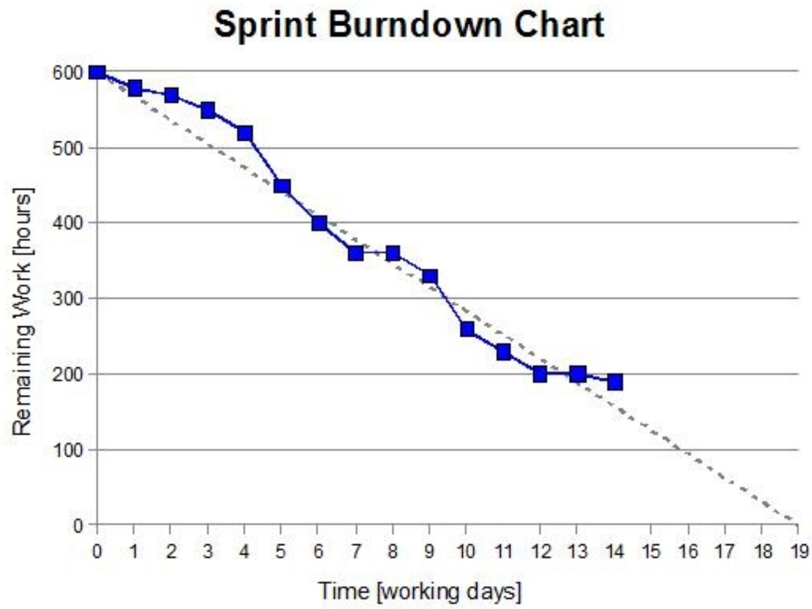

Figure 4. A sprint burndown chart illustrating activities in relation to time

A differentiating factor in comparison to traditional project management is that during a sprint, no outside influence should be allowed to interfere with the work of the Scrum team. This has several potential implications with the most important being that project requirements cannot be changed during a sprint.

3.2.6 Scrum – Meeting structure

In many projects that utilise Scrum, but not all, each sprint begins with a daily Scrum meeting. This meeting, characterised to be short and effective (about 15 minutes), is held every day between the Scrum master and the Scrum team. In this meeting, every team member briefly answers three questions:

(1) What did you do since the last Scrum meeting?
(2) What are you doing until the next Scrum meeting?
(3) Are there anything stopping you from getting on with your work?

The daily Scrum meeting is not meant to be a problem solving session and is not designed to be a way of collecting information about who (or what) is behind a planned schedule (Gustavsson, 2013). That is why it is important to keep it short. Instead, the purpose is to both track the progress of the team as well as allow team members to make commitments to each other and the Scrum master so that work can proceed in the most efficient way with as little impediments as possible. At the end of each sprint, the team meets to discuss their availability for the next sprint and review the sprint that has just ended. After a sprint is complete, a workable function or deliverable can be released or demonstrated to the product owner. This is done to receive feedback of the partial delivery and gather information on what can be done more effectively in the next sprint. This tight follow up is crucial in agile approaches.

3.2.7 Characteristics of agile approaches

When organisations become aware of agile ways of working and strive to call them self *agile*, there are several characteristics in ways of working when "going agile". The first is 'the people factor' (Cockburn and Highsmith, 2001). Gustavsson and Rönnlund (2013), describes the people factor as "Instead of trying to control thousands of people in large projects, agile approaches focus on how to achieve efficiency in small teams, no matter the size of the actual project itself". To achieve this, team members need flexibility in their team roles and the importance of having high autonomy in an informal working environment. The formal communication is usually carried out in a daily gathering for a fifteen minute, time-boxed, meeting to sort out any problems that arose the day before (Cockburn and Highsmith, 2001). This way the team has a better chance of working with the right type of solution given the right type of information.

Gustavsson and Rönnlund (2013) writes that another important characteristic of being agile is the use of a Timebox concept. This means that the time and date (the deadline) supersedes the activities, regardless of how many activities have been completed, the short project phase ends on a specific date. Timeboxning is therefore the term used to define a certain task within a certain time frame, where the time frame has a specific deadline that cannot be budged. It is supposed to clarify what could actually be achieved in a given time frame.

The foundation of this concept builds on the same premise as traditional deadlines in traditional project management but with the main difference of not, ever, extending a deadline. What cannot be done within the time boxed window has to be respecified or cut out. In executing Timeboxning, a project client must prioritise on what is most beneficial to achieve at a given time. This is the trait of an iterative working process. The deadline is completed by a demo of the projects results so far, this is done in order of getting feedback of the partial result from the project client. This is followed by a retrospective of the way of working during this time-boxed period. In management and control terms that mean that the project client must, together with the team, constantly prioritise and reprioritise what should be done before the accepted deadline. A large amount of collaborative involvement from both sides is needed during these demo/feedback-sessions.

This type of iterative planning and executions needs a distinctive definition of what is considered as useful material for the customer (Project client). Therefore, the term Definition of Done is an important concept of the agile way of working (Cohn, 2006). Gustavsson and Rönnlund (2013) highlights that the team members agree on what need to be fulfilled in order to call a part of the functionality (of a solution/product) finished and ready for use. An example is given: "to be able to call a partial delivery of a solution/product 'done', the functionality needs to be tested, documented and accepted by the customer". The word "tested" could be anything from running simulations to calculating tenability of a solution/product. An agile process aims at delivering usable functionality at the end of every time-boxed iteration. An explicit and concrete definition of done therefore means higher velocity and better estimations (Cohn, 2006).

3.3 Circumstantial factors for successfully utilising agile approaches in C&CE projects

In C&CE projects the process of managing a project follows a process which on paper seemingly can look trivial. The process is an overall view of how the construction of a building/facility consists of. It is usually divided into four different stages (highly simplified), these are according to Boverket (2016);

Feasibility Study (Needs investigation)
Designing (Product determination)
Production (The product)
Maintenance (Product usage)

However, the process is far from trivial and therefore this study argues that other approaches, such as agile, could aid the C&CE process in its progression. Which in each of the stages in the C&CE process, some circumstantial factors must be considered. Since traditional project management differs, not only in the methodological approach, but also in how managing a project is perceived, a profound understanding in all affected areas is important.

The researcher has, in conducting the literature review, identified and mapped out circumstantial factors that needs consideration when studying APM. In order to harness on the many alleged benefits of agile, some important factors must be met. This is important because agile approaches have a sort of "loose" definition of what needs to be done in organisations and how work flow should be run. Since working in an agile way has to be accepted by both parties, the project client (customer) and the suppliers of the project, some important factors has been identified. The agile way of having an adaptable approach towards a projects scope must indeed assure good relationships, mutual trust, collaboration and motivated team members.

3.3.1 Inter-organisational relationships

IOR is concerned with relationships between and among organisations, understanding the character and pattern, origins, rationale, and consequences of such relationships. IOR is conceptualised in terms of situations in which one or more people from each of two or more organisations establish a working relationship. It focuses on the properties and overall pattern of relations between and among organisations that are pursuing a mutual interest while also remaining independent and autonomous, thus retaining separate interests (Copper, S., 2008). There are different dimensions across which organisations can be related, in this study two of the most common ones are described. According to Cropper (2008) these two dimensions are; interactive relationships, for instance in the exchange of information or resources, or non-interactive relationships when organisations share particular attributes – such as status, identity, cognitive structures, strategic positioning, or core technology – that induce the same behavioural stimuli in related members and/or expose the organisations to the same evolutionary forces. For this study the dimension of interactive relationship is considered as most applicable when studying agile approaches in C&CE project management.

Since suppliers and customers are bound to engage in long-term relationships for the development and implementation of a certain project, according to Forsgren (2008) the foundation of IOR are considered important for both parties economic interests. The business relationship of organisations working together are established and developed through the investment of time and resources to support and facilitate interactions between all involved stakeholders (this will be further discussed and analysed in the analysis chapter of this thesis).

In an article written by Love, P. et al. (2002), the authors want to establish a model for supporting inter organisational relations in the supply chain. In the article, two types of partnering share many attributes as partnering in project management. These two, which tend to predominate, are; *strategic* and *project*. *Project partnering* is a relationship established for a single construction project which focuses on short-term benefits, while *strategic partnering* is a long-term relationship beyond a discrete project that seeks to gain long-term business benefits. Cowan (1991) defined *project partnering* as a method of transforming contractual relationships into a cohesive project team that comply with a common set of goals and rely on clear procedures for resolving disputes in a timely and effective manner.

These procedures are well in line with the agile project management approaches. *Strategic partnering* could be beneficial for projects in the private sector, but in the public sector it is widely different. This is because of the Swedish government law of *Public Procurement Act,* the purpose of the procurement rules is to ensure that authorities intending to procure goods or services use the public funds that finance public procurements in the best possible way by seeking out and benefiting from the competition in the market concerned. Therefore, long-term relationships can only exist within the discrete project, not beyond.

3.3.2 Trust in project relationships

Kadefors (2004), writes in her article on *Trust in project relationships*, that several studies have shown that partnering projects on average are more successful that traditional ones. Opposed to this some argue that there are no guarantees of success with utilising partnering methods or approaches. Thus, for inexperienced partnering candidates, the risk of ending up in quite traditional roles and relationships still seems to be substantial. The notion in many new thinking approaches and strategies, such as agile etc., are that they seem appealing at first but could carry hidden drawbacks.

If trust is present, people can spontaneously engage in constructive interaction without pondering what hidden motives exchange partners might have, who is formally responsible for problems, or the risks of disclosing information. This is considered as vital in an agile organisation, an open and transparent working environment in which the scope is always customer satisfaction. Mayer et al. (1995) wrote an article *an integrative model of organisational trust* is concerned with the different categories of trust, which poses some interesting point when initiating a supplier – customer partnership. Therefore, it would be recommended to review what kind of partnership that is going to be initiated. Apart from the trustor's propensity to trust, the most important antecedents of interpersonal trust could be grouped into three categories:

1. The trustee's perceived Ability
2. Benevolence
3. Integrity.

Ability refers to skills, competencies and characteristics relevant to the specific situation, while benevolence is the extent to which a trustee is believed to want to do good to the trustor. This aspect encompasses factors such as loyalty, receptivity and caring, and suggests that the trustee has some specific attachment to the trustor, aside from an egocentric profit motive. Integrity, finally, involves a perception that the trustee adheres to a set of principles that the trustor finds acceptable. Such principles include consistency, fairness, reliability, openness and a general value congruence. All three qualities—ability, benevolence and integrity—are considered to be required for trust to arise (Kadefors, 2004).

3.3.3 Collaboration

Dewulf and Kadefors (2012) wrote the article *Collaboration in public construction—contractual incentives, partnering schemes and trust,* with the aim to investigate how formalised context influences collaboration and relationship-building in public sector contracts and to identify strategies that practitioners may use to promote collaboration and trust. The authors identified that many public construction projects are using partnering regimes today. It has grown in popularity and are often implemented in projects where risks are too high to allocate to one party only. However, public procurement regulations put restrictions on the interaction between the buyer and the suppliers and, thereby, on many processes that are generally considered essential to establish trust and collaboration.

Dewulf and Kadefors's (2012) study show that contracts are developed unilaterally by the client and largely fixed before the relationship starts and pre-contractual communication is restricted. Possibilities for clients to select suppliers based on subjective criteria are also limited. This limitation is hindering the C&CE industry from fully utilising new concepts and approaches, such as agile. But the partnering concept, has become increasingly institutionalised and associated with a specific set of tools and practices. These tools include selection procedures, formal team-building exercises, financial incentive systems, formal integrative mechanisms (such as charters, dispute resolution procedures, team-building workshops and the use of facilitators), continuous improvement programmes and benchmarking (Bresnen and Marshall, 2002; Nyström, 2005; Bygballe et al., 2010, Eriksson, 2010). These tools and procedures all hold potential to be performed in an agile manner as well as establishing an agile working environment.

According to Hoda et al. (2011) customer collaboration in traditional software development projects is typically limited to providing the requirements in the beginning and feedback towards the end, with limited regular interactions between the customer and the development team. This is also a common feature in traditional project management in C&CE projects. Hoda et al. (2011) continue by elaborating that in contrast to traditional project management, customer collaboration is a vital feature and an important success factor in agile approaches. Agile approaches expand the customer role within the entire development process by involving them in writing user stories (customer describing how solutions want to be used – practically), discussing product/service features, prioritising the feature lists, and providing rapid feedback to the development team on a regular basis. This advocate high levels of collaboration between the team and their customers in order to frequently release product/service features that deliver business value in each iteration. Customer collaboration involve – planning, prioritising, reviewing, and providing feedback.

3.3.4 Motivation in teams and working environment

Motivational environment is an essential factor for achieving and maintaining high productivity, this is important in any organisation but even more so in agile working environments. The working environment should be such that have a solid ground for supporting the teams and employees in their productivity. Agile environments encourage self-organisation and end-to-end responsibility, relying on personal motivation. In order to utilise a desirable agile outcome, judging by its working principles, is highly dependent on the involved people's motivation (Jansson, 2015).

The Motivator-Hygiene theory is a model proposed by psychologist Frederick Herzberg, who found that satisfaction and dissatisfaction are independent of each other (Herzberg, 2008). The things that motivate people on the job are different from the things that demotivate them. Bad environments, low salaries, and bureaucratic rules are examples of things that make people unhappy. However, people are motivated by other things, such as increased responsibilities, their ability to do a good job, the opportunity to make their own decisions, and the sense of belonging to a group. Herzberg (2008) makes a distinction between motivators and hygiene factors:

Motivators: Challenging work, achievement, personal growth, recognition, responsibilities etc.
Hygiene factors: Job security, salary, status, working conditions, policies, fringe benefits etc.

According to this theory, you cannot motivate a person by "eliminating demotivation." It follows from Herzberg's theory that you also have to introduce motivators: the things that really motivate people. They are different from mere hygiene factors.

Another perspective on motivational theory is the existence of “effectance motivation”, meaning that motivation must be understood as two different views of motivation (Deci and Ryan, 2000), each one with its own type of dynamic. These two different views are titled intrinsic & extrinsic motivation which poses some interesting points when studying agile project management.
Intrinsic motivation is defined as the doing of an activity for its inherent satisfactions rather than for some separable consequence. When intrinsically motivated a person is moved to act for the fun or challenge entailed rather than because of external prods, pressures, or rewards (Ryan and Deci, 2000). This type of motivation is about the desire to really learn, grow and develop with the job you have been assigned and the will to carry it through in the best possible way to obtain continuous learning. This requires an open working environment where it is allowed to act with high autonomy. This form of motivation is well in line with what agile methods suggest, self-motivated team that encouraged creativity.

In contrast to intrinsic motivation, *Extrinsic motivation* refers to the performance of an activity in order to attain a desired outcome and it is the opposite of intrinsic motivation. Competition is an extrinsic motivator because it encourages the performer to win and to beat others, not simply to enjoy the intrinsic rewards of the activity (Ryan and Deci, 2000). This type of motivation seems to be the most dominant in the C&CE industry because of the apparent design of the task and the information at hand is more robust and easier to apply (Schmid and Adams, 2008). There is little room for creative thinking in order to reduce risks of performing tasks with insufficient quality in the project.

3.4 Insights from the literature review

Reading about agile methods and studying the agile concept of being flexible and adaptable in the way project management is to be carried out, agile appears to be very appealing and seems to hold great potential. Even so, assuring that important tasks finishes on time, desirable results are achieved and the projects scope is controllable. There is, to say the least, much at stake.

The agile methods do not contain instructions on how the task (project) is to be handled. Instead, it is implicit in the strategies the methods describe, clear working instructions are missing probably because the methods are based on agile approaches that should allow for some ambiguity in its performance. However, some recurring arguments are evident:

- Requirements and solutions will change during the project
- Feedback and learning is emphasised
- Incremental and iterative development
- Need for extensive, close, transparent and informal communication between the parties involved in the project
- Autonomous / self-organised development team
- Frequent reflection and improvement of work processes
- Pursuit minimal documentation and simple solutions

The way that PMI's PMbok structures a project could act as a valuable design frame for a projects scope, however it could benefit from the incorporation of other aspects as well – such as the notion of being agile. In being agile, in the type of project setting C&CE projects are in, many other factors need consideration before companies in this industry starts to hoist the agile flag. The need to understand that in allowing for flexibility and adaptability in project management entails building up sufficient trust, well established collaboration platforms and a profound understanding for how to best nourish relationships. Connecting the structure of PMI (traditional project management) with the agile literature and methods as well as theory about relationship, trust, collaboration and motivation – will altogether aid this study with a thematic framework to analyse what and how agile could be applied in C&CE projects.

3.5 Thematic framework for data analysis

The thematic framework is for the evaluation of primary and secondary data. The framework is created by the research and aids the study in the analysis of data collected. It is used to connect the literature review (secondary data) with the findings from interviews (primary data), and was created to illustrate what utilising agile approaches entails in the form of human behaviour. The four themes of the framework touch upon areas that are concerned with agile but is not explicitly elaborated upon in the literature. The framework aims to contextualise the surrounding factors of what utilising agile approaches would impose. By analysing and evaluating the data gathered for this study with the framework created will disclose qualitative information of how complex agile project management is.

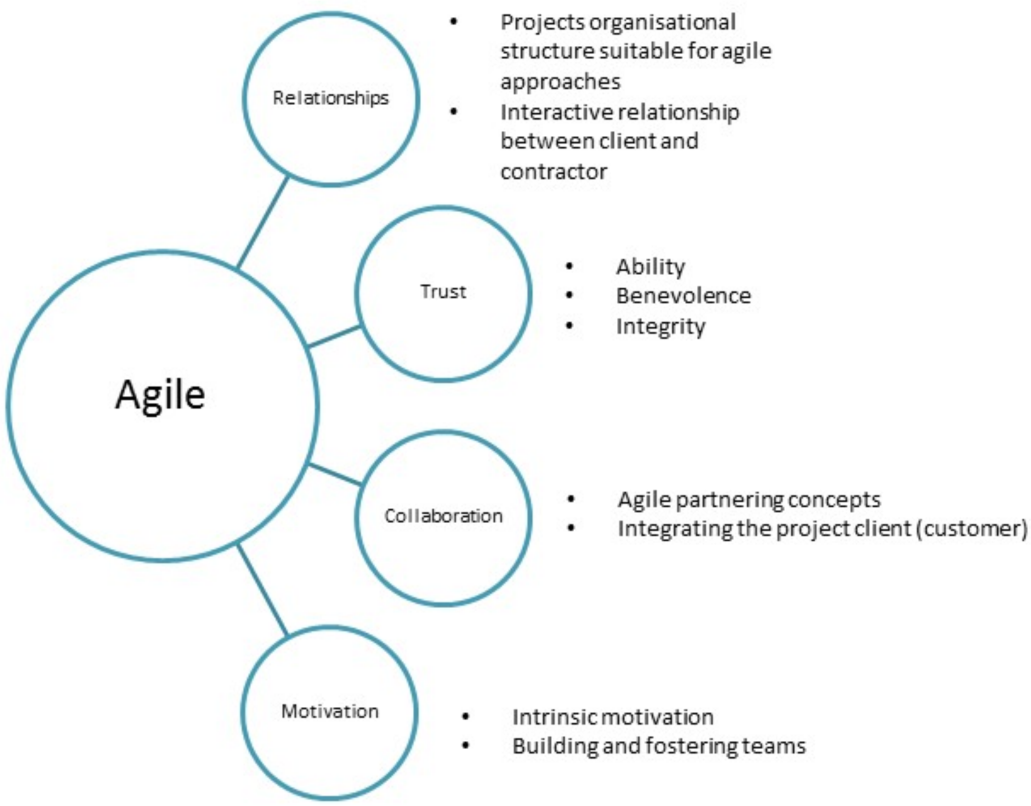

Figure 5. Thematic framework illustrating surrounding factors when utilising agile approaches

4. Findings from interviews

In this chapter, all the findings are collected from the interviews and presented in tables for better overview of what have been extracted from the interviews. The findings chapter will be concluded with an experience description of actual utilisation of agile approaches in a C&CE project.

4.1 Overviewing the findings

The interview questions are provided in the columns below, either in its entirety or as a theme within its subject area. The answers are given as bullet points for the reader to easily overview the findings, further elaboration on the touched upon subject areas can be found in the analysis section. The findings in the tables will be a mix of all gathered data from the interviews, the interviewee column will denote where the answers were collected from. *Traditional* will be short for senior project managers working at WSP Management (four interviewees). *Agile* will represent the findings from the agile coaches (two interviewees).

4.2 Findings from primary data – Theme Realitionships

In this section the findings from the interviews as well as the researcher's interpretation of the collected answers have all touched the subject for relationship building. The section presents findings concerned with barriers causing relationships to not fully prosper, agile views of project management, involvement of different parties and organisational structure. All these areas share a root cause in building functional relationships.

Table 1 Findings within the theme of relationships

Interviewees	Theme/question	Answers
Traditional	Barriers causing delays in large projects?	• It is difficult to design an organisation for a project. Unpredictable change occurs that disrupts the designed organisation. • Change of personnel, high resource fluctuations lead to vacant positions, prolonged deployment etc. • A projects predetermined time plan is often hard to follow-up, the time plan document is not updated trough the project. • Coordination of contractors is a major problem, contractor's organisations follow their best practise.
Traditional	What is interesting about agile approach in C&CE projects?	• Focuses on better communication and collaboration, the building of beneficial relationships. • Useful in early phases of projects when the scope is not already set and allow for ideas to spur.

		• Focuses on costumer involvement to reach better consensus and understanding of chosen solutions. • Clarification of who is running the process. • Tight teams working simultaneously – allows for up-to-date information sharing, in traditional project management it is always a risk that you may sit with out-dated information
Traditional	How could the contractor be better integrated in the implementation phase of a project?	• Better collaboration by involving the contractor in the pre study of a project to start relationship building as early as possible. • With early involvement, the contractor can better control which production methods to use. • Target cost contract with variable fee (incitement solutions) to enable for better settlements for both parties project client/supplier. • Clearly specifying agile working ways in procurement stage to avoid any misconceptions.
Traditional	In an agile way of thinking, change is welcomed, whats your view on that?	• OK if specified where, in which stage and to which extent in a proejct. • Suitable for development projects where construction planning and project management are performend as one role. • Project cannot be too complex, too much at stake to allow for the incorporation of change beyond certain stages in a project.
Agile	Organisational structure and hierarchy	• Organisation should not be to concerned with formal structure. • Must get the workers to take more responsibility over decision making. • When issues occur deal with the issue, do not send it to your superior. • Identification of which decisions that could be put on hold and which could not. • Not to follow a hierarchic organisational structure

4.3 Findings from primary data – Theme Trust

In this section the findings have been identified to touch upon the trust aspect in project management. Trust as a concept incorporates many soft aspects that are hard to pinpoint, it is a highly subjective area and deals with the perception of people getting along as well as allowing for comfort in task being performed correctly and in time. The section covers the evolution of the construction industry perceived by the interviewees, the aspect of a variable project result and challenges to why agile would be hard to implement in the C&CE industry.

Table 2 Findings within the theme of trust

Interviewees	Theme/question	Answer
Traditional	How has the construction industry evolved in the last decade?	• No major changes have taken place, the industry functions as it always has. Best practice is what drives the processes and procedures. • New ideas, such as *partnering* is not as effective as intended. Leads to returning to old habits. • Quality issues is still not taken seriously and self-monitoring is poor by the client side of projects. A project is ordered on poor grounds which in turn leads to uncertainties in the needs and wants from the customer. • Insufficient competence in construction management roles. • Somewhat better understanding for client/supplier interests during the last couple of years. It was way worse before.
Traditional	In APM, time and cost is fixed and the end result is adjustable, what is your view on that idea?	• Ordered product/service turns out differently which in turn could lead to an unsatisfied customer. • Contrary to TPM, in TPM a project is steered in a certain direction depending on the projects scope. • Shows similarities to turnkey contracts which focuses on a more functionality-based implementation of a project.
Traditional	Barriers to why agile would be hard to implement	• The project organisation is scattered and therefore hard to coordinate teams. • Unclarified to what an agile approach would imply in the C&CE working environment. • Difficulties in changing old working patterns, these patterns have been tried and proved to work, why change?

		• Projects are to a great extent depending on external parties which lowers the possibilities of trust in tasks being performed in a correct manner.

4.4 Findings from primary data – Theme Collaboration

In this section several aspects of collaboration were considered when acquiring empirical data for this study. Collaboration is probably one of the most important aspects of project management, therefore collecting different views of such an important matter was crucial. How could better collaboration be achieved, how does the meeting structures work to foster better collaboration, what would a higher degree of customer involvement entail and other factors concerned with reaching more effective collaboration between client/supplier.

Table 3 Findings within the theme of collaboration

Interviewees	Theme/question	Answer
Traditional	How could better collaboration between client and suppiler be achieved?	• Openly discuss important matters with the project client, do not hide potential flaws in a projects scope or flaws in delivered solutions. • Handle change management in personnel better, see to it that the project has the right people working in the project. • Same competence on both sides when discussing technical solutions, the client side should have corresponding technical competence as the supplier to understand implications of chosen solutions. • Successful collaboration should induce: contractor makes money, client saves money and both parties collect valuable experience.
Traditional	How does a usual meeting structure look like	• Internal project management groups and separate steering committee meetings. • Usually coordinated once every 14 days, less follow-up on what was discussed during the meetings than desired. • Meeting frequency changes if projects take a wrong turn, meaning in the early stages in a project the meetings frequency is low and only changes if necessary. • Many different meeting set-ups: steering committee, program management, project management, project work meetings etc. Hard to keep track on which meetings contribute to a specific result.

<table>
<tr>
<td>Traditional
+
Agile</td>
<td>Customer involvement</td>
<td><u>Traditional</u>
• Hard to define who the customer really is in C&CE projects, at times a customer is a project client organisation with many stakeholders.
• The customer exists on many levels depending on the project, is the end customer the maintenance of the built solution product or is it the person who ordered the project…
• In some projects an early high involvement of the customer led to unmanageable work load.
• A well written framework for decision making is valuable to identify in which direction a project should be steered.

<u>Agile</u>
• Customers commitment is key for a successful project, if the customer is not committed to provide the supplier with feedback or specifying what kind of solution is sought after, then the aspect of involving a customer falls apart.
• Forces errors to surface in order to deal with them, the feedback sessions should work as a means to force out uncertainties and errors of possible solutions.
• Higher degree of transparency throughout the process of project management.
• Customer must be fully willing to engage in decision making, constant feedback-loops and tight follow-ups which in turn can be very demanding. Therefore, the customer must be aware that working with agile approaches can be challenging but the reward should be greater.</td>
</tr>
<tr>
<td>Agile</td>
<td>Does it have to be stated clearly that an organisation is working agile?</td>
<td>• It could be good for measurement purposes, such as organisational KPI’s. Keeping track of which areas agile approaches is beneficial.
• Communication of how sprints is supposed to work, the power of these. Also, how to relate to certain rules within agile processes such as Scrum.
• Need to be clear that sprints cannot work if a milestone (stage-gate) mindset is follwed.</td>
</tr>
</table>

Agile	Factors surrounding agile working ways	• Teams must be experienced and forward in their approach, seeing to it that the team has all available information possible at the time. • Large emphasis must be put on the creation of teams. Creating teams with different competencies that fosters the team. • Teams should be built on the basis for good teamwork not solely resource based • Decision making must be allowed to be taken at the last moment when all possible information has been disclosed • Run more than one technical solution in order to ensure the customer that the chosen solution is absolutely right (introduce waste to ensure that everything has been overlooked)

4.5 Findings from primary data – Theme Motivation

In APM, motivation plays an important role and having motivated team members is considered high. In this section the empirical data shows the needed attribute in team members to enable agile approaches in C&CE projects.

Table 4 Findings within the theme of motivation

Interviewee	Theme/question	Answer
Agile	Views on utilising agile approaches in C&CE projects	• Continuous delivering (the supplier) and approval (customer) of sprints. These feedback sessions spur's the motivation amongst team members in displaying that the work that is done matters. • Cyclic pulse mindset of approving partial results to better overview the progression of the project. • Project client involvement is crucial, no work should be considered finished until the project client has reviewed and approved a certain solution. • Greater amount of mandate must be given to the project team by superiors. • One corner stone of agile is to *own* the process, to carry out the work in the way that the team finds most suitable. • Humble approach towards uncertainties, changes in project scope always occurs in an unstructured way. • Use some TPM guidelines to draw large outlines in early phase and continuously plan the project as it progresses.
Traditional	How could change be better handled in C&CE projects?	• Large emphasis on more effective coordination, tighter follow-up should allow this. • The client side must be better on auditing their documents to provide the supplier team with up to date information. • A project manager must openly discuss any change they want to implement in a client's time plan to make it applicable in he's or hers project team. • A clear line for when further changes is not allowed. • An external change management department should exist to handle and evaluate any change that has been made.

Traditional	What is your view on agile approaches in C&CE projects?	• The approaches could be beneficial, uncertain if the industry is mature enough yet. • Largely dependent on individuals, the agile ways of working rests upon people doing what the say they were going to do. • A generation matter, agile will probably grow with a new generation of project managers ahead. • Vague or no clear focus on the end result. • Useful in the early stages of a project to set the scope. • Tighter more continuous follow-up is advantageous for requirement specification. • Sprints could be run in parallel to increase efficiency.

4.6 Experience description – utilising an agile approach in a traditional C&CE project

Projects with great complexity and many different technical areas who need to understand each other and where information must be shared between all parties involved so that a common mindset can be achieved… That is where I see the value of agile approaches.

- Senior Technical Director of Environmental Impact Assessment and Strategic Environmental Assessment at WSP Civil engineering.

In this section a small summary of a hands-on example of a utilised agile apporach in a C&CE proejcts will be described to highlight that agile apporaches could be applicable outside of the IT-sector. In one of the senior projects mangers current project, a scrum based process was utilised. The project is concered with the design of a high speed railway systems across the southern parts of Sweden, connecting big cities. The project is currently in its earliest phase, where effective requiremnet collection is being utilised. The team, consisting up to 15 people, has choosen to work with sprints. The process looks like this;

When sprint one is initiated, it has a deadline set for three weeks, sprint number two can start in parallel at the last week as sprint number one is said to finish. In doing so, feedback from sprint one can be used to complete sprint two more effectively. This also involves the right people in the project early on and allows for the pre study to have a pulse. Having this pulse and mindset of collecting requirements with set deadlines forces the client to engage in decision making.

In order to ensure a smoother decision making, the team takes advantage of the Swedish Environmental Code, which states that a company must offer more than one solution, the limitation to only a handful of possible solutions will aid the client in choosing smarter and more effectively. The team is motivated and feels strongly that in all meetings, they are talking about the "right" things and the standardisation of how the table of contents in reports should look like is clear. The early involvement of all technical areas has been beneficial, often some technical areas are overlooked such as landscape and environmental, in these areas major changes in late stages of a project can have very costly consequences.

5. Analysis & discussion

In this chapter, the findings are combined with the literature review and analysed & discussed upon. The sections have been divided into themes extracted from the thematic framework. Each theme has its own analysis and discussion section and the chapter is concluded with a discussion concerning research ethics.

5.1 Theme relationships

Assuring that a certain project, or any project for that matter, runs accordingly to plan and that a shared understanding that a projects scope is successfully progressing, standing on a solid foundation of good relationships between client and supplier is key. Building well-functioning relationships can be time consuming and complex, therefore it is important to early on understand the need for an acceptance of having an *Interactive relationship* atmosphere in a project. Working with people you can openly discuss concerns with as well as sharing ideas, is an important feature of interactive relationships in projects, which could be easily achieved when previous cooperation has been successful.

But since many public projects do not share prior relations between a project client and a supplier it more of a challenge to know what to expect from a new relationship between parties. In the development of completely new relationships, it is important to realise that no matter how good a basic concept or design of a projects scope is, it is still the execution of the project solutions that matters. Therefore, a project can suffer huge setbacks if the projects progresses without having an atmosphere where project members can discuss and revise ideas. That is why, short iterations and tighter follow-up are strong agile attributes to have in a project. These agile approaches towards project management fosters a more frequent work flow as well as spurs opportunities to be more flexible in providing the project client with more suitable solutions. It also forces people to meet and together try to eliminate risks, unnecessary work, provide clarity in a projects scope and build stronger committing ties between project client and supplier.

Another aspect of fostering well-functioning relationships is *project partnering* which has grown in popularity in later years. Project partnering exists so that main stakeholders in a project are getting the same type of information at the same time, involving more parties than usual. From the findings section of this study, it is not always a most desirable situation to have early involvement of stakeholders, technical areas or contractors in some projects. This is mainly due to the fact that many of the involved areas are not able to manage the information shared in early phases of a project, but according to agile literature it should not be viewed as a hindering factor. On the contrary, getting to know the many stakeholders that is involved in the project early on allow for a better shared understanding of certain issues that only certain technical areas have.

This should not be viewed as a hindering factor to the progression of the project, but rather collecting information and sorting it and prioritise which issues are in great need of attention and which ones that could be put on hold. Each decision will demand a clear explanation to why certain issues has to be resolved earlier and why some issues can be put on hold. Transparency, patience, experience and honesty are key to achieving successful relationships. To safeguard that relationships do not become affected by unresolvable issues, the procurement contract must be written to incorporate as many stakeholders concerns as possible and a shared best interests should be settled upon. Incitement solutions should be put in place and be well described and analysed. Relationships must be built on a solid and common understanding of external obstacles such as laws, regulations, restrictions etc. These must be exposed in an early stage to use them as opportunities instead of interfering factors.

From the finding some barriers to why projects suffer delays was identified; Difficult to design an organisation for a project, change of personnel, coordination of contractors is a major problem. These issues are seemingly hard to address but are all connected to the "handling change" aspect of agile project management. As long as change, in any form, is viewed as a hindering factor for the progression of a successful project then the approach is too rigid and not effective. A positive attitude towards agile must be one that can live with and handle change in an effective manner. From the findings, many of the senior project managers answered the question "What specificly do you like about an agile approach in urban planning?" The answers were; focus on better communication, focus on involvement, clarification who runs the process and having tight teams. Having tight teams means having teams with cross-functional expertise and profound knowledge of the projects scope so that team members are allowed to be replaced if needed.

5.2 Theme Trust

In any project, no matter the size or budget, trust is considered as an important factor to reach and settle agreements, divide work load and to feel at ease with the projects progression. A project is usually built on some basis of trust between the involved stakeholders, this thesis aims to clarify the width of just how important trust is in order to reach a successful outcome of a project. Trust, rather than control, is the moderator of achieving a positive outcome of most working situations, but can only be successful if used properly and with the right type of team members. Often, in the fast phased society that we live and work in, there is not enough time deposited to establish trust between partners/stakeholders. Instead, project team members are left with the only choice of mutual reliance with other parties, reliance and trust are not the same thing. Reliance is the notion of actually needing someone in order for you to do something, a project team member rely on a specific task to be carried out in order to be able to carry out its own task – relying on a peer to achieve the projects goal. Trust is the notion of predicting that the person in question will do the right thing. "the right thing" is what is agile about trust, it is risky but efficient when utilised the right way.

If trust is present, people involved in the project can engage in constructive interaction with no hidden motives which could lead to the identification of disastrous outcomes that would not surface until it is too late. Also, it is notion of continuous learning which agile advocates. Therefore, having a trust culture and understanding people's different competences must be put in place to prevent a blame culture. If, or rather when, something does not work accordingly to plan it should be a collective burden to share, since work should progress in collective teams. From the literature study three categories of trust was extracted, ability, benevolence and integrity, with the aim to display different views of trust as a concept.

The ability for trust to exist, such as needed skills and competencies. These factors come into consideration when a project expands or enters a new phase. It is of upmost importance that everyone involved in a project has the desired skills and competencies requested for the project. Trust cannot appear if team members are not reviewed and appointed to a project by having the appropriate skills rather than just being available for work. This is however extremely hard to overview since projects in the C&CE industry are large and complex. That is why agile advocates that teams must not consist of more than 12 people, otherwise it is difficult to manage team member's competences. This is important to acknowledge, so that when the project is entering a new phase and new technical areas are needed, the design of the project scope cannot be such that allows for bigger teams than teams of 12 members. Exceeding this level should not be accepted and a decision must be made to respecify the order of personnel. From the findings one of the interviewee said that there is insufficient competence in construction management roles, this does indicate a lack of trust and should be handled in a more constructive way. This would become evident during agile feedback-loops and continuous learning cycles.

Benevolence is concerned with members in a project that is wanting to do good, loyalty and caring about performing tasks in a satisfactory manner. Utilising a scrum based process of delivering partial results in sprints will help to display loyalty and caring attributes, since the team delivering the result will seek to obtain positive feedback. A clear installation of trust is needed to allow for results of a project to be adjustable, adjustable to a certain amount of course. Visual planning and prioritising of tasks must be updated on the regular in order to avoid large adjustments.

Integrity is a set of principles that are acceptable such as consistency, fairness and openness. All these principles are needed to achieve an agile approach, consistency in working with sprints, fairness in executing rightful priorities in tasks to be carried out and lastly openness in providing feedback on partial delivery.

5.3 Theme Collaboration

Collaboration in organisations and in client/supplier context has many different levels of value creation. The value of collaborating comes in different forms and can never be fully specified since collaboration between parties can inherent great potential in trading knowledge and competencies. Often in project partnering regimes, collaboration exists primarily to lower risks, when projects are complex the need to distribute reasonability becomes an important factor. Since collaboration is a must in large C&CE projects, having such large pool of different competencies and background enable for huge potential of successful collaboration solutions. Assuming that partnering concept continue to increase, it would be of interest to revise the current tools and practices that are utilised today. Overviewing the tools and practises from the literature review;

Financial incentive systems – should enable better collaboration between teams to clarify which is considered as the best possible solution for a certain task. Since the findings from the interviews showed that as many solutions as possible should be presented to a project client in order to ensure that the best solution is chosen, financial incentives should be put in place for the extra work load of presenting more than one possible solution.
Team building workshops – are needed to ensure that personnel involved in a project can work well together. Team building workshops could be built out of prior experience of other projects or other involving activities. Activities must be such that are suitable and appropriate for the people involved in the project.

In agile working ways, one of the most important factor is customer collaboration, it is considered as a vital feature in order attain successful agile implementation. The Project client (customer) must be fully willing to engage in decision making, constant feedback-loops and tight follow-ups, therefore it becomes largely demanding to order a project and utilising agile approaches. That is why this must be clarly specified by the supplier that if a certain project is to ensure flexability, handle change and incorporate innovatie solution making, customer involvment is the vital key. If a project client has difficulties in managing the workload of high involvment in a projects formation, then that role must be shared, one project client can become a team of project clients that collectivly represents the customer. Since a projects customer in C&CE projects can be hard to identify because of the many levels, large emphasis must be put early on in design phase of a project, the stakeholder identification must ultimately decide who should represent the customer.

Collaboration in an agile manner helps relating to laws and legislations, seeking opportunities instead of seeing obstacles by involving people of different backgrounds and competencies. Also, stand-up meetings should be utilised to change current lengthy meeting structure, this must be done to ensure a pulse-mindset to incorporate agile approaches. Meeting set-ups should allow for more parties to join in order to clarify information distribution and prioritising tasks.

5.4 Theme Motivation

In comparison with traditional methods, Agile have a much greater focus on the individual and the interaction of the collective team rather than processes and tools. A fundamental part of agile's decentralised decision-making comes in the form of motivated cross functional- and self-organising teams. To restrict decision-making to project managers would rather hinder the mobility in being agile. Operations-related decisions should be taken by those who sit closest to the right type of information. In order to build high performance teams, there must also be a strong internal motivation among members. This is maintained by a high degree of autonomy, continuous development and a strong vision. The team should regularly look at how they can become more effective as well as adjust and adapt their behaviour in constantly evolving working ways.

The basic idea is that teams and employees do not need to be controlled, but works best under conditions that within a given framework has great potential to influence and feel ownership over their data. All responsibility is shared by all members of the group. External motivators such as bonuses and individual assessments should be used with caution in order not to damage or disrupt this cooperation in the group. Build projects around motivated individuals and give them the environment and support they need, and trust them to get the job done.

5.5 Ethics

For this study, in order to establish a compelling research context, the term traditional project management was presented as project management procedures that seemingly are not effective whereas agile would be the more modern approach towards project management. This was never the intention of the researcher. The complexity of project management in large projects within the C&CE industry entails more aspects than this study could cover. Interestingly enough, the interviewed senior project managers did not themselves denote their working ways as traditional project management.

The Swedish construction industry has long been criticised for being conservative and not renewed to a sufficient extent. This criticism is accompanied many times by the requirement that the industry must become more innovative and creative. It will lead to increased productivity, reduced costs, higher quality and thus cheaper accommodation and facilities. Applying agile approaches within this industry as well as the civil engineering projects, should allow for the delivery of a higher social benefit. To call the C&CE industry conservative is a harsh statement, it is not the industry per se that is conservative, it is the Swedish governmental laws in combination with political steering decisions. There are, in C&CE projects a lot of predetermined external factors that is out of reach for the project manager to handle. That is why, when a research such as this is conducted, the aim is to give birth to new ideas and induce a new angle of approach.

This study is not intended to portray any of the interviewees in a negative way or exploiting gaps in their working way, rather it is about presenting the findings and analysing round them to introduce agile approaches. All interviewees have had the opportunity to review the published material for this research.

6. Conclusions

In this concluding chapter, the research questions are answered. Each question is presented with an introductory text and concluded with a bullet point list to enable for easier overview. The chapter frame what agile approaches entail in the C&CE industry and concludes with future studies that could add more body of knowledge in the field of studying APM in non-software development contexts.

6.1 Main research question

> *Could agile approaches be applied autonomously of the phases in C&CE projects, which normally utilise a traditional project management?*

The research shows that structuring project management in an agile manner is possible. This is mainly because agile approaches differ from agile methods, agile methods are frameworks designed to apply the IT industry… However, agile approaches are effective and flexible working ways built on the values that origin from APM. Applying agil approaches in C&CE projects allows for a more flexible project management, if all constituent parts of what working in an agile manner is understood. Agile approaches allow the project management process to be a vivid and continuously updated depending on the how much information has been disclosed as well as how many different scenarios have been run. Agile project management provides project managers with methods, tools and approaches to aid both the project manager and project client to engage in a more efficient manner, allowing for more open communication, feedback sessions and the notion of pursuing a shared goal towards successful project management. This entails a large workload on both parties and that is why project managers and project team members should not be involved in more than 1-2 projects at the time.

Project phases are needed in a project to allow for an accessible project progression overview and the allocation of resources based on in which phase a project is. However, it is of great importance that a milestone (stage-gate) mindset is <u>not</u> to be used. This is because sprints, as described in the literature review chapter, are designed to demonstrate how much work can be produced in a particular sprint, not promising an exact delivery. That is why milestones and sprints does not work well together.

- Everyone involved must have an understanding for agile working ways, all the way from project client – supplier – contractor. The supplier is the party that utilises agile approaches, but the project client and the contractor must be aware of these working ways in order to understand the project planning process. The agile process differs in meeting structures and frequency, decision making, risk management, feedback sessions, customer involvement etc. All these areas and more must be clearly specified and distributed amongst everyone involved in the project.

- Uncertainty is *handled* not reduced. Handling uncertainty is about handling change which is one of the main pillars of agile. One cannot reduce uncertainties solely by decision making and risk management, uncertainties must be made visual and appointed continues attention.

- Sprints are meant to create value, something that the customer can work with – a project team must strive to deeply understand the needs and wants to satisfy customer.

- The value of sprints is to eliminate question marks – when project team gets a customer's order, they should immediately start defining where large question marks might lie.

- Utilising a pulse mindset to attain higher degree of efficiency within the team, possible solutions must acquire feedback from the customer to ensure quality. A continuous pulse in delivering sprints and getting them reviewed must be in place.

6.2 Sub-research questions

What are the prerequisites in order to apply agile approaches?

In an organisation that is pursuing to adopt agile ways of working, a thorough investigation of how the organisational structure looks like must be made. What aspects of agile could be applicable and which one's are not. Such questions must be analysed. Allowing the organisation to become more agile should act as an adding factor to allow more flexibility rather then change too much. Some important points has been identified;

- Organisational acceptance for delegating responsibility at lower levels, classic hierarchical organisational structures is not recommended in order to enable full agile decision making. If hierarchical organisational structures however do exist, each team within its respective field will require full autonomy for decision making within its respective field. If teams cannot make their needed decisions by themselves, agile approaches have a limited effect.

- Team members should have their full focus on one to two projects not more – to reach desired efficiency. If this limit is exceeded, working with sprints and continuous feedback sessions will not work.

- Top management is in great need of education in APM, in order to fully execute agile approaches in an organisation when working with project management, the top management must have a profound understanding of what agile entails.

What kind of effects would these new ways of working have?

The effects of utilising agile approaches are mainly concerned with providing clarification and display the progression of work. The effects of having a pulse mindset of getting answers, collecting information, sorting out different possible solution, following up earlier feedback etc. all contribute to a more effective working environment.

- The Project client (customer) must be fully willing to engage in decision making, constant feedback-loops and tight follow-ups, therefore it becomes largely demanding to order a project and utilising agile approaches

- Larger emphasis on *project partnering*, allow main stakeholders in a project to get the same type of information at the same time, involving more parties than usual in meetings.

- Need for extensive, close, transparent and informal communication between the parties involved in the project

- Autonomous / self-organised development team

- Frequent reflection and improvement of work processes

- Pursuit minimal documentation and simple solutions

- Daily stand-up meetings, should be short and more precise than regular protractive meetings. The daily commitments decided in the meetings allows participants to know about potential challenges as well as to coordinate efforts to resolve difficult and/or time-consuming activities.

- Visual planning to evaluate progress in project, to ensure that tasks starts and ends at the appointed task. Visual planning should highlight if workload is too high or too low.

6.3 Fulfilling the research purpose

The purpose of this study was to investigate whether project management within the C&CE industry – which so far mostly has been carried out in a traditional way – could benefit from utilising agile approaches. By studying both traditional project management and observing how projects were run at WSP Management, as well as interviewing experienced senior project managers, the identification of possible agile approaches was identified. Combining the foundation of knowledge about the traditional sense of project management with agile theory, value & principles and interviews with agile experts – it became evident that the possibilities of utilising and benefitting from agile approaches in the C&CE industry is viable.

However, applying new strict framework's such as Scrum could prove to be a challenge since the framework is developed for the IT industry. But, the scrum framework contains a lot of information on how projects could be run in a more effective way when utilising sprints, assigning roles for who is owning the process, visualising tasks in sprint backlogs & burndown charts, practice daily scrum meetings to effectively extract what teams intend to do accomplish in the working day.

In whatever way projects are carried out, the circumstantial factors presented in this study is of the greatest importance. No agile approaches, methods or tools will be applicable in any project if not good relationships between project client, supplier and contractor is established, trust is present so that the understanding that tasks will be carried out differently in an agile manner but allow for more flexibility and effectiveness. Large emphasis on collaboration to collectively share potential success or burdens throughout the project, and lastly motivation amongst team members and upholding of an attractive working environment.

The study also aims to clarify how agile potentially could be applied outside of software development projects. The most important aspect of wanting to become more agile is to analyse an organisation and which types of projects could be suitable for utilising agile approaches. Since agile approaches differs from agile methods in the sense that methods are frameworks and approaches are values, agile approaches could be applied in any industry. Sorting out which agile approaches are appropriate for an organisation and for which type of project, is the key of allowing for many possible benefits of reaching a more flexible project management in an industry such as C&CE. This study aims to aid the process of analysing an organisation and sorting out with projects could allow for agile approaches implementations by mapping out circumstantial factors to utilise new methods and approaches rather then technical solutions.

"Project management is moving more towards psychology than technology"

- Dave McAlister, Global Director at WSP Global

6.4 Future studies

This study has been conducted at the supplier side of project management, it would be of great interest to conduct similar studies on the project client side as well as on the contractor side. The need to involve more aspects of how agile approach could be utilised and the possible barriers/benefits throughout the whole project management chain would be valuable. Using this study, or similar studies, to identify which partnering concepts are possible on the supplier/contractor side would also enable agile approach to gain a foothold in the C&CE industry.

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