Arttu Eskola

How to expect the unexpected?

Boundaries of rational planning in projects

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TIIVISTELMÄ:
Projekti on organisaatiorakenne, joka on muodostettu jonkin määritellyn tavoitteen saavuttamiseksi. Perinteisten projektinhallintamenetelmien voidaan nähdä painottuvan ennakoivaan suunnitteluun, jossa kerätyn aineiston perusteella muodostetaan tarkka työsuunnitelma. Tätä suunnitelmaa noudatetaan tavoitteeseen pääsemiseksi, ja sitä hyödynnetään myös arvioitaessa projektin onnistuneisuutta.

Koska yksittäinen projekti on aina tietyllä tavalla ainutlaatuinen, projekti sisältää epävarmuustekijöitä. Mikäli halutaan saavuttaa jotakin uutta, eivät kaikki keinot tämän tavoitteen saavuttamiseksi ole välttämättä tiedossa. Epävarmuustekijät törmäävät rationaalisuuden mallin kanssa, koska kaikki tieto ei ole saatavilla tai käsiteltävissä siinä vaiheessa, kun työsuunnitelmaa muodostetaan. Rationaalisuuden malli ymmärretään tässä tutkielmassa siten, että tavoitteen saavuttamiseksi käytettävät toimintamenetelmät arvioidaan hankittavissa olevien tietojen pohjalta ja optimaalisin toimintamenetelmä valitaan toteutettavaksi.

Vastapainona rationaalisuudelle on rajoittuneen rationaalisuuden malli, joka kuvaa sitä, miten täyttä rationaalisuutta rajoittavat ihmisen kognitiivisen päättelyn kyvyt sekä käytettävissä olevan tiedon rajallisuus ja tiedon prosessoimiseen käytettävä aika. Tämän tutkielman avulla selvitettiin, miten rationaalisen ajattelun malli esiintyy projektityössä ja mitä vaikutuksia sillä on projektin menestyksen arvioinnin kannalta. Teoriassa vertailtiin kahta eri tavalla epävarmuuteen suhtautuvaa projektinhallintamenetelmää. Empiirinen osa tutkimuksesta toteutettiin teemahaastatteluina kohdeorganisaatiossa, jossa haastateltiin kymmentä projektien parissa työskentelevää henkilöä. Analysoitujen haastattelujen pohjalta nostettiin esiin keskeisiä teemoja, jotka tuovat esiin sekä rationaalisuutta että sen rajoitteita.

Tutkimuksen tuloksena saatiin selville, että rationaalisen malli näyttäytyy selkeästi projektin suunnittelussa ja sen menestyksen arvioinnissa. Rationaalisuuteen pyrkimisellä voidaan nähdä olevan sekä positiivisia että negatiivisia vaikutuksia projektin menestymisen kannalta. Tarkkaan laadittu työsuunnitelma motivoi tavoitteiden saavuttamisessa sekä jäsentää monimutkaista todellisuutta hallittavampaan muotoon. Epävarmuustekijät aiheuttavat kuitenkin sen, että suunnitelmaa voidaan joutua täsmentämään uuden saatavilla olevan tiedon myötä, ja alkuperäiset tavoitteet voivat osoittautua epärelevanteiksi. Tällä on vaikutusta projektin onnistuneisuuteen, mikäli arviointi perustuu alussa kerätyn tiedon perusteella asetettuihin tavoitteisiin. Tutkimuksen tuloksia voidaan hyödyntää käytännön projektityössä pyrittäessä ottamaan huomioon ennakoivan suunnittelun rajoitteita sekä niiden vaikutusta onnistuneisuuden arviointiin.

AVAINSANAT: Planning, project, rationality, success, uncertainty

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1 Introduction

Böhle, Heidling and Schoper (2016, p. 1386) reported on a study conducted in 2013 that looked at 5400 software projects. Almost half of the projects exceeded costs before the end of the project, in more than half of the projects the scope of the project had to be restricted (in comparison with the original plan), and nearly one-fifth of the projects caused the business risk to the organization carrying out the project because of underachieving in comparison with the expectations. Problems with IT projects can be considered particularly risky because project outputs are often integrated into larger product, process and system contexts. This can cause problems to occur as soon as the project outputs are combined with the outputs of other projects during the product assembly.

According to Böhle et al. (2016) other surveys on major global industrial projects gave similar results. 65 per cent of the 318 projects included in other survey did not achieve the pre-defined targets. On average, the planned costs were exceeded by 40 per cent, the project timetable was exceeded by an average of 28 per cent, and only 60 per cent of the planned product quantity could be delivered (p. 1386). On the basis of these results it is possible to raise a question if all these projects have been planned or executed inadequately, or if these “failures” might have something to do with the expectations that have been set up for the projects?

Cuellar (2010, p. 19) presents that traditional way to measure project success is to evaluate how well set targets are met by reflecting to the areas of “triple constraint” or “iron triangle” of project management – time, cost and scope/quality. These constraints can be seen as guidelines for project management to keep a project on track during the execution phase in order to deliver within expected time, budget and scope/quality. By setting up the targets already at the outset of a project, a very limited space is left for unexpected, i.e. surprising, events as the established plan is clear. Although, the possibility for trade-offs between constraints is left as it might be needed when new events are encountered.

By reflecting to the work of Simon (1990; 1997), in order to form a thorough plan, a lot of effort in information gathering and processing of data has to be carried out as multiple possibilities has to be considered, and predictions about the future has to be made on some level. Rational choice theory provides an ideal of fully rational behavior in which computational limitations do not bind and decision makers are capable to consider all possibilities and to choose the most optimal one that maximizes their utility. The concept of bounded rationality on the other hand acknowledges the limitations of human capabilities and the complexity of the task environment which results in the fact that fully rational behavior is not reachable all the time. By contrast, satisficing (see Simon 1989; 1997) or good enough decisions are made due to complexity of the task environment and incapability to gather and process all the necessary information.

Böhle et al. (2016, pp. 1385-1386) point out that there has been a prevailing view in project management that unforeseen or unexpected events are the result of incompetent planning. Careful planning and risk preparation at the outset have been seen as an appropriate and sufficient way to manage projects and assure fluent execution. In other words, unexpected events are the result of inadequate planning or lack of control, or completely unpredictable events that could not have been anticipated. It is indisputable that in project management, planning in advance is necessary in order to keep up with the schedule, or to not exceed costs. Control is needed also for successful project implementation and quality control.

Still, widely used project management methods with markable effort to planning at the early stages have come under critique as they have been proven insufficient to tackle challenges at the later stages of projects (Böhle, et al., 2016, p. 1385). The so-called “plan-driven” model of project management that has remained dominant and emphasizes pre-planning activities is focused on controlling and monitoring that the targets set, for example, for time, cost and quality are met on project implementation stage. As a result, a clearly defined pathway is being created at the outset and it is meant to be followed (Howell, Windahl, & Seidel, 2010, p. 256).

According to Böhle et al. (2016, p. 1386), advances in technological systems have increased the number of information systems used in organizations and a network of interconnected information systems gives a fruitful ground for new uncertainty factors to arise. The number of factors increases as the number of internal and external factors affecting the activities increases and, consequently, the number of predictable and controllable factors decreases. Further, the reorganization of work, for example by decentralization, provides more flexibility, but also increases the amount of internal dynamics and the need for self-organization within the organization.

Perminova, Gustafsson and Wikström (2008, pp. 73-74) point out that uncertainty management in projects can be considered as an important research area to focus on as many organizations are seeking competitive advantage by concentrating their operations towards the provision of high-value integrated solutions to meet customer expectations, instead of stand-alone scalable products and services. Even though certain tools and planning techniques can be implemented in multiple projects as they are, and most projects have restrictions in time, cost and quality, all projects are unique undertakings to a certain degree as objectives are formed on a basis of customer needs and expectations. Thus, some degree of uncertainty is present in all projects and it has to be coped with.

1.1 Research objectives and limitations

The aim of this thesis is to gain insights on how the ideal of rational behavior appears in project planning and what implications it has on evaluation of project success. One commonly used method to evaluate project success is to use the triple constraint of project management (time, cost and scope) as a frame (Cuellar, 2010, p. 19). As Siegelaub (2007) stresses, depending on the point of view or interpretation, triple constraint can consist of time, cost and quality – or of time, cost and scope. In this thesis quality is understood as overall resulting factor from all three other constraints as

increased or reduced schedule, budget or scope can be considered to have an effect in overall quality, as originally agreed extent is compromised (Siegelaub, 2007).

If the objects that determine project success are derived from triple constraint, then the focus should be on how the bases of these objects are formed. According to Perminova et al. (2008), uncertainty is acknowledged as having effect to project objectives in both traditional (waterfall model) and more flexible (learning approach) project management approaches but the view on how to deal with uncertainty vary. Dealing with uncertainty can be based on trying to minimize or reduce it as much as possible (uncertainty seen mostly as a threat) or accepting it as a fundamental factor that has to be dealt with, and that can also have positive effects on a project (uncertainty seen as both opportunity and threat).

Considering the success criteria from the rationality point of view, it can be examined, if due to uncertainty, it is possible to form the objects regarding time, cost and quality already at the outset of a project that will eventually serve as success criteria? By reflecting the work of Simon (see 1989; 1997), in order to be able to act rationally and to make the optimal decision, a remarkable amount of information should be available and analyzed in order to form the basis of an optimal decision. Uncertainty can put a spoke in the decision maker's wheel as the underlying foundations to making a decision are unclear. More search and processing would be required in order to resolve or reduce uncertainty.

Projects as temporary endeavors stand on a fruitful ground for unexpected events or situations to emerge as there are multiple internal and external factors affecting project execution that is performed within constraints in time, cost and scope (Böhle, et al., 2016, pp. 1386-1387). Those unexpected events can arise both from the nature of a project as well as from external factors or for example, technical issues (Pich, Loch, & De Meyer, 2002, p. 1010).

This study aims to gain deeper understanding on rationality and uncertainty in projects through the following research questions:

1. *How does the ideal of rationality appear in project planning?*
   and
2. *What effects does it have on evaluating project success?*

In this study, the comparison of different approaches is limited to the waterfall model, that represents traditional plan-focused project management method, and to learning that emphasizes more flexible approach to project planning (Tuulenmäki & Välikangas, 2011, pp. 30-31; De Meyer, Loch, & Pich, 2006). These approaches were chosen due to their different basis on information adequacy and uncertainty.

As Sommer and Loch (2004, p. 1335) and Böhle et al. (2016, p. 1384) point out, while in the waterfall model a lot of effort is put in to acquire adequate information to reduce uncertainty at the early stages of a project, in the learning approach it is accepted that information is inadequate at the outset and a project plan is complemented during the project as information becomes more complete and knowledge increases. View to planning can be seen as controversy between the two approaches. One emphasizes forming a complete plan at the outset, that is to be followed in order to implement and control a project successfully to meet the objectives, while the other emphasizes more flexible approach as the plan can be more approximate at the beginning and will become more accurate on later stages.

Project management literature includes a variety of project management knowledge areas (e.g. time management, cost management, human resource management et cetera) that are integral parts of the whole management concept (see Project Management Institute, 2008). In this study, uncertainty is considered as having impact on all of these areas, as a project as a whole consist of different contributory factors (see Turner 2009, p. 2). Therefore, no further exploration is targeted towards one specific

area. Risk management practices are touched on the side, as they can be seen closely connected to uncertainty concept (Project Management Institute, 2008, pp. 275-276). In addition, the scope of this study's exploration is focused on projects that have passed evaluation phase regarding financial or strategic effects and have been determined to be implemented.

As Andersen, Dysvik and Live Vaagaasar (2009, pp. 497-484) mention, projects can be based on delivering outputs to external stakeholders in which case the user or customer of the end product is external to the project organization, or to internal customers in which case the user or customer of the end product belongs to the same organizational structure. In addition, a project team can be set up to work full time on the project, or project work can be executed as matrix organization type of work where the project team members work simultaneously for both project and base organization. As rationality is a concept related to human behavior (see Simon, 1997), and uncertainty can be seen omnipresent in all types of projects (see Perminova, et al., 2008), both types of organizing work and recipients of project deliverables can be included to the scope of this thesis.

1.2 Structure of the study

This thesis is structured into six main chapters. Literature review forms the first part and it is divided into three main chapters. First, in chapter two concepts of rationality and bounded rationality, uncertainty and risk are discussed in detail. Chapter three contains exploration of project as a concept and examination of project constraints. Project stakeholders and project success criteria are discussed in the second subchapter of chapter three as stakeholder relations might require a different point of view depending on the project management approach at hand. In chapter four, two project management approaches are examined and compared with each other. The waterfall model representing the traditional approach and the learning approach as an example of more flexible approach.

The second part of the thesis consists of the presentation of methodological approach and the empirical part of the thesis. In chapter five, the methodological approach and data collection methods are presented. Chapter six consists of themes constructed from analysis of interview results. In chapter seven, the thesis is concluded along with notions of the findings and practical implications as well as possible openings for future research.

2 Rationality, risk and uncertainty

This chapter forms the first part of literature review of the thesis. Concepts of rationality, risk and uncertainty are examined first as they form a basis for later concepts. In the first subchapter, a term ”satisficing” (cf. satisfying) is used as it is presented in the original literature (see Simon 1990; 1997).

2.1 Rationality and its boundaries

Simon (1997, pp. 20; 87-89) refers to rationality as utility maximizing or profit-maximizing models derived from classical economic theory. Rational choice making can be described in a form of an “Economic man” that makes “*static decisions in a fixed framework*”.

According to Simon (1989, p. 2) the aim for rationality in classical economic theory is to maximize expected subjective utility. To clarify, we can conclude that by maximizing one is aiming to gain the best possible result and expected refers to probability of possible outcomes of events i.e. what is to be expected. Subjective refers to ones’ estimates of the relevant probabilities of events whereas utility means the actor's own ordering of preferences among outcomes.

Simonsen (1994) points out that rational choice theory has gained a lot of critique for being unrealistic. From one point of view, it can be understood as an ideal that is used as a tool to study how decision-making processes work, instead of being a comprehensive model of actual behavior. It could be said that the rational model does not fully exist in the real world, nor is it possible to fulfil the requirements in the model.

Simon (1990, p. 6) stresses that if the assumption that people make their decisions in a way that maximizes their utility is taken as a given as the interpretative condition, it allows to predict a great deal of behavior in a choice situation without taking into

consideration how the environment affects the behavior of a person. He uses the following metaphor:

> *"If we wish to know what form gelatine will take when it solidifies, we do not study the gelatine; we study the shape of the mould in which we are going to pour it. In the same way, the economist who wishes to predict behaviour studies the environment in which the behaviour takes place, for the rational economic actor will behave in whatever way is appropriate to maximize utility in that environment. Hence (assuming the utility function to be given in advance), this maximizing behaviour is purely a function of the environment, and quite independent of the actor." (Simon, 1990, p. 6)*

According to Simon (1997, p. 121), rational expectations describe the underlying idea that all decision makers have accurate knowledge of the environment where the choice situation exists as a whole, and that all others share the same knowledge and beliefs on it. Further on, it is also assumed that all actors form expectations about the future and together with these expectations use the knowledge and beliefs as basis for making decisions.

Simon (1997, pp. 20; 87-89) describes that cognitive limitations do not affect the Economic man as in theory it is assumed that all information (relevant to the problem) to base decisions on is available and exploited. The information is evaluated and probabilities for outcomes are calculated, resulting in a scenario where the best possible option is chosen among all the other possibilities.

Herfeld (2018) stresses that from point of uncertainty view, rational choice theory proves to be problematic as predictions that one makes about future state have to be based upon past data. This results in the fact that one has to have previous data of the similar kind of choice situation in order to base prediction on to something, i.e. predictive accuracy is based on data that has been encountered in the past.

According to Bendor (2010, p. 24), Simon's formulation of bounded rationality can be misunderstood as understating human capabilities in decision making. Instead of

evaluating absolute human capabilities, the idea is intended to put into perspective decision makers' mental limitations and the complexity of the faced problem in the environment where the decision is being made.

> *"The capacity of the human mind for formulating and solving complex problems is very small compared with the size of the problems whose solution is required for objectively rational behavior in the real world – or even for a reasonable approximation to such objective rationality." (Simon, 1957, p. 198)*

Thus, as Bendor (2010, p. 24) states, the idea is not to assert one's great ability or incompetence as a human being, but to point out that one is not independent from the surrounding task environment. If the cognitive limits do not bind in a given decision making situation, in another words, the problem is simple, one's limitations do not affect the choice being made and rational behavior is possible. If the problem is complex and one's cognitive limits do bind in a given decision making situation, the idea of bounded rationality comes in handy.

Simon (1990, p. 7) formulates this joint effect by stressing that *"human rational behavior (and the rational behavior of all physical symbol systems) is shaped by a scissors whose two blades are the structure of task environments and the computational capabilities of the actor"*.

According to Simon (1990, pp. 9-10), in a situation in which cognitive limitations come in question, i.e. the number of variables is too great, or no previous experience cannot be exploited, one applies the so-called "weak methods". One weak method is satisficing where search for an alternative is being continued until an alternative that exceeds one's pre-defined expectation level is found. Alternative is being chosen as it is reasonable compared to the costs of search for information and its assumed outcome is acceptable. It is "good enough". The pre-defined expectation level is formed on a basis of experience on similar kinds of tasks. That experience is used to construct an expectation about how good a solution would be reasonable to achieve. When a solution that is good enough is chosen, it deviates from perfectly optional choice as per rational choice theory. Selected

choice might not be as optimal as it would be if it was possible to search and analyze all alternatives but as it exceeds the expectation level, search for better alternatives is halted.

Simon (1990, pp. 9-10) stresses that choosing the alternative that exceeds the expectation level is sensible as it tackles challenges arising from *"an enormous, or even potentially infinite, number of alternatives are to be compared"* and highly complex structure of the problem resulting to the fact that *"all alternatives would have to be examined in order to determine which is optimal"*. Another problem confronted with full rationality and cognitive limitations comes in bearing when choice alternatives are incommensurable. That might be due to numerous dimensions of value that cannot be compared, uncertain outcomes that may be more or less favorable or unfavorable or they affect the values of more than one person. A satisficing decision can be made if an alternative that meets all the criteria is found. If an alternative is satisfactory along all dimensions of value, has satisfactory outcomes for all resolutions of the uncertainty and is satisfactory for all parties concerned, it can be considered as a satisficing choice.

Simon (1990, p. 9) points out that if there is previous experience on the similar kind project or the environment is well known, it is possible to progress systematically and according to the pre-defined plan as the expectations are clear. There is no need for great search or to try out different possible solutions as the way to the solution is known by following systematic steps. By contrast, if there is no previous experience and the environment is unknown it is not possible to proceed in a completely rational way as the expectations are not clear. Search has to be performed with the help of methods that have turned out to be successful previously. By taking advantage of previous experience on similar kinds of problems, an expectation of how good a solution might be received, can be constructed. As soon as that expectation is met, the search is halted.

According to Simon (1997, pp. 87-89; 118-119), the idea behind bounded rationality is that even though complete rationality is not achievable due to previously mentioned

limitations, there is still an intention to reach out to rationality. Satisficing is a term used to describe behavior that accepts the limits of human capability, with an aim to look for a choice that is satisfactory, or good enough.

2.2 Risk and uncertainty

Project Management Institute (2008, pp. 275-276) points out that risk in project originates from the uncertainty that can be seen omnipresent in all projects due to their nature. Project risk is traditionally described as "*an uncertain event or condition that, if occurs, has a positive or a negative effect on at least one project objective, such as time, cost, scope, or quality*''. According to ISO 31000:2018 Standard, effect is "*a deviation from the expected. It can be positive, negative or both, and can address, create or result in opportunities and threats*" (ISO, 2018). From the definition of Project Management Institute (2008, pp. 275-276) it is possible to highlight three important points:

- Risk and uncertainty are closely linked but not the same
- Risk can have positive or negative implications
- Risk is related to objectives

According to Perminova et al. (2008, pp. 74-76), risk and uncertainty can be seen through the notion of cause and consequence. If an uncertain event or condition occurs, it creates an effect that is either positive or negative. Derived from the above-mentioned definition, uncertainty can be seen as an underlying cause of risk, and risk as a consequence emerging from that uncertainty. If risk materializes, it creates an effect that is either positive or negative. Whether that effect is positive or negative depends on project objectives. It is possible to interpret that risk is dependent on objectives. There cannot be risks without objectives since materialization of a risk, whether it is positive or negative, is evaluated in relation to the objective. These objectives can be linked to either scope, quality, time or cost of a project.

By considering the above mentioned, it is possible to conclude that the significance or magnitude of a risk depends on set project objectives, but it doesn't necessarily depend on the level of uncertainty. As a hypothetical example, if it is uncertain whether it will rain tomorrow, and a farmer has planned to harvest wheat, the risk of rain can be considered high if the whole harvest has been planned to be collected on that day, or it can be considered medium if only a part of the harvest has been planned to be carried out on that day. Regardless of the option chosen, the uncertainty of the rain is the same.

As Ward and Chapman (2003, p. 98) and Perminova et al. (2008, p. 77) present, another way to conceptualize uncertainty is to compare it with certainty, thus uncertainty can be seen as opposite of certainty. If some event or situation is known to occur and its effects or causes are known beforehand, it can be considered as certain. Therefore, it is possible to divide causes of uncertainty into two axes: probability and outcome. Probability refers to predictability of something to occur and outcome to the effect that the occurrence has.

If probability can be calculated beforehand, it is possible to be prepared for the event or situation through the means of traditional project risk management (Pich, et al., 2002, p. 1010). According to Ward and Chapman (2003, p. 98) and Perminova et al. (2008, p. 77), an event or situation that might occur or not, and which effect can be perceived as positive, is usually considered as an opportunity. On the contrary, event that has a negative impact is usually considered as a threat.

Böhle et al. (2016, p. 1386) present that the presence of uncertainty in projects can be justified from two perspectives. From an ontological point of view, the presence of uncertainty is related to the fundamental structure of a project and its factors due to its nature (temporary, unique, limited et cetera). From a pragmatic point of view, uncertainty is related to differences between possibilities in theory and practice. Although, theoretically it would be possible to eliminate uncertainty in a project completely, it is not possible in practice because the resources needed to remove it (e.g.

temporal, material, personal and financial) are limited (see cost for search). Regardless of the point of view, uncertainty can be seen as an inevitable and normal phenomenon in projects.

According to De Meyer, Loch and Pich (2002, pp. 61-67), uncertainties can rise from different sources, for example form technical issues, market conditions, personnel, stakeholders or project constraints. In the light of project management approaches and the response for uncertainties, the authors categorize four types of uncertainty: variation, foreseen uncertainty, unforeseen uncertainty and chaos.

According to De Meyer et al. (2002, p. 61), variation refers to minor differences in project variables compared to set objectives and plan. As the project plan is set up in order to function as a guideline to be able to follow the pre-defined critical path, objectives and actions needed to reach those objectives are decided at the outset. If value of a resulted activity (for example activity x takes two weeks to complete instead of planned one week) variates from predicted value, there is variation that has effect on overall project performance i.e. other activities. Monitoring is needed to keep the overall project performance on track.

De Meyer et al. (2002, pp. 61-62) present that foreseen uncertainties are events that are identifiable and their influence on project objectives can be understood. Uncertainty emerges from the fact that it is not sure that these events will occur. For these types of uncertainties, it is possible to prepare beforehand as they are identifiable at the outset as distinct events that are known possible to happen by previous experience. Preparation for foreseen uncertainties can be done by the means of traditional risk management tools i.e. with contingency plans.

According to De Meyer et al. (2002, p. 62), unforeseen uncertainty refers to situation that cannot be prepared in advance during the project planning phase. They are unidentifiable as the project team is not aware of the possibility for these events to occur

or their influence on the project. These events are referred as “unk-unks” or “unknown unknowns”. Unforeseen uncertainty does not necessarily refer to completely surprising new situation or event as it can arise from joint effect of many singular events that together cause unanticipated effect, even though as individual events they might be foreseeable. Unforeseen uncertainty can be seen as present in situations where no previous experience can be exploited, or the environment is unknown or only partially known.

2.2.1 Conceptualizing uncertainty

Atkinson, Crawford and Ward (2006, p. 693) mention that uncertainty can be characterized also by the level of information that one has in comparison with the information that is needed. It can be described as the lack of information that one needs to make decision about something. Ambiguity on the other hand can be seen as a lack of clarity, meaning that there is not clear view about the information that is already existent. Ambiguity can be referred to situations where there are too many variables or too many possibilities to make decisions or to understand the completeness of the variables linked to each other. In order to tackle uncertainty, acquisition of more information is needed to resolve remaining unclear factors, whereas clearing ambiguity, sensemaking and defining problems by exchanging views and interpretations is needed. Ambiguity can be seen as absence of knowledge about functional variables (Pich, et al., 2002, p. 1010).

Howell et al. (2010, p. 260) describe chaos as an extreme situation of uncertainty. In a chaotic situation nothing can be predicted and the probability of unexpected events occurring is 100 per cent. Authors attach uncertainty to probability and point out criticality as a concept related to outcome. Criticality refers to the consequences of uncertainty, i.e. what is the result if something unforeseen occurs.

According to Howell et al. (2010, p. 260), chaos as an uncertainty type can be linked to project structure. In “normal” scenario it is possible to determine goals and assumptions for a project at some level, but with chaos the basic project structure is unclear as it is not possible to form anticipation of expected outcome, and so the project execution phases cannot be planned to meet the objectives. An example of chaotic project type would be a situation where groundbreaking technology is used, or completely new research is launched.

Howell et al. (2010, p. 260) mention complexity as another closely attached concept to uncertainty. In complex situations it is hard to make sense of connections between factors affecting each other, in another words, “what is going on”. That refers to situation where it is unclear what is the ratio between different variables and their interconnectedness. There is a lack of comprehension of how factor x affects factor y and therefore lack of predictability is also present. As a result, complexity can be seen closely attached to uncertainty.

According to Loch, De Meyer and Pich (2006, p. 10), it is possible to see complexity increasing as the system size increases (altogether with the number of parts that the system includes). A large system does not necessarily mean complexity if there is no interaction among the parts. If parts in the system are not interconnected and can be isolated from each other, system performance can be studied by adding up different parts to construct a whole. Therefore, it can be stated that complexity is caused by the interaction of different parts in the system that causes non-predictability as the system becomes more than the sum of its parts.

2.2.2 Probability and outcome

Pich et al. (2002, p. 1010) point out perspective rising from operations research and decision theory, that is focusing on managing uncertainty. Referring to the probability point of view of uncertainty, events that are known as possible to occur but it is not

certain whether they will, can be seen as possible to manage by the means of risk management, whereas "*existing work has implicitly viewed it as impossible to manage events that cannot be foreseen*".

The classic definition of risk and uncertainty can be derived from the work of Frank Knight's Risk, Uncertainty and Profit (1921). According to Knight, *"risks are events subject to known or knowable probability, whereas uncertainty refers to events for which it is impossible to specify numerical probabilities"* (Perminova, et al., 2008, p. 75).

Ben-Haim and Demertzis (2016, pp. 2-4) point out that in Knight's concept, the divider is the probability of occurrence. The so-called Knightian risk can be defined as a scenario where probability distributions are known. That means there is understanding of underlying processes that result in an event to occur. In means of decision making, there is some level of predictability on the odds. Under risk, there is probabilistic "confidence" about the underlying system.

According to Ben-Haim and Demertzis (2016, pp. 2-4), on the other hand, Knightian uncertainty reflects the ignorance of underlying probability distributions. One cannot optimate decision based on its possible outcome as the foundations of the decision are unclear. Thus, there is no information or knowledge one needs in order to set accurate odds in the first place. Uncertainty refers to that what is unpredictable.

3 Project

According to Loch et al. (2006, pp. 2-4), projects are organizational structures that allow flexible and adaptive form of organizing work to respond to the needs, changes and challenges emerging from both internal and external sources. Projects have been traditionally associated to for example R&D, infrastructure and IT industries but have become omnipresent in terminology of all industries and areas as a way to organize and perform work in order to adapt to increased uncertainty and velocity of changes in environment. Any activity that is significant form the customer perspective, or any activity that is supposed to deliver significant change or improvement as a result, could be considered as project (Perminova, et al., 2008, p. 73).

Work in organizations is performed by people and with limited resources allocated to perform it, work is planned, executed and controlled (Project Management Institute, 2000, p. 4). After the same task has been repeated many times, stage of planning requires less attention since operatives involved know how the task is performed and what is the expected result of it (Hughes & Cotterell, 2005, p. 2). With features of predefined expectations of desired outcomes and with previous experience of performing similar tasks, work has characteristics of being ongoing and repetitive, so-called operational or process type of work (Project Management Institute, 2000, p. 4). According to Rice, Colarelli O'Connor and Pierantozzi (2008, p. 93), it is possible to take advantage of previous experience in operations as actions are repetitive and routines have been utilized many times before. Therefore, outcomes of these actions can be fairly accurately predicted.

Project type of work has the same fundamental characteristics as operations as it is performed by people, with limited resources, and it is planned, executed and controlled (Project Management Institute, 2000, p. 4). Hughes and Cotterell (2005, p. 2) states that although a project includes a planning phase it might be difficult to forecast the way tasks are being performed later on: a project includes non-routine tasks that have not been carried out before. The defining feature of a project is also its time span, it has a

pre-defined start and an end. Therefore, distinctions to operational work can be found in timeframe and repetitiveness: project work has characteristics of being temporary and unique (Project Management Institute, 2000, p. 4).

According to Johansen (2015, p. 85), between kick-off and cease, projects have different phases where activities are performed and the output of one phase serves as the input for the following. All these phases collectively form the project life cycle. The project life cycle contains phases from the start of the project until the end. By the end of the last phase, the project should have provided all the agreed deliverables. One reason to divide projects into phases is to facilitate their management (Project Management Institute, 2000, pp. 11-12).

Goodman and Goodman (1976, p. 494) define project as "*a set of diversely skilled people working together on a complex task over a limited period of time*". Turner (2009, p. 2) defines project as "*an endeavor in which human, financial, and material resources are organized in a novel way to undertake a unique scope of work, of given specification, within constraints of cost and time, so as to achieve beneficial change defined by quantitative and qualitative objectives*". Köster (2010, p. 3) describes projects' difference to operational work by describing project´s objective usually being "*a new state of that is different from normal work*".

According to Artto, Martinsuo and Kujala (2011, p. 11), projects can be harshly divided into two categories by their objective of providing value either to internal or external customers. Internal projects have developmental nature to improve existing processes inside an organization and therefore they can be seen as an investment to company's own business. Projects can be set up, for example, for improving existing processes or creating new ways of working. A project can include actions towards increased cost efficiency, automatization or new production facilities.

Artto et al. (2011, p. 11) mention that projects orientated to create added value to external customers can include development of a new product or creating unique solutions that meet customers' needs. Investment is targeted towards meeting external customers' requirements. Form of a project instead of operational work is appropriate when actions towards the objective are based on a customer's need for a unique solution that cannot be or is not sufficient to be produced as so-called mass production, or in other words, operations.

Köster (2010, pp. 3-4) stresses that projects regardless of their size, duration, purpose, scope or other differentiating criterion in hand have three main characters: they are limited, unique and risky. A project is limited in a sense that it should have a clearly defined start and end. In its lifecycle, a project should deliver a desired output that justifies its meaning and resources that have been invested in the project. Projects can be launched and carried out in different organizational levels and they can have different objectives.

According to Köster (2010, pp. 3-5), uniqueness comes from their nature of creating something new that has not been created before ant therefore being non-routine work. Even though projects can share some identical phases or same type of structure, the unique output distinguish one from the other. In addition to its non-routine feature, riskiness comes from its aim of improving things and setting a new state in uncertain environment. During the project it is not possible to know in certain if, for example, trends or requirements will change, and thus the project might become outdated. It is something that cannot be predicted beforehand.

Project Management Institute (2000, p. 30) stresses that as a structure, project can be described as a temporary organization. This temporary organization is formed by the people, groups, and organizations taking part in implementing the project. The project organization has organized structure, responsibilities, and procedures. Turner (2009, p. 3) mentions that temporariness is based on a project's aim to change status quo and to

bring a desired future state. A project should have a clear start and an end. A project starts when a vision of future state is concretized into a plan and resources for the purpose of converting that vision into reality have been allocated. A project is not meant to be ongoing and therefore when the new state has been achieved, the project disbands. To conclude, Loch et al. (2006, p. 1) define project as "*a sequence of activities undertaken to accomplish a temporary endeavor (with a defined completion date) to create a unique product or service*".

As highlighted earlier, according to Turner (2009, p. 4), one defining characteristic of a project is its riskiness. Since a project is a temporary organization specially set up for delivering a unique objective that is not similar with any prior, it requires a new way of working. When there is no repetition and, in that sense, no possibility to take advantage of previous experience as with ongoing operational work, novelty and uniqueness creates greater uncertainty and greater risk of failure. Tools and practices from previous projects of similar kind can be utilized but the whole of the project is unique and includes novel elements.

Loch et al. (2006, p. 1) mention that even though projects themselves can be considered as risky, organizing the way of work to project structure can be seen as an organizational tool to respond to risks. Projects are temporary structures that are formed on a basis of providing a solution to unique need and therefore can be considered as having more flexible methods to achieve that objective as the whole structure is formed solely on that purpose. As after the desired output has been provided, project ceases which stress's the previously mentioned argument.

In the following table, characteristics of a project are presented in comparison to operations. It is worth to mention that project and operations are not completely distinct from each other, and the line between projects and operations can be volatile for example in matrix organizations (Artto, et al., 2011, pp. 241-242).

Table 1. Distinctive characteristics between project and operations (adapted from Project Management Institute, 2008, pp. 22-23; Köster, 2010, pp. 3-5; Rice, et al., 2008, p. 93).

Character	Project	Operations
Duration	temporary	ongoing
Type of output	unique	repetitive
After the task is completed	cease	restart
Predictability of expected end result *ex ante*	low	high
Possibility to exploit previous experience	low	high

As described by Köster (2010, p. 9), a program consists of several projects in a bundle. Program has the same characteristics of a project but in a larger scale and it requires more resources and coordination. A benefit of a program is the possibility to exploit synergy effects between different projects in a program. All projects in a program are steered towards the same direction to pursue the program's objective. Therefore, due to a larger scope, a program can be considered as providing more significant benefits to an organization (Project Management Institute, 2008, pp. 8-10).

3.1 Constraints

Projects have constraints in time, costs and scope as well as certain demands for quality (Perminova et al., 2008, p. 74). As presented by Kerzner (2009, pp. 7-8) and Wearne and White-Hunt (2014, pp. 9-11), the project management triangle (or project triple constraint, iron triangle) is a framework for reviewing and understanding these constrains and their interdependencies. The idea behind the triangle is that change in some of these areas often require trade-offs among other areas. Improved performance in one area may be possible only by sacrificing performance in another.

According to Kerzner (2009, pp. 7-8) and Wearne and White-Hunt (2014, pp. 9-11), the overall quality of a project is limited by the budget (resources allocated), the deadlines set for completion of the project and the tasks needed to complete for closing the project. For example, if the project is required to be completed faster (time constraint), it is possible to increase budget (cost constraint) or cut down scope (scope constraint) in order to complete project within given time. In a similar way, extension to scope of project (scope constraint) might require more resources (cost constraint) or more time (time constraint) in order to complete the project in line with increased scope. If the budget is cut down (cost constraint) without adjusting deadlines (time constraint) or tasks to be completed (scope constraint), e.g. lower quality might be expected.

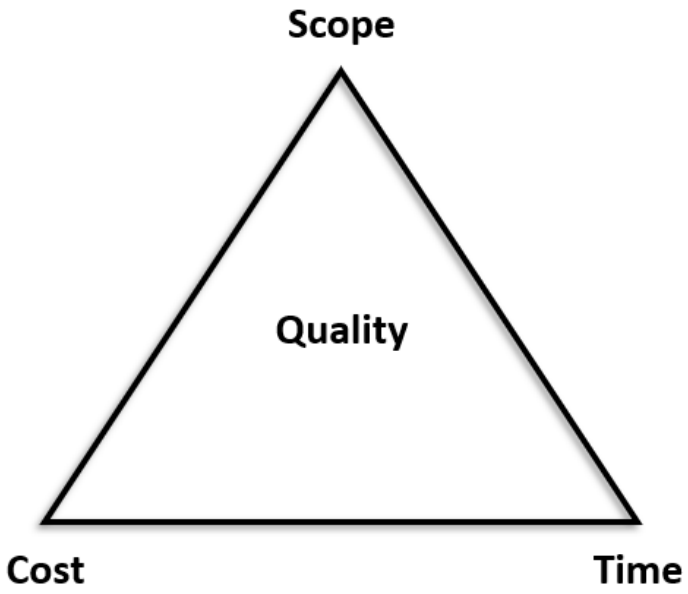

Figure 1. The Project Management triangle (adapted from Kerzner, 2009, pp. 7-8; Wearne & White-Hunt, 2014, pp. 9-11).

Lenfle and Loch (2010, p. 46) mention that setting the constraints too tight might cause problems during the project execution. Underestimation of resources needed to complete project within set objectives might the derail project. If uncertain events occur, adjusting to the new situation might increase demand to extend the schedule or increase budget that would eventually require trade-off within the constraints. As a result, the conclusion might be that the project is inviable.

Atkinson (1999, p. 337) stresses that since constraints are usually set up at the beginning of a project, they are, at best, only guesses since the starting phase is the time when least is known about the project. Moreover, quality can be seen as an emergent phenomenon and it is evaluated by people through their attitudes and beliefs. Those attitudes and beliefs often change during the project lifecycle as knowledge and understanding increase.

3.2 Stakeholders and project success criteria

Stakeholders are different parties that the project may affect or that can affect the project (Artto, et al., 2011, p. 11). According to Project Management Institute (2000, p. 16), stakeholders are individuals or organizations that are involved in the project directly (active participation to project execution) or indirectly (result of the project execution may affect their interests positively or negatively). To carry out a project successfully, the project stakeholders should be identified, and their requirements should be determined in order to be able to manage and adjust expectations and respond to the requirements. Some of the key stakeholders are presented in Table 2 below.

Table 2. Project stakeholders (adapted from Project Management Institute, 2008, pp. 23-27; Artto, et al., 2011, pp. 30-32).

Stakeholder	**Role**
Project manager	Responsible for the project for achieving its objectives, for managing and controlling its implementation, and for communicating with stakeholders.
Project organization	People, groups, and companies taking part in implementing the project. Usually includes at least a project team, a steering committee, and a customer.
Project team	Project team is group of people who carry out the work of the project to achieve project objectives. Team members belong to the project organization.
Organization unit of the company conducting the project	The unit to which the project is attached at least in part. The unit's personnel can participate in project execution by providing subject matter expertise or services to the project.
Customer/user	Individual or organization that orders the project and uses resulting product or service. Customer/user can be either external or internal to the company. Customer/user and user can be the same entity or in some cases customer refers to entity acquiring the project's product and user to the one that utilizes the product.
Sponsor or project owner	Person or a group that provides financial resources for the project. In internal projects, representative of management can be called a project sponsor or project owner.

Artto et al. (2011, p. 25) stress that project objectives should be defined in a way that they meet project stakeholders' needs and expectations. Project management should aim to achieve stakeholder satisfaction by responding to needs, demands and requirements by completing project in line with set objectives. Multiple stakeholders

might have different requirements and expectations, thus managing stakeholder expectations might require balancing between contradictory demands. As a result, communication with external stakeholders as well as inter-organizational project parties is crucial to manage expectations.

Jaafari (2001, p. 93) points out that since it is not possible to foreshadow future events with certainty, sticking to a fixed project plan might cause obstacles during the project. If the environment changes it might not be possible to achieve the original project objectives with allocated resources or within given time. In the light of flexibility, the project objectives should be re-evaluated when a surprising event occur and thus to be ready to change the course if needed. In order to re-evaluate and adjust objectives, required adjustments should be communicated to stakeholders (Artto, et al., 2011, p. 25).

According to Artto et al. (2011, p. 25), stakeholders' demands might be linked to different objectives within project objectives. Overall project goal can be considered to promote the objectives of the project customer as the customer is the recipient of project end product and thus can be seen as one of the most important stakeholders. Along with external stakeholders, the project team as internal actor is also important stakeholder. Project team affects the efficiency and result of the achievement of project objectives and thus should be incorporated to communication in order to manage expectations.

Artto et al. (2011, pp. 30-32) stress that a great number of stakeholders can result in challenges to manage and respond to multiple expectations and requirements. When project objectives are formed at the early stages, the needs and expectations of stakeholders should be identified in order to build a common view on goals and objectives. If the project objectives get compromised due to events or situations that occur after the definition of project objectives, project managers should communicate with stakeholders in order to manage and control the needs and expectations. If stakeholders are left unnoticed there is a risk of unsatisfaction and miscommunication

between project the team and external stakeholders that can lead to difficulties between different parties.

Traditionally, the success criteria for a project that project management uses is focused on evaluating whether the project was done right in the light of project implementation (Atkinson, 1999, p. 338). Cuellar (2010, p. 27) mentions that the success of a project is evaluated from project organization perspective. A project that produces an output that doesn't meet the need of the customer or end-user, could be interpreted successful if the project implementation stayed inside the budget, given time and was delivered in the required scope.

According to Cuellar (2010, p. 19), the current measurement highlights the triple constraint as determining success criteria. Time, cost and scope are the objects that need to be fulfilled in order to evaluate project as a success. If unexpected events occur during the project, trade-offs between priorities might be needed in order to resolve problems that have arisen after the planning phase. Or, as a result of these events, new opportunities that could lead to even greater customer satisfaction or innovation could be captured if original objects regarding constraints would be eased off.

4 Managing uncertainty in a project

According to Project Management Institute (2000, p. 6), project management is the method of knowledge, skills, tools, and techniques to project activities that are needed to fulfill project requirements. Project management is implemented by processes of initiating, planning, executing, controlling, and closing a project.

Perminova et al. (2008, p. 74) mention that when taking into consideration that all projects are unique and complex endeavors with constraints in time, costs, resources and quality of the product to be delivered, it is reasonable to assume that forming a project plan is a challenging task. Moreover, there is a possibility for constraints and unclear areas that neither customer nor the project organization are able to recognize at an early stage.

4.1 Traditional approach

According to Pich et al. (2002, p. 1011), a project is often seen as a network consisting of concurrent and sequential activities, where these activities together produce the output and the value of the project. In a simplified way, project management mostly consists of planning, implementing and monitoring these activities. When moving forward to project implementation, activities are taken as given as it is already decided what is to be done and the main focus is to manage, control and schedule these activities. It is assumed that a well-designed project plan will form a network in which the activities are organized in the best possible way. Thus, by putting a lot of effort to planning at the outset, it is possible to discover possible threats and obstacles beforehand and if they occur, be prepared for them or even avoid them.

Böhle et al. (2016, p. 1384) point out that in plan-driven approach, project management can be considered as a set of activities focusing to planning, governance and control. When considering uncertainty, this approach with effort on planning and control is

focused on reducing and resolving uncertainty as much as possible. Uncertainty is seen as a negative factor that prevents successful project implementation and therefore it is seen as an obstacle that has to be eliminated.

According to Tuulenmäki and Välikangas (2011, pp. 30-31), the waterfall model as plan-driven approach is based on creating a formalized plan with sequential steps. Each of these steps or gates has a control point in which performance is evaluated to ensure that performance meets required criteria. Evaluation is done against the project plan that has been formed at the outset of the project. Therefore, this model can be seen as choosing the point of view that all the necessary information to create a project plan and to respond to future events is possible to gather at the outset. It can be considered that this model allows very few changes or unexpected events to occur during the implementation and therefore it aims to avoid or minimalize uncertainty.

De Meyer et al. (2006) call this approach as instructionalist and refer to it as being the fundamental logic of existing project risk management methods. According to authors, "*contingency plans are drawn up as instructions for the project management team to follow, and contingencies and flexibility are pre-planned and then only "triggered"*. This approach can be seen as sufficient for scenarios where there is a possibility and resources to identify all risks and predict their possible impact if these risk events occur. By considering that, it is clear that this approach does not emphasize the existence of unforeseeable unknowns, events with unknown outcomes that cannot be predicted, due to the notion that by carefully scanning the environment and creating contingency plans at the outset, unexpected events can be minimized. Uncertainty management consists creating buffers for risks or implementing simulation in order to be prepared for risk materialization as the probability for events to occur can be predicted.

According to De Meyer et al. (2006), this approach has multiple conflicting factors in the light of dealing with uncertainty. First, lists and carefully designed plans might give the project management team a false signal that all risks have been identified and therefore

there will not be any unexpected events occurring. Second, it is possible that these detailed plans become the objective of the project instead of being the way to achieve the objective. Third, if there would be a need to change the already defined plan due to emerging circumstances during the project, stakeholders might interpret these changes as negative or as evidence of incompetency as there should not be any need for change due to careful scanning and planning at the outset.

Traditional approach to project management focuses on assuring conformance to time, budget and scope constraints (Perminova, et al., 2008, p. 74). Andersen et al. (2009, p. 481) mention that as the targets are set early on and work structure is well defined, implementation is carried out efficiently and through control and monitoring, predictability of expected results for different stages can be seen as clearer. According to Perminova et al. (2008, p. 74), as a downside, continuous improvement, customer-centric thinking and reflective learning can be left for less attention. This might lead into project organizations becoming less flexible and less capable to accumulate knowledge and experience necessary for coping with uncertainty.

Perminova et al. (2008, p. 73) found that traditional project management approaches put a lot of effort on ensuring time, budget and scope constraints are kept in scope with the project plan. The approach can be criticized to be rigid as it emphasizes coordination and control over the predefined plan and constraints instead of an ongoing process that confronts occurring events by adapting to them. According to Lenfle and Loch (2010, p. 42) the main target for the approach is to eliminate uncertainty by setting a clear project mission. Project stages are executed linearly, contrary to multiple parallel trials or continuous trial and error approach, in order to avoid unnecessary rework and increased costs.

As Tuulenmäki and Välikangas (2011, pp. 30-31) mention, a plan-driven model promotes extensive planning at the outset with an expectation, that information needed to determine objectives and measures to successfully complete a project in relation to the

fundamental constraints, is available and future activities can be based on that information. On later stages of a project those objects can be achieved by following the plan that has been determined at the outset. Success of a project is mostly determined by how well the original plan is followed and the targets set for time, cost, scope and quality are met, meaning that execution of a project should stay inside the budget and set completion times et cetera. By failing to fulfil those targets project execution is possible to be considered as unsuccessful.

According to Böhle et al. (2016, pp. 1387-1388), dominant project management approach takes into consideration the possibility of events that might affect project execution to arise, but from a viewpoint that probability to those events to occur can be estimated and therefore it is possible to be prepared for them beforehand. Those events can be considered as risks and they fall into the area of risk management knowledge area in project management. Risks can be considered as events that might or might not occur, and if occurring, having an effect on project execution. The presupposition is that even though there is no certainty that those events will occur, their outcomes or effects are known. Therefore, by calculating probabilities for those events to occur, and knowing their causes, they can be taken into consideration when forming a project plan and therefore it is possible to be prepared for them beforehand.

De Meyer et al. (2002, pp. 60-61) point out that commonly accepted definition of a project is "*a unique interrelated set of tasks with a beginning, an end and a well-defined outcome*". That definition includes pre-assumption that tasks can be identified at the outset in order to set direction to the desired outcome. Contingency plans can be set to tackle possible variations in order to secure the same overall vision throughout the project. Thus, it can be anticipated that this approach is based on a fixed sequence of tasks.

According to Loch et al. (2006, p. 3), in traditional project risk management risks are assessed at the outset and for the identified risks contingencies and some level of

flexibility are pre-planned. The aim is to take actions in order to get the project back on track when risk events occur, thus risk events trigger alternative actions. This approach can be seen as sufficient when all the risks are identified, or risks are simply events that temporarily pass by and take project off its planned course. When project team has resolved these events, project should get back to its original plan.

Loch et al. mention (2006, p. 52) that traditional approach emerges from assumption of operating on known terrain. As a result, it can be discovered of what events and outcomes of actions to expect. As it is possible to foresee the range of events to possibly occur and the respective causes of these events, it is possible to choose the best course of action. Even though there is no full certainty on which of these events might occur or what is the probability for their occurrence, they can be identified and foreseen at the outset. According to Lenfle and Loch (2010, p. 32), project structure is formed in life-cycle that consist of phases that projects go through. Each of these steps includes an end review that determines whether the phase is completed, and next phase should begin.

A summary of traditional approach and its view on uncertainty is presented in Figure 2. By reflecting to the work of Loch et al. (2006), De Meyer et al. (2002) and Böhle et al. (2016), a detailed plan is based on the initial idea, that required information is possible to gather at the outset, and the plan consist of sequential steps that are to be executed in order to proceed in the project. The plan might include if-clauses or bumpers, that have been defined to keep the project on track. Those if clauses are formed on the basis of predictable events that might occur and cause deviation, even though there is no full certainty if those events occur.

According to Loch et al. (2006), De Meyer et al. (2002) and Böhle et al. (2016), the aim is to minimize uncertainty, and risk, and to reduce possibility for “surprises”. If anything exceptional occurs, it creates pressure to get the project back on track regarding the initial plan, as the execution of the project should stay inside the constraints formed along with the plan. The positive side of the approach is that it sets clear expectations

to stakeholders as the plan is detailed and thus the project progression is easier to control. Downside of the approach is that as uncertainty is minimized as much as possible, the constraints limit possibilities to grasp on opportunities that come along with the risk.

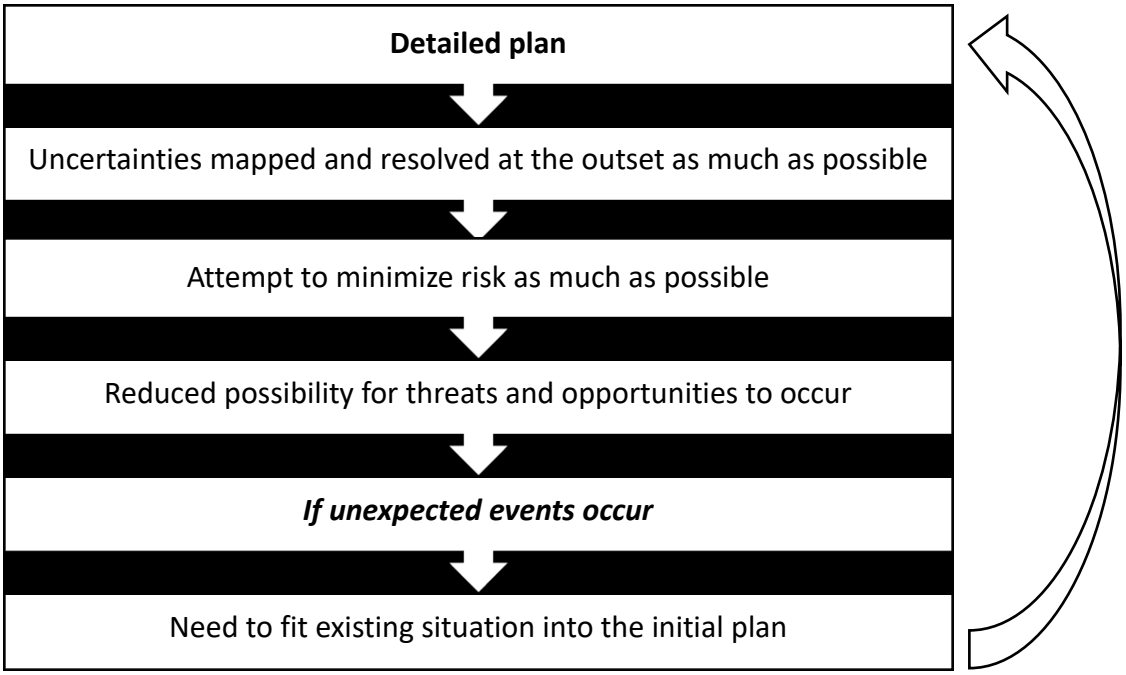

Figure 2. Summary of traditional approach and its view on uncertainty (adapted from De Meyer, et al., 2006; Böhle, et al., 2016, p. 1384).

4.2 Learning approach

Pich et al. (2002, p. 1014) mention that when the knowledge of the task environment is not complete (there is a lack of information or knowledge) and new events occur, learning-based approach could be useful. With learning-based approach new and original plan are conducted to fit the current situation. According to Sommer and Loch (2004, p. 1335), project activities and targets are adjusted to fit with new information, as it is received. Approach requires flexibility as information and knowledge that was previously unavailable re-shapes the understanding of the current situation.

In an environment where uncertainty is present an approach that promotes methods based on learning could been seen suitable (Howell, et al., 2010, p. 256). Loch et al. (2006, p. 130) define learning in projects as flexible adjustment to changing environment. Emerging events are taken as they occur and new information that is being obtained during the project is used to adjusting performance and goals. This way of approaching project management can be seen quite distinct to planning-based approach as project execution is not based previously planned solutions to emerging events.

According to Loch et al. (2006, pp. 103-104), each new activity provides new information and insights that can be used to review a project plan. Changes might not be on a large scale, but they might adjust the project implementation in a way that the end result might look quite different from the original intention. Changes might influence, for example, required resources and the stakeholder relations and because of that more flexible approach to project is needed from all parties involved.

Loch et al. (2006, pp. 123-124) mention that selectionism as an approach can be considered as trial and error type of approach. In selectionist approach multiple trial projects are being set out at the outset to explore environment and possibilities. Later on, these "candidate" projects are evaluated, and the best ones are chosen to execute further. Sommer and Loch (2004, p. 1335) point out that the fundamental principle is the same as in the learning approach. Information is not complete at the outset and fixed step-by-step plan cannot be formed. Selection is done ex post; multiple trials increase knowledge of the environment and as information is more complete the best option can be chosen. Selectionism is viewed as having the same foundations to deal with uncertainty as learning approach, thus it is not examined separately in this thesis.

According to Perminova et al. (2008, p. 73) "*the key elements in managing uncertainty are reflective learning and sensemaking as enablers of flexibility and rapidness in decision-making regarding the choice of alternative actions in response to the situation*".

Thus, the advantage of the learning approach is its ability to create flexibility to allow continuous improvement, customer-centric thinking and reflective learning.

The learning approach has similarities to principles in opportunistic investment strategy described in article Strategic management of uncertainty by Collis (1992, pp. 128-129). Opportunistic strategy in investments refers to approach where "*strategy is not pre-determined but altered as uncertainties are resolved […]" and "it employs a strategy of organizational flexibility and responsiveness […]*". The fact that not all underlying assumptions and effects of possibly occurring events cannot be known beforehand forms the basis of flexible approach where the plan is adjusted during the course of the project and uncertainties are reduced by means of learning and discovering.

According to Wouters, Roorda and Gal (2011, p. 41), at the early stages of a project it is functional to identify important uncertainties that might affect project objectives. Nevertheless, trying to identify all uncertain factors is not sensible nor even possible as the list of uncertainties would become extremely long and the cost of search would be remarkable. In the later stages of the project when uncertainties have decreased through learning more detailed plans become possible and useful.

Deducted from Simons' (1990, p. 6) hypothesis we could point out that as the environment sets the criteria for the possible solution for the problem in hand, it is practical to study the requirements of the environment first and format the plan afterwards when one is more aware of the underlaying implications, instead of creating the plan first. As one is uncertain of the probability and/or outcome at the first place, it can be seen as insufficient to form a plan without reasonable knowledge.

Pinch et al. (2002, p. 1014) mention that the learning approach can be seen as an extension to the plan-based approach. An initial plan, based on available information at the time, is formed at the outset of a project. During the project, the initial plan is modified when signals from the environment depart from the initial plan. As a result of

incompatible signals, the project plan is updated to match with the current situation. As the new state of things could not have been known beforehand, the plan is modified during the project incrementally. The learning approach accepts the fact that unknown events might appear during the project, and to which it is not possible to be prepared beforehand. For that reason, it is not possible to follow a fixed plan where deviant events trigger pre-specified actions that are being executed. Thus, the learning-based approach can be seen as more flexible and responsive to uncertainty as plan-based approach.

According to Pich et al. (2002, p. 1014), a downside of learning-based approach is that it requires flexibility from the project team perspective. Constant monitoring and adaptation require more effort compared to strictly following the fixed plan, in which actions to respond to different scenarios are planned beforehand. Learning can be seen as time consuming and psychologically difficult. The project team must actively incorporate new information and re-plan the project structure in order to meet with the environment's expectations.

A summary of learning approach and its view on uncertainty is presented in Figure 3. By reflecting to the work of Pich et al. (2002), Wouters et al. (2011) and Perminova et al. (2008), as it is accepted at the outset that not everything can be considered, the plan is constructed in a more flexible form. As a room for deviations is left, unexpected events are grasped as they come. The approach calls for constant reassessment of the plan as encountered events shape the possibilities and limitations of the project. It allows greater possibility for opportunities, but on the other hand, it also requires greater effort for revising the plan.

According to Pich et al. (2002), Wouters et al. (2011) and Perminova et al. (2008), with new information and encountered events, the plan is reassessed instead of trying to fit the existing situation into the plan. A positive side of the approach is that the constraints are not constructed into overly tight form, that would limit the possibilities later on. As a downside, a lack of detailed work breakdown structure requires self-direction from the

project team. Also, the approach requires more effort in communication with stakeholders as the expectations have to be maintained and updated constantly. That results to the fact that trust from stakeholders is needed towards the project team.

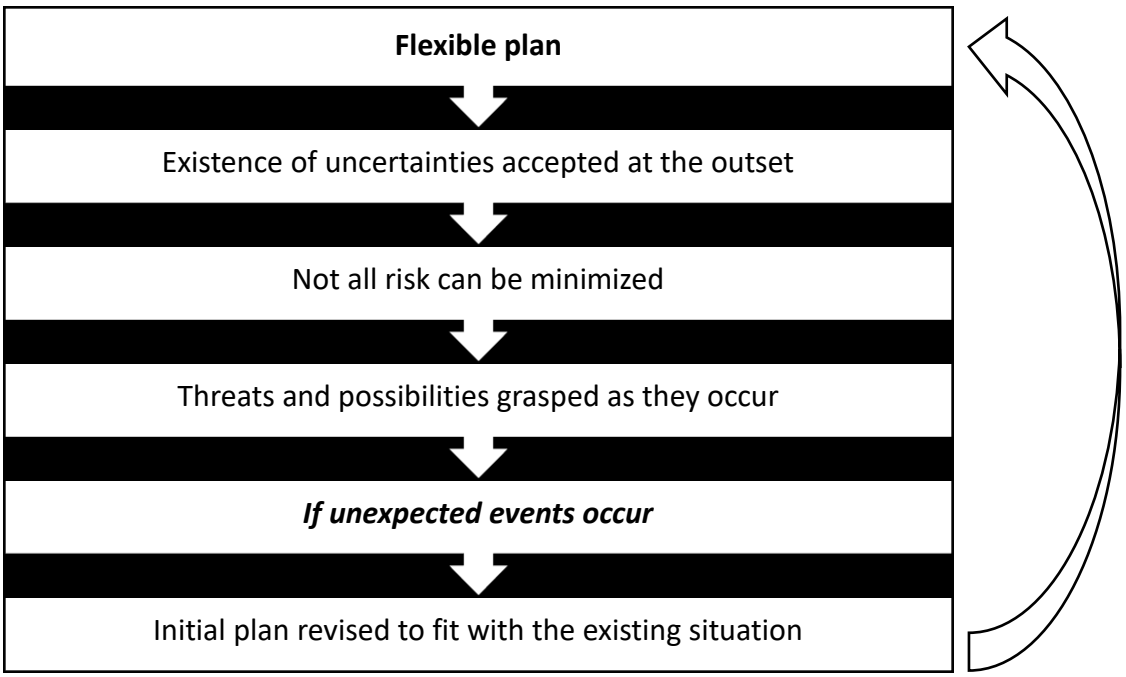

Figure 3. Summary of learning approach and its view on uncertainty (adapted from Pich, et al., 2002, pp. 1010-1014; Wouters, et al., 2011, p. 41).

5 Research methodology

This chapter covers research and data collection methods and justifies the purpose of selected approach. Research method is presented in the first sub-chapter, followed with the description of data collection methods and selection of interviewees. In the last sub-chapter, the validity and reliability of the study are being discussed.

5.1 Research methods

According to Murray (2010, pp. 77-78), both quantitative and qualitative research methods are based on empirically collected evidence i.e. the data collected. Differences emerge when data collection and data analysis methods are considered. Quantitative method as mean of data analysis is suitable for statistical analysis of numerical data. Qualitative method on the other hand is an interpretative analyzing method and is suitable for bringing out deeper meanings of the data sample analyzed. Main difference between sampling of data is that with quantitative method random sampling is used to gain representative subgroups of the population, whereas with qualitative method purposive sampling is used to target participants that would have the relevant characteristics for the purpose of the study.

Heikkilä describes (2014, p. 15) quantitative research method as suitable for research where the purpose is to seek answers to questions to which the results can be presented as percentages or numbers. Quantitative research can also be described as statistical research. It can be used to explain changes in interdependencies of different phenomena, i.e. the researched phenomena are described on the basis of numerical data. It is therefore well suitable for studies where the aim is to find out the current situation of the phenomenon, but ill-suitable for studies where the aim is to focus more on underlying causes the of phenomenon at hand.

Qualitive method can be seen suitable for researches where there is a need to describe reality and real-life occurrences in a comprehensive way (Hirsjärvi, Remes, & Sajavaara, 2013, p. 161). Qualitive method gives the possibility to acquire deep perception of the phenomenon of interest (Kananen, 2017, p. 32). With qualitative approach, according to Murray (2010, pp. 77-78), focus is shifted towards subjective meanings that the selected participants give to the topic of interest, and those experiences and meanings are not independent from effect of social and cultural influences. The approach offers an empirical method for investigation the real-life, lived experience.

According to Creswell (2009, pp. 61-64), in qualitative researches, theories are not usually tested with the same objective as in quantitative researches as the findings of the research cannot be generalized to larger population due to small sample size. Theory is still employed in the research. It functions as a theoretical lens that shapes the perspective of the study and affects, for example, what kind of questions are asked from the interviewees. Even if the initial idea would be constructing a theory based on observations, some conceptual structure composed of theory already exists.

In this thesis, the structure and the area of interest is formed on the basis of the theory. Research method is inductive by nature, as data is gathered through interviews. The data is analyzed to compose themes, and the themes are compared with existing literature later on (Creswell, 2009, pp. 61-64).

5.2 Selection of data collection and analysis methods

Target group for the interviews was selected on the basis of so-called expert sampling. According to Bhattacherjee (2012), expert sampling is a technique where participants are not selected in a random manner. On the contrary, selection is based on the expertise on the topic being studied. The purpose of this method is to gain more credible insights as participants are familiar with the phenomenon, compared to random sampling where participants would possibly consist of experts and non-experts.

The criteria for selecting target group for interviews was based on project experience. As the researcher is working in an organization that has a project team, as well as multiple ongoing projects, conducting interviews within the organization was found sensible. Employees belonging to the project team or working with ongoing projects were targeted for interviews. An invitation email was sent to selected persons to survey their willingness to participate in the research. In total, ten persons out of twelve accepted the invitation. Due to tight schedule and limited availability of the participants, the interviews were decided to be conducted as pair interviews. None of the participants refused the idea to conduct the interview with another person. As a result, a total of five interviews were conducted.

Semi-structured thematic interview was selected as data collection method. The aim of thematic interview is to collect data for constructing an overview of the research topic of interest. That overview is constructed on the basis of smaller details collected with the interviews. (Kananen, 2017, p. 90; 105) As the aim of the thesis is to find signs on how rationality presents itself in project environment and how it affects project success, it can be justified to use semi-structured themed interview as the data collection method in order to gain insights from project team members and to construct further analysis based on that data.

Framework of the method of analysis in the thesis is based on thematic analysis. According to Braun and Clarke (2006, p. 79), "*Thematic analysis is a method for identifying, analysing and reporting patterns (themes) within data.*". As the data collection method is based on themes, thematic method of analysis can be found reasonable.

Data was analyzed by the means of semantic approach. Semantic approach was selected for two main reasons. First, as mentioned in the theory part of this thesis, rationality as a concept is possible to interpret on the basis of an ideal of fully rational behavior. Thus, rationality can be considered quite an abstract phenomenon. In order to find out

meanings and patterns related to rationality from the data set, it can be considered sufficient to try to point out these meanings by finding latent references to the topic across the whole data set (Braun & Clarke, 2006, p. 83).

Deductive view within the thematic analysis was chosen to analyze the data. According to Braun and Clarke (2006, pp. 83-84), by choosing deductive approach, analysis is motivated by the researcher´s theoretical or analytic interest in the area. In this case, the researcher's interest was to find meanings and patterns related to the concept of rationality. In comparison with inductive analysis method, that is more data driven and aims to bring out themes linked to the data itself, deductive approach acknowledges the researcher's own preconceptions and existing frameworks that affect the analysis of the data. As a result, some extend of the overall richness of the data is lost, but more detailed description of some particular theme inside the data set is possible to achieve.

Another decision made with analysis of the data set was to choose method for identifying themes. According to Braun and Clarke (2006, pp. 84-85), semantic themes are identified on explicit level of the data. As such, the researcher is not trying to look for anything beyond what the interviewees have said and is motivated to theorize the significance of the found patterns and their implications. In contrast, analysis in latent level is targeted to find out underlying ideas and meaning behind the semantic themes. As a result, analysis is not only description of the data but already includes the researcher's own interpretations, and as such, is already theorized.

Themes have been produced on the basis of analyzing the interviewees' answers to the questions presented to them. Themes presented in the next chapter are not replicas of what the interviewees have said during the interviews nor the questions presented to them, instead they are researcher's own interpretations of the foundations of meanings that the interviewees have given to certain questions. As Braun and Clarke (2006, pp. 85-86) mention, one example of misleading "analysis" is an analysis that has not been done at all, but presenting the questions to the interviewees as themes in analysis. In that case,

no analysis has not been done at all but instead researcher's own questions have been used as themes and interviewees' answers to those questions have been used as verification of the existence of those themes.

An overview of selected research methods is presented in Table 3 below.

Table 3. Overview of selected research methods.

Research method	Qualitative, inductive
Data collection method	Semi-structured themed interview
Method of analysis	Thematic, deductive, latent
Data approach	Semantic

5.2.1 Description of target organization

Xerox is an American based company that operates in information technology industry. It serves customers in approximately 160 countries providing advanced document technology, services, software and genuine Xerox supplies for a range of customers including small and mid-size businesses, large enterprises, governments and graphic communications providers, and for Xerox partners who serve them. It had approximately 32,400 employees worldwide at December 31, 2018. (Xerox, 2019)

Part of Xerox network is Shared Service Centre of Excellence located in Barcelona, Spain. In the center Order to Cash processes are carried out for BELUX and Nordic countries. Interviews took place at the office in Barcelona between 5th and 14th of November 2019. The average duration of an interview was approximately 45 minutes per pair. At the beginning of each interview, the topic and purpose of thesis as well as data collection method were briefly explained to participants. Interview consent form (see Appendix 2.) was presented to participants and signed by both parties (researcher and participants).

In order to avoid preconceptions of the topic and to allow spontaneity, participants did not receive the interview questions in advance.

The interviewees represented both supervisor and employee level status in the organization, as well as multiple nationalities, and had varying work experience with projects either in their current organization or in previous ones. Most importantly, all of the interviewees had real experience on working with projects. In order to secure anonymity, nationalities, titles, company names or any other identification data is not mentioned in this thesis.

5.2.2 Conducting the interviews

During the interviews, notes and notations of the situation at hand were made, if new ideas emerged. Some of the initial questions in the interview frame were already covered by the interviewees during the flow of conversation and in that case those questions were left out in order to not repeat same questions and cut off the flow of the discussion. If new openings emerged during the interview, extensive questions were posed. Along with some topics, more defying questions were posed in order to make sure that researcher understood the meaning correctly.

After the interviews were conducted, all the recordings were transcribed in order to read them through systematically. Since analysis is based on semantic approach, it was not considered necessary to transcribe features of discussion such as in-breaths, mumbling, gestures or facial expressions. (Clarke & Kitzinger, 2004, p. 200). Although, if an interviewee expressed comment in a humoristic way, features such as laugh were transcribed in order to give more context to the reader.

Coding of the data was conducted by first reading through the data multiple times and making notes of the ideas that arose, without further categorizing them. The meaning of this phase was to familiarize oneself with the data. In the second phase of the analysis,

codes for initial ideas of the data were made. As the chosen approach is deductive by nature, initial ideas were coded keeping rationality as a frame in mind. In the third phase, after the codes were defined, ideas were collected for potential themes.

5.3 Validity and reliability

Credibility of the study is commonly evaluated by the concepts of validity and reliability (Noble & Smith, 2015, pp. 34-35). With qualitative research method, compared to quantitative one, evaluation of credibility can be considered different by nature as credibility cannot be calculated or estimated with the same accuracy (Kananen, 2017, pp. 175-176).

According to Noble and Smith (2015, pp. 34-35), validity refers to the precision in which the findings accurately reflect the data, and the application and integrity of the research methods chosen to conduct the analysis. To ensure validity, participants' perspectives should be presented accurately. Nevertheless, it is worth to keep in mind that the researcher's personal viewpoints and experiences cannot be completely excluded, so any possible bias that could affect the validity should be pointed out. Reliability refers to the consistency of the analytical procedures, including accounting for personal and applied research method biases that may have influenced the findings.

Noble and Smith (2015, pp. 34-35) describe generalizability as referring to the transferability of the findings to other frames, and applicability into other contexts. It should be considered if the findings can be applied to other contexts, settings or groups and if an independent researcher could arrive to similar or comparable conclusions with similar type of research setting.

Kananen (2017, pp. 176-179) presents that with sufficient documentation and transparent explanation on the phases of conduction of the research it is possible to improve the credibility of the qualitative research. Saturation is one factor that increases

credibility of the research. When the so-called saturation point is achieved, answers of the interviewees start to repeat themselves and no new meanings are produced. During the interviews, saturation point was achieved as the answers of the interviewees started to repeat themselves.

It is worthwhile to notion that as the researcher works in the target organization, a greater possibility for biases can be detected due to, for example, personal connection to the interviewees. Also, as the researcher is employed by the target organization, the effect of organizational, formal or informal, rules and pressure cannot be excluded completely. In order to assure the credibility of the study, the researcher did not reveal the interview questions in advance to the interviewees and tried to pursue neutral attitude towards all the interview situations. The analysis and the composing of themes were done independently, and the interpretations of the interviews were not shared with the interviewees before the publication of this thesis.

6 Findings and discussion

In this chapter the analysis of collected data is presented. Themes have been constructed into three main themes that are presented as subchapters. Under each theme, interpretations of collected data are being presented from the researcher's perspective. Overall, the chapter examines how rationality presents itself in target organization from the researcher's perspective. Discussion and reflection to previously examined theory in the literature review part of the thesis is carried out in the last subchapter.

6.1 Positive effects of planning and rationality

6.1.1 Concretizing the complex

When a project is decided to be implemented, it is set up to cover a need. After the need is determined, a structure, or a plan, for the project has to be set up in order to fulfil that need. Defining the plan starts with data gathering, and by using that data, possibilities and limitations are being determined. Data gathering includes searching for information about functional variables, allocating resources et cetera. At the beginning of the project, the whole might feel overwhelming as there are so many variables.

To make the complex entity of multiple and possibly uncontrollable variables more concrete, a plan is defined. The plan can be very detailed in the form of a step-by-step plan, or a bit looser plan with flexibility inside its phases. The function of the plan can be seen as versatile. On one side, it makes the complex whole more tangible from the project team's perspective as seeing the whole divided into smaller pieces gives one concrete understanding of what to do. As one of the interviewees mentioned in discussion related to work breakdown structure used in one of the projects:

> *"But in the beginning it (the plan) really gave me literally a visibility of… okay, because it (project) can be quite immense… and big… like I don´t know where to*

start, I don´t know what to do, I don´t know the process, I don´t know what… what should I… how should I work and then… it really gives you… yeah a clear sight on… on your plan"

Other interviewee pointed out overwhelmingness of the whole that might create a feeling of uncontrollability:

"You know it´s a complex process… you know there´s many phases and you don´t even know where to start… so, to see it I think like line by line… and see progress is helpful"

These examples give support to an interpretation of an idea that the feeling of controllability is important in a complex reality of projects. One can rely on the plan, in which all the pieces of the puzzle have been put in an understandable form and order. By following the plan, the best possible way to perform efficiently in relation to the targets can be justified, as the plan is concrete and visible.

On the other hand, the plan can be seen as a concretizing factor also for the external stakeholders. Even though external stakeholders might not be interested in individual steps within the project, they most probably have interest in knowing the progress of the project. In that case, the plan works as a communication tool of accountability. By presenting current status of the project in relation to the defined plan, it can be seen as a relatively easy way to present progress on the project in a concrete way. The plan can be seen as a communication tool for both internal (project team) and for external stakeholders. Internally within the project team, the plan acts as a tool for keeping persons accountable regarding their input on the project.

"So, there are some projects but… I don't follow up – nobody is following up on me… so they are there… and eh"

"There are some projects that are never done… they are on all the time… in every organization it is so dynamic"

As two of the interviewees mentioned above, keeping persons accountable can be seen as a way to secure project progress. The plan functions as an easy way to follow up, without having the need to put too much effort into going into details to individual project variables. It concretizes the complex and turns it into more manageable entity.

6.1.2 Motivation

Related to accountability, the plan can be seen as playing a role in motivation of project team members. As projects are complex structures where lot of new information and functional variables arise all the time, a need to have something concrete and visible to see progress, can be seen as sensible. The plan keeps project team accountable for progress and creates expectations and pressure to complete tasks. This kind of pressure motivates team members for trying to reach the targets, and even to work harder on securing the progress.

> *"[…] but also a bit as some sort of a natural… pressure you´re feeling… on the responsibility you have finishing your… the… your task of that moment… your step that you created yourself in the end, eh?… so, create your own responsibilities and of course it feels a bit bad… I can tell (laugh)… out of my own experience… that it doesn´t… yeah, it feels a bit bad if you didn´t accomplish what you planned to do"*

> *"I prefer loose plans but… I think strict plans are better for somebody like me… and if you have the continuous follow ups where you have on a weekly basis… you have to… to present an… like to present your results and motivate why they are like that… if they don't live up to the expectations… that… naturally that makes me… eh, push harder to reach the goals"*

Without having these visible targets as a pathway to work on towards the end goal, the number of variables related to project might seem too overwhelming and the complexity might blur one's vision. The lack of controllability could be interpreted as having negative effect on project performance and thus to motivation as well.

The more detailed the plan is the easier it can be interpreted to get support for the project. That can be also interpreted as a result of making complex more understandable. With clear and smaller steps it is possible to follow up the project and its progress and to ensure accountability.

> *"For example… we do a project now and sponsor will support it… I mean if you don't give any feedback to sponsor for over a year… sponsor is also thinking like what the heck is going with this project… I mean… if you present something… small steps… small goals.. you have much more support from your… organization"*

As a summary of the interpretations made form the interviews, one reason why planning is given so much importance is that it makes complex reality simpler and gives feeling of control. A project as a whole might feel so overwhelming that dividing it into controllable pieces is needed. Controllability helps the project team and other stakeholders to organize themselves for proceeding towards a clearly defined goal.

6.2 Boundaries of rationality

6.2.1 Stakeholder expectations

As rational planning is based on the assumption that required data is gathered at the beginning of the project, and decisions made are based on the evaluation of that data, a lot of reliability is given to the accuracy of the gathered data. However, environment, organizations and people functioning in that environment, can be seen as a dynamic concept. Environment changes all the time and creates a collision with the plan if it is assumed to be fixed.

Selling the project idea is done to stakeholders, and support for the project comes from stakeholders as well. When a need for changes in the project occur due to, for example, uncertainties, communication towards multiple project parties is needed in order to get

all the parties on the same page. Communication during changes can be interpreted as colliding with rationality, as valid explanation and motivation to argument changes in the original plan has to be included.

> *"Depends of how much… or how big the change is… if it's a bigger setback in terms of… the timeline… well you need to come with your points like… what happened, what's the… it's always nice to come with a solution… so that you're working on the issue or the problem and then… giving your arguments for it… and then… come with your request for whatever it is… like more time or more money and so on… but it's always good to come with a solution before you approach… you know management… or people that are affected"*

Stakeholders might live with the expectations of the initial plan, which was made based on the information at hand during the starting phase. Expectations of the project team might have changed due to new information available or due to unfolded uncertainties. In addition, the expectations of stakeholders might have changed during the project execution, so communication is needed in order to keep all the parties involved and on the same page with each other.

> *"The more they're (stakeholders) involved the more they'll see how things are going… if there's any issues and so on… and they'll be more understanding… but, if they don't receive any information and they're just waiting for… you know (laugh)… things to happen… and then suddenly you approach them with like a bigger issue… then of course they're going to be caught off guard"*

Honesty with stakeholders came along as a topic during the interviews. If there is no recurrent and honest communication, the idea and expectations based on the initial plan, that has been made with incomplete information, might stay. The earlier stakeholders get involved the easier it can be seen to communicate regarding changes, and to get acceptance to them. With the initial plan all the parties set certain expectations to the project, thus recurrent communication can be seen initial in order to manage the expectations.

Stakeholder expectations might be keener on rationality as stakeholders are not directly facing every small obstacle on the way. Communication is needed as the environment is dynamic also for the stakeholders. If there are changes in stakeholders' environment, priorities might change, and thus stakeholders might not be interested in supporting the project anymore. To avoid a project proceeding too far, communication should to be rapid and honest also from the project team perspective.

> *"So there were a lot of factors that we didn't have in consideration at the begging… even though during the project we started with the "if - what happens if…, what happens if…" … so, this is when we started… I mean at the beginning it is like a nice idea… you do that in a wonderful world… then, as soon as you start like working in the project… you make it more realistic"*

It could also be that stakeholder motivations differ from the expressed ones, and a project might have different purpose for stakeholders, compared to the one that was communicated to project organization. One of the interviewees mentioned an interesting example of motivation for the project which revealed itself after the project was completed.

> *"The first part of the project was basically to streamline the team in Location 1 and…. and getting one process, one tool… and everything… that was the idea... but in reality it was just preparation to move the whole task to Location 2… that is what is was, yeah?... Eh… or part of the task because we had more tasks than only doing this one specific task… but… I mean… the part what could be done in Location 2 was at the end moved to Location 2… so, your ideas to have this nice team here in Location 1 doing this wonderful job… but in reality it doesn't work like that… because at the moment it is there and they realize that it will be done cheaper in Location 2 … it moves to Location 2"*

As Simon's (1997, p. 121) description on rational expectations presents, for being rational all parties should somehow have the same knowledge, the same interpretations and same assumptions regarding the expected the future state. In reality that does not seem to be the case as reality might unfold differently for different parties.

6.2.2 Dynamic environment

Boundaries of rationality comes in handy when data gathering is considered. All bumps on the road are not possible to be known in advance, thus the plan is a combined structure of gathered data and assumptions. All the data needed might not be available or the type of data needed is not known. There might also be variation between interpretation of functional variables between different stakeholders.

> *"So it is gathering information and trying to make an assumption… which is kind of right"*

> *"You can make an estimation… you can make a proposal but… it'll always… how to say… fluctuate, no?"*

As data is gathered from dynamic environment, the meaning or importance of the data might change. Causalities of functional variables cannot be known in advance as it is not possible to forecast future with 100 per cent certainty. Stakeholder expectations are a dynamic variable that might change during the project. That results to the fact that the expectations set at the outset are only "best guesses" and they might change along the way. Also, when the number of variables increases, the harder it gets to forecast the causality of the variables.

> *"It's really hard to foresee all of the bumps in the road that you will hit… and you know it can be anything that delays it… especially if it's a… if it's a project that involves a lot people… and that it goes a longer period of time… if you have a small project, then the deviation of the time maybe won't be as much… but, in the bigger ones definitively"*

It could be interpreted from the interviews that the idea of rationality exists as a mindset. Even though it is recognized that there will be obstacles and uncertainties along the way, the belief for the initial plan and its justification stays. The basic assumption seems to be that you have to be merciful regarding changes in relation to the initial plan. Something has gone wrong because after all the effort to planning, the plan does not hold true.

"Also, it's really important to try to plan as much as possible for these… risks that can happen… so, let's say with (other interviewee's) example… there's one person leaving… maybe this was also…. accounted for in the initial plan… where they maybe needed four people or for this project… but they decided to go with five people to start with… to also cover these risks… so, let's say that person did leave after two or three months… but the project managed to stay on… well, it managed to stay on time because… they… in reality they needed four people… so, this is something you try to plan as much as possible but of course things can happen… like with… let's say it's a (describing project type) project you have some system issues or something like that… which will happen… and then it is important that you go back to… you plan… and see okay what can you change around and… if it is a budgeting thing it will be more complicated because if you're in the end required to go request more budget or more money then that's going to be more complicated and you need to build a case for it… in order to… yeah… increase the budget or something like that… but that needs to be a strong case then"

It is also worthwhile to notice that when the data is gathered, boundaries of rationality come in handy. Even though the ambition for rationality is present in the form of constructing a throughout plan, it is already somehow accepted that not everything can be considered or planned in advance. Environmental constraints can be interpreted to pursue towards rational approach as priorities and limitations have to be matched altogether. External pressure and constraints derived from the environment creates a situation where a decision exceeding aspiration level is being made. A good enough decision.

"Yeah… first question for example for the project that I did… […] it took us one year and a half… so, first question… okay that's the project that we have… the idea is fantastic… you know congratulations… cost?... You know the first question was cost"

"But, if we go back to expect the unexpected… this is why it's unexpected because you don't expect it… in the beginning… there are a lot of things that can happen that are not in your control… or will never be in your control because it depends on other thins… other people and so forth… so, eh… and on the other hand, you cannot… when you have a risk… what is the thing that you can do…in project management… you can create an if-clause… okay, if this happens you do this… but then… at the beginning of the project you… if you brainstorm all the possible risks that can arrive… then you'll lose much more important time focusing… the time that is more important to focus on other things… so, I think risk… we can all understand that is… there will be… there… things will happen… is the way you overcome… and how fast you overcome those challenges… so… I don't really

remember any project that was defined from… I don't know A to Z steps… and it was implemented exactly like it was defined"

As mentioned in the previous subchapter, planning is used to concretize the complex whole into more manageable pieces. It is also used to assure accountability and progress. Even though the plan is a structure to assure those things, it is more of a guideline for executing the actual tasks.

"So, planning is great… planning doesn´t lead to actual results… (laugh) sometimes… but I think you need to plan… otherwise you´re just going with… ah, it´s going to be ready whenever… yeah you know no organization works like that"

Dynamic environment creates the need for a rational plan, but also affects the accuracy of the planning. As an organization can be considered as a dynamic structure that changes all the time, the plan is needed to create some stability in order to assure progress on the project. On the other hand, as the environment where organization works can also be considered dynamic by nature, the fixed plan that is created to keep stability and assure accountability proves to be inaccurate over time.

"And it always takes longer than you expect most of the time"

"I don't know if a sixty-five-year-old project manager doesn't have any unexpected surprises"

"You never know… because as I said there's a lot of external factors that you can't control, and you don't have the information… so it's approx."

6.2.3 Experience

With experience it is possible to fill the gaps that would otherwise be left unresolved with rational planning. Experience helps to expect the unexpected, to take into consideration that not all possible occurrences can be known and something colliding regarding the initial could happen. Yet, as it is not possible to forecast future occurrences with one hundred percent accuracy, it is still not known what the unexpected is. That

could be linked with the probability factor of uncertainties. The effect of the possible uncertainty remains unknown but some assumptions on the probability can be made.

> *"I think the more experience you have the more realistic timeline you will set… because sometimes especially when you're starting out… let´s say as a project manager… you're really optimistic about what's possible and then with experience you realize that… certain time goals were a bit unrealistic and so on… so, you kind of also learn to calculate this a bit better and also taking into consideration that some… you know uncertainties can happen and that will also affect your timeline… so, as you become more experienced as a project manager you will also be better to calculate… like the time"*

> *"I think you can prepare for most things but not everything… there's always going to be something that happens… that I's like out of your control… that you can't plan for… but with more experience you're able to handle these better… of course there's always new things but you're… yeah it's something everybody will expect"*

> *"I think in the beginning… in the beginning you didn't know… or you knew kind of that unexpected things probably will happen… but you never knew… how many… or what… really what to expect… so, when I planned my very first project… my time, that I put in to complete it… was… like my deadlines were way too short… and also you learn about yourself… a bit during the projects as well… and how you handle things"*

As it can be interpreted from the quotes above, experience helps to adopt a more realistic attitude towards uncertainties. It helps to prepare for deviations that the dynamic environment causes to the initial plan. Experience does not enable full rationality as new information becomes available all the time and unknown factors remain unknown, in addition to the fact that it is not possible to unfold all uncertainties due to the constraints of a project.

6.3 Evaluation of project success

6.3.1 Covering the need

When discussing the project success evaluation, a determinant factor of project success was derived back to the starting point of the project, to the need that is to be covered. Importance was given to the fact that if stakeholders and specifically the sponsor and/or the user of the product are satisfied with the result, the project can be considered successful.

> *"For me it's when it is implemented… even though you didn't meet the deadline, or you failed in some of the steps… if it is implemented and you get a benefit from it… then it's a successful project"*

> *"I think if we started with a need, I think the correct answer (to what is successful project) would be if the need is solved"*

Less importance was given to meeting the targets related to constraints of the project. The effect of uncertainties and unknown factors in relation to the initial plan was understood, and from the project team perspective achievement of satisfactory end result would surpass the process performance. That can be interpreted to relate to the fact that the project team is dealing with everyday reality of a project and has to modify expectations continuously with unfolding uncertainties.

Participants evaluated project success on the basis of implementation of the project's output. As project is set up to fulfil some need, fulfilling that need is seen as an important factor when evaluating the success. Even though the plan for achieving the goal is set up as a guideline to monitor project performance, the acceptance of the end product was evaluated as highly important factor when asked to describe successful project.

> *"You can also look at it as a successful project that is… fully completed, within the deadline and everything is done… and that might be… that is a successful project*

> *obviously… but then you can have a… another project that goes… a month, two moths over deadline… but in the end, the earnings from this project is greater than the other project because the other project is a small and easy project than it saves… let's say if we talk time saving… it saves five hours per week, twenty hours per month… the other one saves 50 hours per month… so, if you just look at it over time, the other project is more valuable… and if you… even if you need to go past the deadline and spend some extra time on it, I could see that one… I could see that one as.. more… more successful or at least equally successful"*

Project success evaluation from project team perspective might differ from stakeholder perspective as project team is the one executing the project and stakeholders might be on the receivables side. Also, if the stakeholders are representing an external party to project organization, and are the one that finances the project, it is reasonable to think that the importance is highly focused on staying within the constraints.

From project team point of view, implementation of the project was found important. That reflects also the point that if the need is met then the project could be called successful. Also, success can be found as subjective description, thus there might be variation between different stakeholder on how success is determined. On one hand, completing the targets in the initial plan was found important and necessary, but on the other hand, success should not be evaluated by reflecting to the plan as dynamic environment is constantly changing and knowledge of the variables increases all the time.

> *"I think in the end… the satisfaction of the customer is the most important… like regardless of how the process went"*

> *"I think it is a combination of all things… I mean… along the way you have your success, but you also will have your failures… within the timeline what you said… Eh, some goals you will reach some goals you won't reach… yeah.. in an overall it is more the end product of the project if it is really success or a failure… I mean if you along the way have only failures… most likely at the end you also will have a failure… yeah.. so, you need find some kind of balance between it and at the end goal… to have a success"*

6.3.2 Communication

Communication could be interpreted as one factor that has effect on project success. With sufficient amount of on time and honest communication, project team can try to fit in reality with expectations that have been set out at the outset with limited information. If involvement of all parties is maintained from the beginning, the overall understanding of possibilities and limitations within all parties can be seen as creating a better possibility for achieving success.

> *"Also, something that you (other interviewee) didn't mention, is that sometimes there are really a lot of parts involved… It's good that you involve them from the beginning"*

> *"[…] and here we end up to communication… so, you need to have a very strong communication… to manage the expectations"*

Communication can be seen as important also for taking into consideration tolerance on how much resources should be used to achieve the expected end result. As uncertainties unfold and the knowledge on functional variables increases, it might turn out to be that the resources planned for the project are insufficient or the expected benefit from the project is overestimated.

> *"The question is… do you communicate these kind of things in time… so, before you make too much cost, can the project already be stopped… or at one certain moment your project is running already for a while so you already invested a lot of time and money in there… and then the questions is… is this going to be… a good thing to invest now more, or do we stop it here"*

> *"Failed project is… I mean the… the first criteria for it is a project that… what we would say in (langue of the interviewee)… something that costs more than it takes… eh, and… yeah it's a project that just ends up… you end up putting in a lot of time… and energy on it… and maybe you won't even be able to get a finished product… or you get a finished product that… where the returns are just… so bad… and this is not maybe based on the performance in the project itself… it might be also that the original idea is highly overvalued… or that the initial idea… initial goals set are unrealistic… so, yeah… but then again if you already put 100 hours into something… you kind of want to have… you want to present something in the end…*

> *so, it's really hard to just take those 100 hours and scrap it… eh, that's… I mean that's definitively a fail… but sometimes maybe it's actually better… to take those 100 hours and scrap them… than to put another 100 hours in and get… almost nothing back"*

Stakeholders might not consider the project product successful if they do not understand the product's functionality. Thus, close communication can be seen important. External stakeholders might not understand the internal difficulties inside the project team that might be due to, for example, technical limitations et cetera. Internally the limitations might be well understood but externally they might not be known.

It can be interpreted that uncertainties have an effect on rational expectations as initially unknown factors shape the ratio between expectations and possibilities. If the project success is evaluated on the basis of initial expectations, there can be seen a risk of deviation that might result into a negative evaluation. Communication can be seen as an important factor to shape those initial expectations to match with current reality and by doing so, to create a higher possibility for success. Nevertheless, it is a matter of priorities between different stakeholders and some deviations cannot be accepted by all parties if the project goal changes dramatically.

6.4 Reflection to theory

The presented themes illustrate the many sides of existence of rationality and its boundaries in projects. As presented in the theoretical part of the thesis, the defining features of projects result to the fact that uncertainties are inevitable phenomena in projects (Köster, 2010).

Interviewees' insights gave support on the circumstance that rational behavior is sought, but the limitations of human capabilities cause the intention of full rationality to hit the complex reality of dynamic environment (Simon, 1990). Multiple stakeholders, and their demands and priorities, result to the fact, that an "acceptable" solution within the

circumstances has to be carried out. Multiple examples showed how something that could not be anticipated at the outset of a project, collided with the initial plan and resulted to the collision between initially created expectations and the reality.

When considering the features of the presented approaches, the traditional and the learning approach, the learning approach could be interpreted to fit better to uncertainties (Perminova, et al., 2008). On the other hand, the traditional approach turns out to be an easier way to achieve stakeholder support to the project as the plan is more concrete and the responsibilites are clear (Perminova, et al., 2008).

Extracts from the interviews give support to the interpretation that the traditional approach makes a project easier to control as the detailed planning concretizes the extensive and complex whole into a more understandable form (see De Meyer et al., 2006). On the other hand, the concretizing minimizes room for unknow events by setting well defined constraints which eventually results into discrepancy between the initial plan and the existing situation (see Perminova, et al., 2008).

7 Conclusions

The aim of this thesis was to gain insights on how the ideal of rationality appears in project management and what kind of effect uncertainties have on rationality. In more detail, the concept of rationality was examined through planning of project and effect of uncertainties through evaluation of project success. In the theoretical part, comparison between two distinguishable approaches to planning was made between the waterfall model and the learning approach.

The ideal of rationality can be seen omnipresent in project planning. The underlying idea is that when the need and the goal has been defined and decided on, the planning should start. With data gathering necessary amount of information is acquired and the information is used to allocate resources for project execution.

The initial plan or structure sets certain level of expectations to both external and internal stakeholders. For external stakeholders, it can be seen as a tool of assuring accountability. For project team it is used as a communication tool to show progress and give status updates. It also functions as accountability and control tool to keep the project on track.

Changes in the environment causes collision with rational planning. As targets set at the outset are somehow taken as a given, any new information or event that threat the realism of the initial plan, causes challenges with the initially set expectations. As the project team is at the heart of the project reality, changes in expectations are easier to justify, even to the management of the project or to the management at company level. Stakeholders on the other hand, are more distant to everyday project reality and based on the rationally planned structure, expect project progress based on that structure.

A plan defines boundaries and limitations to project. With the data gathered at the outset, boundaries related to time, cost and scope/quality are defined and they can function as a method to evaluate project success. If it was initially planned that achieving

certain target requires certain amount of resources, it is reasonable to expect that with completing all the steps in the plan, the project should reach the set target.

Boundaries of rationality comes in handy with complexity and predictability of the environment. As it is not possible to consider all the possible options without losing efficiency of the project, nor to process all the variables that exist and their dependences with each other, it could be assumed that there will be deviations to the original plan. Also, variables that are unknown at the outset cannot be considered at the time as they are not known.

Uncertainties affect the reality of the project as they might change the expectations and possibilities for the project. Some goals might turn out to be unrealistic or even impossible to reach, or in contrary, some goals might be even easier to achieve than it was initially expected. Altogether, that brings it back to the capability of rational behavior as there can always be unknown factors and limitations. With new information arising the expectations should be managed to match the existing reality with the expectations set at the outset.

If project success is evaluated based on the expectations set at the outset, and constraints are used as a mean to evaluate success, there is a risk that evaluation of the project will turn to negative because the means of evaluation can be seen as based on somehow outdated data. If changes in the project reality are communicated to stakeholders, and by doing so their expectations are managed successfully – and stakeholders are willing to accept these changes – there can be seen a higher possibility to consider the project successful. As mentioned in the theoretical part of the thesis, by using constraints as success criteria, evaluation of the success focuses more on to project performance. Instead, if the success should be based on meeting the need, evaluation should focus more on how well the need is met with the result of the project.

Also, the initial need might have changed during the project. Priorities might change within the sponsor or other external stakeholders. Even though the project team would follow the initial plan successfully, project might turn out to be unsuccessful because of changes in priorities or expectations of other stakeholders. It can be interpreted that full rationality proves to be problematic on the external side of the project stakeholders as well. Uncertainties and arising of new information affect projects in overall, not only from project organization perspective.

Greater accuracy of planning at the outset can be achieved with experience. It is easier to forecast something that has been experienced earlier on. Even with experience, it is not possible to forecast with one hundred percent accuracy. Calculations made at the outset are the best guesses, that are made at the time. As information and knowledge increases, the best guesses might turn out to be incorrect.

To summarize, there can be seen a link to rationality when considering project planning, and there is a justification to rationality as well. It is worth to aim for rationality as it is targeted to perform actions in a most efficient way. Rational way of thinking also gives secure and controllability to the complex whole that cannot be managed or successfully processed as such. Boundaries of rationality hit when knowledge is increased, and uncertainties unfold. A more realistic and flexible way to planning should be pursued as it would allow greater project success. Needs, priorities and expectations might change during the way, so it would be more suitable to take these things into account instead of trying to deny and minimize their existence.

When considering the two presented approaches, the waterfall approach and the learning approach, it can be interpreted that the latter one takes uncertainty into account with greater detail. More room is left for revising the plan when new information is encountered as the initial idea is that not all can be known at the outset. On the other hand, more effort has to be put on communication with stakeholders as the plan is revised constantly to fit in with the current situation.

Interesting part of the of the interviews was the fact that the rational planning with detailed work breakdown structure also functions as a motivational factor. As complex whole is converted to minor and controllable pieces, it motivates to push harder in order to reach the set targets. Even though those targets might turn out to be unreachable or might have to be revised, the motivational factor holds its place. It can be assumed that the waterfall approach has this positive effect as it is focused on detailed work breakdown structure. On the contrary, the waterfall approach takes uncertainties into account poorer as the plan is constructed on the basis of information gathered at the outset.

The findings of this thesis gave insight on how the ideal of rationality appears in project planning and what effects it has on a project success. The findings can be exploited when a suitable approach is considered for project planning. Boundaries of rationality, and the negative and the positive sides of the examined approaches, can be considered when trying to fit the expectations into the reality.

As this thesis is focused only on project organization point of view on uncertainties and environmental limitations, for future research it would be interesting to compare more closely stakeholders' views on changes with the initial plan and goals with the project organizations' ones. As stakeholders might have different priorities and different level of tolerance to setbacks and changes during the project it would be interesting to gain more sight on how communication about changes affect their rational expectations.

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Appendices

Appendix 1. Themed interview frame

Background

- Experience on working with projects

Rational behavior and bounded rationality

- Describe the process when you start working in a project? How do you estimate time, or the amount of work needed in the beginning? How do you determine the scope?
- In your opinion, what are the limitations for creating a detailed step-by-step plan or work structure? How clear it is in the beginning how the end result might look like and how to get there?
- Do you have to make compromises between what you would want to investigate and what you can actually do (e.g. due to schedule)? If so, what do you think could be the reason for that?
- Do you use the knowledge or experiences from previous projects? In which way you take advantage of them?
- How would you plan ideal project (regarding your own work)? How precisely you think it is possible to plan everything from the start until the end?

Risk and uncertainty

- How do you understand the concept of risk in projects? To what the risk is related to? When do you pay the most attention to risks?
- How would you describe the start of a project and your level of knowledge?
- How do you feel about things that are uncertain or unclear at the beginning? How do you process/resolve them?

- If you think about completed projects that you've participated in, how well the original plan held true?
- In your opinion, what are the pros and cons of clear step-by-step plan? In your opinion, what are the pros and cons of looser "unstructured" plan?
- Has there been any "out of the blue events" or surprises that derailed your original plan? How could these kinds of events be taken into consideration in your opinion?

Project constraints and success

- In your opinion, what is the most challenging target to reach in projects? What makes it a challenge?
- From your point of view, what causes the most stress in projects? Is it due to internal or external factors?
- In your opinion, how would you define successful project? How would you define failed project?
- Which factors you find the most important ones when evaluating project success?

Managing uncertainty in projects

- In which ways planning of the project could be improved in your opinion? What kind of plan structure would be ideal to you and why?
- At which point of the project it becomes clear to you, what is exactly needed in order to reach the targets? Is it clear already at the beginning?
- If you think about past projects you've been involved with, how would you describe the difference between how you expected the outcome to be and the final outcome eventually turned out to be?
- What you think caused variation between expected outcome and final outcome, if there was any variation?

Appendix 2. Interview consent form

By signing this form I agree that:

1) I am voluntarily taking part in this thesis project and I can stop the interview at any time. I can pass or leave unanswered any question during the interview, and I do not have to give any reason for that. I do not expect to receive any benefit or payment for my participation.
2) I accept that the interview will be recorded and transcribed. The transcribed interview or extracts from it are used only for the purposes of this project. When recording is transcribed, all identification data giving possibility to identify the interviewed, is removed. The actual recording will be permanently destroyed after the thesis has been accepted and published, i.e. it is no longer needed for the project.
3) My words may be quoted directly in the thesis. If direct quotes are published, pseudonyms (e.g. Person 1 or P1) are used instead of real names in order to secure anonymity. Any summary interview content, or direct quotation from the interview, that is made available through publication of the thesis will be anonymized so that I cannot be identified.
4) I recognize and understand the obligation to maintain secrecy and the code of conduct of the organization I work at/the organizations I have worked at. Any internal information that would not be allowed to share with third parties according to the obligation to maintain secrecy and/or the code of conduct of the organization/organizations will not be published.

Participant	_____	Researcher	_____
Signature	_____	Signature	_____
Date	_____	Date	_____