

Routines in consecutive projects

Organization and Management

Master's thesis

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2011

ROUTINES IN CONSECUTIVE PROJECTS

Research Objectives

The objective of this study was to understand routines in project context. As routines are recurring, context-related behaviour patterns and projects are one-off complex endeavours, the combination provides an interesting and paradoxical but rarely researched research set-up. Routines are seen as key components in capability building, knowledge creation and transfer, as well as a source of inertia and excess bureaucracy. Projects on the other hand face a challenge in transferring knowledge and capabilities. The research aimed to understand what routines are in project context, what their role is, what factors affect the routines and how they are developed in consecutive projects.

Methodology

The research was conducted as an embedded case study of one investment program with four consecutive projects. The case company was a Finnish oil company aiming at becoming the world's largest renewable fuels provider. The empirical study used 29 open, semi-structured interviews from the projects and the case company. The research was done as part of a larger research project on large project governance.

Research Findings

The research findings state that routines exist in projects but are relatively difficult to identify. They are not isolated events but intertwined with other routines and artifacts. Routines are used to create, store and transfer knowledge and capabilities between projects. If routines are not appropriately acknowledged and transferred from one project to another, know-how can be lost. Routines are affected by the context, the participants of the routine as well as the related artifacts. Both the permanent as well as the project organization affect the project's routines. Routines are developed among other things by increasing the participants' knowledge on the cause and effect of the routine, as well as planning appropriate artifacts and incentives.

Key Words

Routine, project, artifact, capabilities

RUTIINIT PERÄKKÄISISSÄ PROJEKTEISSA

Tutkimuksen tavoitteet

Tämä Pro Gradu-tutkielma tutki rutiineja projektikontekstissa. Rutiinit ovat toistuvia, kontekstisidonnaisia käyttäytymismalleja. Projektit taas ovat uniikkeja, monimutkaisia hankkeita. Tämä yhdistelmä tarjoaa mielenkiintoisen ja ristiriitaisen tutkimusasetelman, jota on harvoin tutkittu. Rutiinit nähdään tärkeänä osana organisaation kyvykkyyksiä, tiedon synnyttämistä ja luomista, mutta myös inertian ja byrokratian lähteenä. Projektien haasteena taas on yleisesti nähty tiedon ja kyvykkyyksien siirto. Tämä tutkimus pyrki selvittämään mitä rutiinit ovat projektikontekstissa, mikä rutiinien rooli on projekteissa, mitkä tekijät vaikuttavat rutiineihin sekä miten rutiineja kehitetään peräkkäisissä projekteissa.

Metodologia

Tutkimus toteutettiin tapaustutkimuksena neljän projektin investointiohjelmasta. Tapaustutkimuksen yritys oli suomalainen öljy-yhtiö, jonka tavoitteena on kasvaa maailman suurimmaksi uusiutuvien polttoaineiden tuottajaksi. Empiirinen tutkimus käsitti 29 avointa, puolistrukturoitua haastattelua projekteista ja kohdeyrityksestä. Tämä tutkimus toteutettiin osana laajempaa, suuria projekteja tutkivaa tutkimusprojektia.

Tutkimuksen tulokset

Tutkimus osoittaa, että myös projekteissa esiintyy rutiineja, mutta ne ovat vaikeammin tunnistettavissa kuin pysyvissä organisaatioissa. Rutiinit eivät ole irrallisia tapahtumia, vaan ne ovat liitoksissa muiden rutiinien ja artefaktien kanssa. Rutiinit ovat projekteissa osa tiedon ja kyvykkyyksien luomista, säilömistä ja siirtämistä projektien välillä. Jos rutiineja ei tunnusteta ja asianmukaisesti siirretä projektista toiseen, tietämys voidaan kadottaa. Rutiineihin vaikuttaa konteksti, rutiiniin osallistujat sekä artefaktit. Projektiorganisaation lisäksi, myös pysyvä organisaatio vaikuttaa projektin rutiineihin. Rutiineita projekteissa kehitetään muun muassa lisäämällä osallistujien tietämystä rutiinin syistä ja seurauksista, sekä suunnittelemalla asianmukaiset artefaktit ja kannustimet.

Avainsanat

Rutiini, projekti, artefakti, kyvykkyydet

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1 Introduction

Projects – one-off, complex, target-oriented endeavours that are limited in time, cost and scope (Artto et al., 2006) – are an increasingly common method for organizing operations in a variety of organizations (Whitley, 2006). Projects in all kinds of organizations face a challenge in transferring knowledge (Ruuska, 2005). In other words, projects tend to forget. Routines on the other hand act as the organizational memory and store knowledge (Nelson & Winter, 1982; Hannan & Freeman, 1989; Becker, 2008). Routines are involved in knowledge creation (Cohendet & Llerena, 2003) as well as carrying knowledge and skills (Becker, 2008) in an organization. Routines have previously been defined in literature as regular and predictable behaviour patterns (Nelson & Winter, 1982), organizational dispositions to motivate conditional patterns of behaviour (Hodgson & Knudsen, 2004), and as executable capability for repeated performance in some context that been learned by an organization (Cohen et al., 1996).

As routines in project context have rarely been researched, it is still unclear what is the role of routines in projects. Could routines enable learning, remembering and transferring knowledge in projects as well? Although projects are by definition one-off (Artto, et al., 2006) they still perform routine and repetitive tasks. Often projects executed by an organization are similar, which makes it possible for organization to use routines to learn, create, and transfer knowledge through projects. (Brady & Davies, 2004) As Brady and Davies (2004) explain, previous literature has misleadingly associated project-based activities with non-routine behaviour. This thesis aims to clarify the role of routines in project context, explaining what routines are used in projects and how routines develop in the context of consecutive projects. In routine literature routines are connected to knowledge creation (Cohendet & Llerena, 2003), building capabilities (Cohen et al., 1996) and knowledge transfer (Becker, 2008; Nelson & Winter, 1982). Do routines also carry these attributes in project context or are they a source of unwanted inertia? As routines can increase stability and control in a complex situation, they could also increase predictability in complex projects (Feldman, 2000). If routines are seen to develop through repetition (Knudsen, 2008) and projects are one of a kind (Artto et al., 2006), then how do routines develop in projects? In the context of consecutive projects, are routines transferred from one project to another, and if so, how does the changing context affect the routines?

Because of the recurring nature of routines (Becker, 2008) and the temporary nature of a project, the combination is very interesting, and also to an extent a contradictory research area.

To study this phenomenon, investment program with four consecutive large-scale projects was chosen. A program is defined as a combination of multiple projects with a common goal (Artto et al., 2006). The projects are managed together, to obtain strategic objectives that could not be achieved by any of the projects on their own (Turner & Müller, 2003). Large projects are significant undertakings that often involve multiple organizations, changing priorities of project objectives, and are subject to the impacts of a wider socio-political environment (Ruuska et al., 2009).

1.1 Case background

The thesis was done as a part of a larger research project of Project Business-research group. The case company in the empirical study is Neste Oil, a Finnish oil refining and marketing company, and in particular its investment program of four renewable diesel plant-projects.

In 2003 the European Union (EU) decided to aim to increase the relative consumption of renewable fuels. The EU directive was launched to increase the portion of renewable fuels by 2020, up to 10% of all fuel consumption. As Neste Oil had earlier been developing its own renewable diesel called NExBTL, the company felt they had a valuable business opportunity. Neste Oil modified its strategy and decided to invest greatly in NExBTL. They wanted to become the world's leading supplier of renewable diesel by moving quickly into the market. In order to reach its goals, Neste Oil developed an investment program consisting of building four NExBTL-plants in different parts of the world. They built their first two commercial reference NExBTL plants in Porvoo, Finland, and one bigger, world-scale, plant in Singapore. The second world-scale NExBTL-plant in Rotterdam was started up in September 2011 (www.nesteoil.com). The first two plants in Porvoo were executed in cooperation with Neste Oil's subsidiary engineering company Neste Jacobs. For the two world-scale plants in Singapore and Rotterdam, a new partner, Technip, was chosen as the main contractor.

Because of the company's desire to move fast to the market to gain the first mover advantage, it decided to use replication in the investment program. Replication can be defined as organization's strategy where it intentionally reproduces its successful practices and technologies (Lajunen, 2010). The investment program is very important for Neste Oil since

the speed of expansion was very dramatic compared to anything Neste Oil had previously done. The NExBTL-investment program was key to the new strategy of Neste Oil, and a very big investment with the combined cost of the plants summing up to 1,37 billion euros.

1.2 Research objective and research questions

Routines are recurring, regular and predictable behaviour patterns, while projects, by definition, are unique and therefore difficult to repeat. The objective of this research is to study this somewhat paradoxical concept of routines in the context of projects. As routines have rarely been researched in projects it is important to understand what routines are and what their role is in the project context. As context constitutes the basis of routine, it is important to clarify how routines are identified in different projects, with different contexts. Previous research has indicated that routines are among other things involved in the knowledge creation (Cohendet & Llerena, 2003), capability building (Cohen et al., 1996; Teece, 2003) and transfer of tacit knowledge (Becker, 2008; Nelson & Winter, 1982). They can also cause excess bureaucracy and be a source of inertia (Nelson & Winter, 1982). Do routines have these same roles in the context of projects? To understand the scarcely researched combination the main research question seeks to understand the nature of routines in this specific context:

- What are routines in project context?

To further develop the understanding of this phenomenon the study also seeks to answer the following questions:

- What is the role of routines in consecutive projects?
- What factors affect routines?
- How do routines develop in consecutive projects?

The case of four consecutive projects was chosen to see how routines are developed between the projects and how the different context affects them.

1.3 Methodology

The study aims to understand the concept of routines in the context of projects, how routines develop, and what factors affect the development. Maxwell (2005) argues that qualitative research is appropriate in situations where the research aims to understand the meaning for the participants, the particular context and the process by which events and actions take place. Therefore a qualitative research method was chosen.

As the research aims to understand and clarify a new perspective on routines, routines in project context, a single case study was chosen (Fletcher & Plakoyiannaki, 2011; Easton, 2010). The research design is a single embedded case study, since the case involves one company with four projects as subunits for research (Yin, 2009).

The empirical research was done with 29 semi-conducted interviews with key individuals from the investment program. The open interview method was chosen so that the interviewees could communicate their stories in their own words. This allows them to express their experience and understanding in their own terms (Patton, 1990).

The interviews were conducted by 2-4 researchers with a help of an interview guide. Using an interview guide increased the comprehensiveness of the data, while making the gathering of data more systematic. The interviews were executed in two parts; 17 interviews were completed in winter-spring 2009-2010, and 12 in spring 2011.

In addition to the interviews the company's website and other resources were also utilised to gain further understanding of the context.

The research methods used will be explained more in-depth in the methodology chapter of the thesis.

1.4 Structure of the thesis

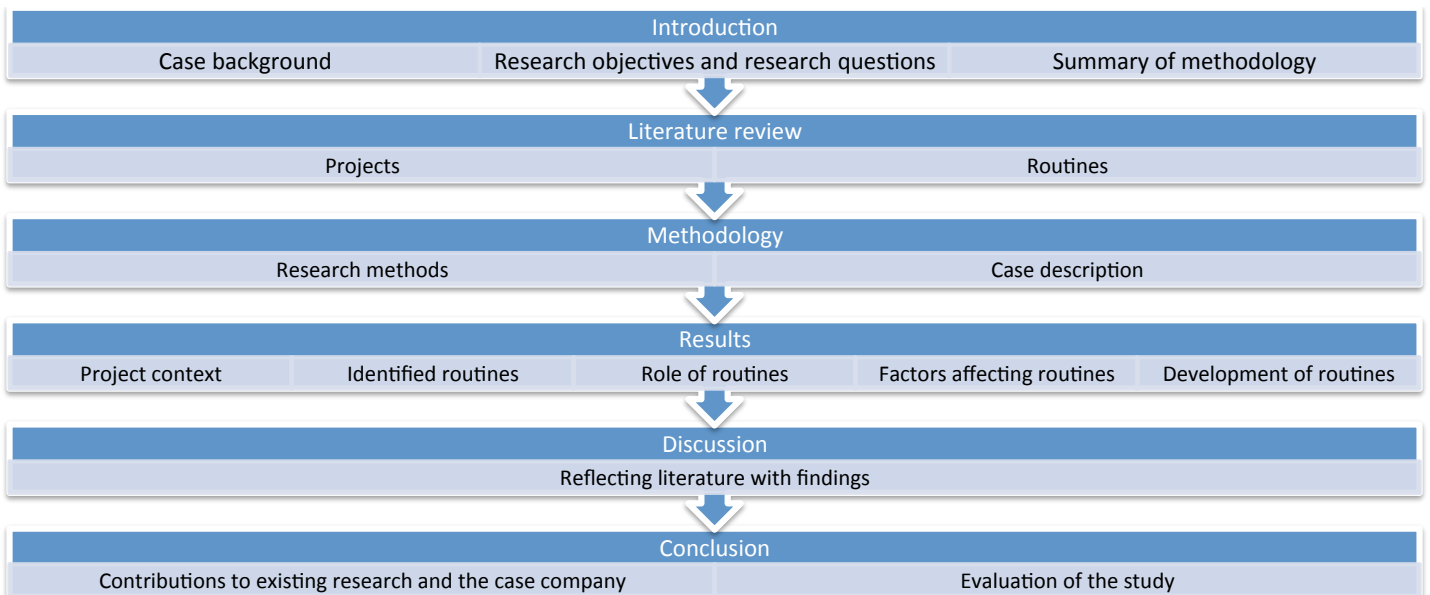
The next chapter, Chapter 2 will introduce the previous literature on routines and projects. For the reader to understand the context, research on projects is introduced first. Then the literature review will continue to explain the concept of routine. The summary of the literature review will reflect routine and project literature together in order to clarify the connection between the two concepts this study is based on.

Chapter 3 focuses on the methodology and introduces the case more thoroughly. Also the case selection and research designs are presented with the data collection methods.

Chapter 4 covers the main research findings from the empirical research. The findings are divided so that first context of the projects is introduced as explained by the interviewees. Then the overall routines detected from the interviews are presented, after which their role in the projects is clarified. Next the factors affecting routines are presented. Finally the development of the routines according to the empirical findings is presented.

Chapter 5 reflects the empirical findings in the light of the previous literature. In chapter 6 the conclusions are presented. The first section summarizes the key contributions to existing research, while the second section presents the recommendations for the case company. Finally the shortcomings and strengths of the study are discussed together with the suggestions for further research. The outline of the study is presented in Figure 1.

Figure 1 Structure of the thesis



2 Literature review

This chapter introduces the previous literature on projects and routines. First the context of project environment is described. The section that follows will introduce how routines and their role in an organization are defined in literature, discussing how routines emerge, adapt and how they are modified. Finally, the summary and synthesis of the literature is presented.

2.1 Project literature

Project management theory has been a growing field, and especially towards the turn of the last century it started gaining grounds for being its own academic research field– not just as an execution-oriented perspective on management of projects. As the importance of efficient project management practices has grown, so has the academic interest as well – and continues to grow at a rapid pace. From the beginning of project management theory, in the 1950's, the predominant themes have continually changed, from procurements in the 50's, to project management systems in the 60's, and organization and leadership in the 70's. The 80's made way for a theory focused on modeling and information technology, while in the 90's processes and networks were visible themes. From the beginning of the 21st century attention has been given to cooperation, virtual organizations and project business. (Artto, Martinsuo, & Kujala, 2006)

Given the ever changing nature of project management theory, it would seem difficult to define, indeed there have been many different types of definitions throughout the history of project management theory, however, some characteristics remain the same in practically all definitions (Artto et al., 2006). Projects are seen as; 1) one-off 2) complex 3) a combination of interrelated functions 4) limited in time, cost and scope, and 5) target-oriented. They are seen as having a beginning and an end. Projects are often also seen as a common objective shared by multiple parties. (Artto et al., 2006) They are implanted by a temporary organization that can work independently or in cooperation with a stationary parent organization (Modig, 2007). The temporary organization of projects is commonly established to meet the parent organization's strategic objectives such as technology research, process or new product development (Ruuska et al., 2011)

Projects are often seen as “vehicles for implementing or introducing strategies” (Artto & Wikström, 2005, 350). Projects can be used as the standard method for creating, responding to

and executing new business opportunities (Hobday, 2000a). Davies et al. (2004) argue that projects can be used when an organization wants to move into new technology or market area. Davies et al. (2004) – building on Penrose (1959) – explain that projects in moving into a new area are used to implement either offensive or defensive strategies. When using offensive strategy to expand to new areas, an organization deliberately aims to explore to new market areas or innovations. A defensive strategy instead is used when the external environment pushes the organization to expand to new areas. “Offensive base-moving projects are created to take the lead in the development of new technology or to create first mover advantage in new markets” (Davies et al., 2004, 16).

Often strategies have been introduced through large projects which have been described by Ruuska et al. (2009, 142) as “a significant undertaking characterized by a) multiple organizations seeking success with different objectives, b) changing priorities of project objectives, and finally, c) the project being subject to the impacts of a wider socio-political environment”. Most large projects include multiple stakeholders, and often multiple organizations. The organizations involved in large projects include firms, public organizations and political decision-making bodies. This wide range of organizations can look for very different and indeed conflicting things from the project. In project research large projects have been divided into three main industries; public endeavours such as transportation, rail and road infrastructure; nuclear power plants research and airport construction project research. Examples of large projects include Olkiluoto 3, Olympic Games-production project and Beijing-airport. (Ruuska et al., 2009)

In general, large projects face a challenge in coordinating the activities of the diverse actors of the multiple organizations involved (Ruuska et al., 2009). When the project involves multiple organizations and departments, each responsible for different functions, it can be difficult to capture the learning from the project. With spread responsibility, there is a risk of losing capability at the end of the project and the lessons learned may not be communicated sufficiently to other projects. (Middleton, 1967; Davies & Brady, 2000) Transferring knowledge can be often done by either moving people or creating networks of people from the relevant organizations (Ruuska & Brady, 2011). Davies and Brady (2000) on their article on organizational capabilities and learning, found that the creation of an internal consultancy in one of their case companies improved knowledge transfer and captured the learning from previous projects to the future ones. The internal consultancy gathered knowledge and lessons

learned, and built new capabilities that could be transferred to the subsequent projects (Davies & Brady, 2000).

When implementing strategies larger investment programs are also used. Artto et al. (2006) define a program as a large project, or more often a combination of multiple projects that have a common goal. Program is often established to implement a certain strategy and might last several years. A program is a temporary organization that has been established to manage a complex and large entity of projects. The projects in a program can be coexistent or consecutive projects. (Artto et al., 2006) Turner and Muller (2003, 7) further define a program as, “a temporary organization in which a group of projects are managed together to deliver higher order strategic objectives not delivered by any of the projects on their own”. When talking about large projects and programs, the executed projects can be said to have their own business relevance. In that case the term project business is used (Artto & Wikström, 2005). When an organization bases operations on projects they can be called project-based organizations that are explained in the next chapter.

2.1.1 Projects-based organizations

Whitley (2006, 78) explains, that project based organizations “create novel outputs by integrating varied forms of expertise in fixed time periods”. Organizations based around projects can develop distinctive organizational capabilities, executing similar projects, and maintaining employees in the company, benefitting from the knowledge gathered from the projects (Whitley, 2006). A project in this case can be a subunit of a larger company and make products for either internal or external customers (Turner & Keegan, 1999). “In [project based organizations] the knowledge, capabilities, and resources of the firm are built through the execution of major projects” (Hobday, 2000b).

When a company is formed for the single purpose of the project, and is dissolved once the project goals are reached, it is known as a project based firm. Project Based Firms (PBFs) “are legally constituted collective actors that control property rights and exercise formal authority over task organization and performance through employment contracts. Some types are able to develop firm-specific capabilities and knowledge through the management of a succession of projects and employment of skilled staff” (Whitley, 2006, p. 79). Even though large companies might organize activities around projects, they may not be PBFs. PBFs vary in terms of how they coordinate their activities and what kind of commitment they get from

investors and workers. There are meaningful differences in the singularity of their goals and outputs, and to the degree of distinctiveness and stability of the organizations skills, as well as how they organize work roles. (Whitley, 2006)

One way to differentiate project-based businesses is to examine what is the target of management, project, several projects, or the network of actors involved in the projects. This framework is called project business framework.

2.1.2 Project business framework

Artto and Wikström (2005, p. 351) define project business as “part of business that relates directly or indirectly to projects, with a purpose to achieve objectives of a firm or several firms”. The four distinctive management areas of project business are visualized in the framework of project business in Figure 2. As explained by Artto et al. (2011) both projects and firms are independent entities and independent networked organizations. The framework shows four, sometimes overlapping, management areas of projects; these four areas can often differ in terms of target management. The management of a project addresses a single entity that can be considered as its own business with focus on the outcome of the project. The second aspect of management of a project-based firm, addresses the issues of a firm that uses projects to execute either a majority or just a specific part of the activities, with the unit of analysis being a portfolio of projects, and the multiple projects being simultaneous or sequential. The third aspect, management of a project network can be described as a temporary network of several firms and other organizations participating in a project. In a project network, communication and the relationships between the organizations are key. The more complex the project, the more important fluent system integration is for coordination and even integration of capabilities. (Artto et al., 2011) In project networks, the project’s capabilities are a collection of the different capabilities of the actors. The combination of the unique capabilities of the actors in the projects network comprises a collective capability possessed by the network as a whole. (Ruuska et al., 2009) The fourth aspect relates to the management of a business network, which involves several organizations that engage from time to time in mutual projects. The network can be described as a, “‘permanent’ constellation of actors that are or could be involved in each other’s current or future project activities” (Artto et al., 2011, 140). The unit of analysis in this case is a network of firms and their relationships, the project network and business network are interrelated; what happens between organizations in a project affects the business network and vice versa. A business

network can be viewed as being a project network in the short-term, and becoming a business network when viewed in the long term. (Artto et al., 2011)

	One firm	Many firms
One project	1. Management of a project	3. Management of a project network
Many projects	2. Management of a project-based firm	4. Management of a business network

Figure 2 Framework of project business: four distinctive management areas (adapted from Artto & Kujala, 2008, 470)

Another way to look at the management of projects is through the distance between the project organization and the permanent organization, and how independent the project organization is from the permanent organization.

2.1.3 Projects in relation to permanent organizations

Projects differ in terms of how connected they are to the permanent organization; some projects are executed at a distance from the permanent organization, while others operate in very close proximity. This connection, or lack thereof, to the “parent”, or stationary organization, defines how the project organization is formed and how it works (Modig, 2007). Modig (2007) suggests that the more involved the parent organization, the more guidelines are specified for the temporary project organization. The complexity and uncertainty of the project task further affects the organizing of the project organization. Complex and unsure projects are more likely to be run by “pure” temporary organization, however when the project is similar to other projects, resources and knowledge are shared to a greater degree through the parent organization. (Modig, 2007)

The use of the permanent organizations resources further defines a project. Pure temporary organizations rely on employee’s professional networks for access to resources; conversely projects with more active parent organizations share the responsibility with the permanent organization (Modig, 2007). In Figure 3, Modig depicts a continuum of types of project organizations, in terms of three factors; employment, work processes, and resource network, dependent on whether the project is run by a pure temporary organization, or a pure permanent, i.e. a stationary “parent” organization. When the employees are involved in a long-term project, the resource network already exists, and the work processes and routines are pre-defined, displayed to the left in Figure 3. For example, if the project organization is a pure temporary organization, it is more likely that the routines were developed internally. If the permanent organization is heavily involved, it is more likely that the work processes and routines were predetermined.

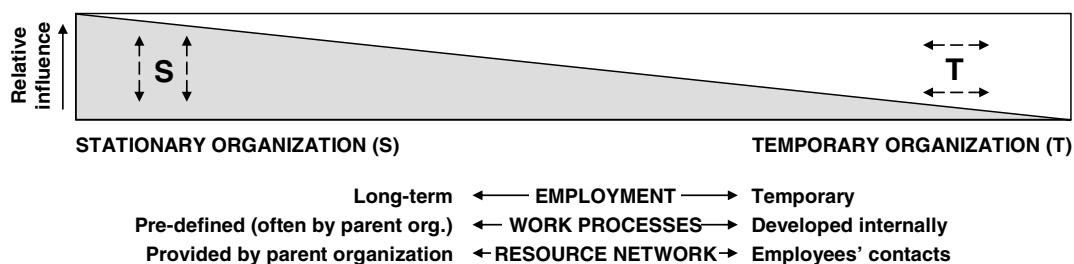


Figure 3 Contrasting organizational forms with respect to employment, work processes and resource network (Modig, 2007, 812)

Modig has seen routines as one way to identify how project organization is connected to the parent organization but routines and projects can also be seen as conflicting concepts. For example Lindkvist (2008) sees projects and routines as complimentary modes of adaption, arguing that depending on the type of problem a company is facing, the organization should choose either projects or routines as a strategy to adapt to the situation. While routine-based adaption, in his terms is suitable for situations where cognitive resources need to be economized or memory compensated, project-based adaption is more appropriate for situations where increased cognitive effort and more reflective modes of learning is needed. This approach of applying routines and projects on the opposite sides of the spectrum has been discussed previously (Anell & Wilson, 2002). In the following chapter routines, as discussed in routine literature, will be explained, paying particular attention to the idea that putting these two concepts on opposite sides of the spectrum is an unfair comparison.

2.2 Routines

In this chapter the concept of routine is further examined, the main theoretical views on routines are introduced, as well as the different aspects of routine. The relevance of routines to the organization and the development of routines are also discussed.

Organizational science is a varied and broad field of research where basic questions include where do organizational stability, change and survival stem from? How do learning, flexibility and organizational change occur? Pentland and Feldman (2005) argue that to understand these general questions in the field, one should understand the how organizational routines are structured. In their definition, routines form the foundation of organization, and upon understanding the detailed base, one can start to both understand, and even influence the big picture through the smaller pieces. As Nelson and Winter explain “the behaviour of firms can be explained by the routines that they employ” (1982, 128). Cohendet and Llerena (2003) argue that the difference between firms results greatly from them relying on different routines and competences. Effective routines no matter where they are located in the organization seem to have common features (Eisenhardt & Martin, 2003) and by recognizing its routines an organization can start identifying its effective and ineffective operating patterns. Pentland and Feldman (2008, 241) describe effective routines with the concept of ‘live’ routine, defined as “generative systems that can produce a wide variety of performance depending on the circumstances” (Pentland & Feldman, 2008, 241).

2.2.1 Defining routines

In the seminal work of Nelson and Winter (Nelson & Winter, 1982) routines are explained as regular, and predictable behaviour patterns, that among other things act as organizational memory. Hannan and Freeman (1989, 76) further explain this, “an organization’s repertoire of routines is the set of collective actions that it can do from memory”. Another widely accepted explanation of the concept of routine was discussed by a group of researches in Cohen et al. (1996, 683); “A routine is an executable *capability* for repeated performance in some *context* that has been *learned* by an organization in response to *selective pressures*”. The central themes discussed in routine literature include capability, repetition, context-dependence and learning (Becker, 2004; Cohendet & Llerena, 2003).

Learning is a key element of routines, because routines both enable, and are modified through learning. Routines are also explained as socially transmitted arrangements that rely largely on

informal and tacit knowledge (Becker, 2008). Becker (2004) explains that routine is for a collective group the equivalent to what skills and habits are for individuals. Routine is always a collective activity involving multiple individuals (Becker, 2004). He explains that the basis of routines lie with the multiple individuals participating in them, saying that the different actors (their motives, previous experience and understanding of the routine) have an effect on the routine and its outcome. Teece (2004) on the other hand, emphasizes the aspect of routines as the micro-foundations for dynamic capabilities. Dynamic capabilities are defined as “the firms ability to integrate, build and reconfigure internal and external competencies to address changing environments” (Teece, 1997, 516).

Another common feature in definitions of routine is recurrence. As Becker puts it: “One would be hard pressed to call something happening only once a routine” (Becker, 2004). Because routines recur, the organization has the opportunity to develop them, for example recurring events can be shortened and simplified (Nelson & Winter, 1982). The recurrence also enables learning from routines. Employers can also then focus their limited cognitive resources on the non-routine events (Becker, 2008; 2004).

The size of routine can be loosely defined “by its share of the productive activity of the organization” (Winter & Szulanski, 2002, 7). The size of routine varies to great degree, but is not indicative of the importance of the routine (Winter & Szulanski, 2002). Large routines might comprise many smaller routines (subroutines), as Feldman highlights through her example of the different routines operating in a university housing office (2000). Using hiring routine as an example, Feldman points out intertwined routines. Even though a hiring routine can be seen individually, it can include many smaller routines, such as interviewing and advertising. When modifying routines, the surrounding routines and context need to be taken into consideration, changing one routine can affect the outcome of another. This is linked to the context-embedded nature of the routine.

Routines are context-embedded, which means that as the context changes, the routine changes as well. Depending on the context, routines’ power of replication, degree of inertia, and search potential changes as well (Cohendet & Llerena, 2003). Context can be defined as the surrounding (external and internal environment) factors, and the nature of the human actors that influence behavioural change. (Denyer, Tranfield, & van Aken, 2008) It can also include the physical state of equipment, external memories, work environment and the surrounding community (Cohendet & Llerena, 2003). The surrounding culture can also affect the details of

the routine to a degree that it can greatly affect the end result (Winter & Szulanski, 2002). The context can also be defined as the community in which the routine is implemented (Cohendet & Llerena, 2003).

Cohendet and Llerena (2003) argue that the community affects greatly how routines are formed and developed. They discuss mainly three types of communities; hierarchical communities, autonomous communities, and project communities, which can be seen as a type of hybrid community, created for the specific needs of the project. Hierarchical communities are communities with strong cohesion and respect for social norm, and are able to have strong routines in the sense of organizational memory, and power of replication. Autonomous communities are much more self-determining, i.e. they determine their own routines. New project communities have less inertia, and a greater ability to explore new solutions to problems, as their community consists of heterogeneous agents, each belonging to a distinct community. When the community has strong cohesion and respect for social norm, such as hierarchical communities, routines potentially have stronger powers of replication, but consequently more inertia. In the case of a strong hierarchy, the process of developing routines can be dictated from above.

Another aspect that needs to be taken into consideration with these project communities is that they often cross the boundaries of existing firms. The members of a project community can come from different organizations, and the parent organization needs to take into consideration that the transfer of knowledge and routines could be difficult, and that the capabilities and routines developed could be transferred to the other organizations. (Cohendet & Llerena, 2003)

In Table 1 the definitions of routines are summarized, and the key characteristics are separated to further illustrate the main differences.

Table 1 Summary of routine definitions in literature

Author	Definition	Key words
Nelson & Winter (1982)	Routines are regular and predictable behaviour patterns that among other things act as organizational memory.	Behaviour patterns Organizational memory
Hodgson & Knudsen (2004, 290)	Organizational dispositions to energise conditional patterns of behaviour within an organized group of individuals, involving sequential responses to cues.	Dispositions
Zollo & Winter (2002b, 340)	Stable patterns of behaviour that characterize organizational reactions to variegated, internal or external stimuli.	Patterns of behaviour
Cohen et al. (1996, 683)	A routine is an executable <i>capability</i> for repeated performance in some <i>context</i> that been <i>learned</i> by an organization in response to <i>selective pressures</i>	Capability
Teece (2004)	Micro-foundations for dynamic capabilities	Dynamic Capabilities
Cohendet & Llerena (2003, 272)	Routines can be viewed as a condensed way to <i>remember by doing why to do (motivation-incentive), and how to do things (cognition and co-ordination)</i>	Way to remember Motivation-incentive
Hannan & Freeman (1989, 76)	Collective action that an organization can do from memory	Collective memorized action
Becker (2008)	Routines are socially transmitted arrangements that rely largely on informal and tacit knowledge	Socially transmitted arrangement Tacit knowledge
Feldman & Pentland (2003, 96); Pentland & Feldman (2005, 765; 2008, 235)	Routines are generative systems that produce repetitive recognizable patterns of interdependent action carried out by multiple participants	Generative systems Multiple participants
Van der Steen (2009, 162)	Collective patterns of habitual interaction, which can be mindless or require conscious effort, and which require a 'trigger' or 'cue' to be invoked	Habitual interaction Collective patterns

The conception of what a routine is varies greatly in literature. However, some common characteristics can be found. They are seen as patterns of behavior (Hodgson & Knudsen, 2004; Nelson & Winter, 1982; Zollo & Winter, 2003), related to capabilities (Cohen et al., 1996; Teece, 2004), organizational memory (Becker, 2008; Cohendet & Llerena, 2003; Hannan & Freeman; Nelson & Winter, 1982) and collective action (Becker, 2008; Feldman & Pentland, 2003; Hannan & Freeman, 1989; Van der Steen, 2009).

2.2.2 Different perspectives to routines

The routine discussion generally separates two main perspectives to routines. They are seen as both an internal process, often described as a cognitive process, and action, which refers to the actual process of implementing the routine. Routines can also be viewed from the perspective of artifacts.

The first perspective looks at the cognitive process involved in the routine; the abstract understanding and tacit knowledge the participant of a routine have of the routine (Pentland & Feldman, 2005; 2008). This ‘ostensive’ part of implementing a routine can be described as the participants’ representation of the routine (Becker, 2004). The other perspective on the other hand studies the performative part of a routine, the actual performance by specific people, at a given time, in a particular place. (Feldman & Pentland, 2003)

Both the ostensive part as well as the performative part of a routine are seen as strongly inter-related with artifacts that are defined as the physical manifestations of routine. Artifacts can take many forms (such as written guidelines, computers, databases or laws) and they are often designed to guide routines (for example security protocol) or represent the outcome of routines (minutes from a meeting). (Pentland & Feldman, 2005) Pentland and Feldman (2005) argue that the ostensive, performative and artifact perspective should all be taken into consideration in order to understand the whole routine. Their idea of routine is visualized in Figure 4.

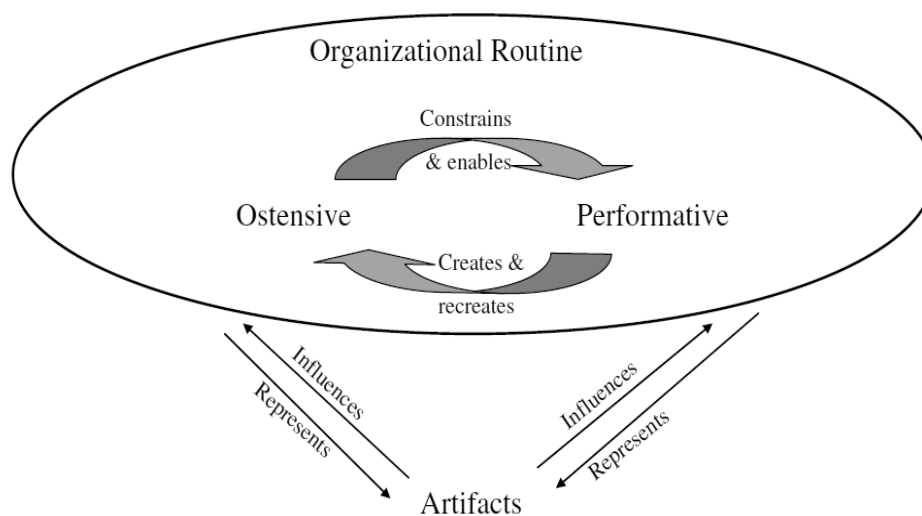


Figure 4 Organizational routines are generative systems (Pentland & Feldman, 2008, 241)

Similar perspectives to routine have been identified by Becker (2004), who explains that routines can be seen as cognitive regularities and behavioural patterns. Behavioural patterns have been described as recurrent interaction patterns implying that routines can be viewed as repetitive, collective (=interaction), and as an activity pattern. While behaviour pattern-perspective focuses on activity, cognitive regularities focus on cognition (Becker, 2004). Cognitive regularities are comparable to the ostensive perspective introduced by Pentland and Feldman (2005, 2008). Behaviour patterns respectively, can be connected to the performative perspective. Becker (2004) also identifies routines as propensities, which suggests that routines are not behaviour but dispositions of behaviour (Hodgson & Knudsen, 2004).

These different perspectives to routines are discussed in order to establish the complex theory of routine. As Becker (2004) explains, without clearly describing which aspect of a routine is researched, the concept remains too ambiguous.

How routines are seen to be born also differentiates how routines are seen by different researchers. Routines can be seen as either mindlessness, i.e. the participants are involved in the routine without paying attention to them, or effortful accomplishments where participating in the routine is a conscious decision (Becker, 2004). Another perspective to routines in the research is the motivational dimension (Cohendet & Llerena, 2003; Nelson & Winter, 1982), i.e. what are the incentives of the participants to participate in the routine.

Despite growing attention, theory has only scratched the surface of the complex phenomenon of routines (D'Adderio, 2008). The questions of how routines emerge, and evolve have received little attention (Zollo & Winter, 2002b). Identifying routines is quite difficult because of their intertwined nature; Pentland and Feldman (2005) describe identifying routines as trying to isolate the Gulf Stream in the Atlantic. Identifying the origin of a routine is further complicated because the reasons for change in the routine might not be fully visible (Becker, 2004). Another aspect that makes the identification of routines more difficult is that as routines become more familiar and internalised, they become increasingly difficult to verbalize, and even though they may become easier to do, but they also get harder to explain (Pentland & Feldman, 2005).

Despite the challenges in identifying routines, it is important to pay attention to them in order to be able to take the most out of the benefits and minimize the negative impact of routines. The next chapter will explain how routines can affect an organization.

2.2.3 The relevance of routines

Routines have many dimensions that a company can benefit from, but routines can also hinder a company's performance. The main focus of this chapter is to discuss the relevance of routines in an organization.

One of the problematic features of routines, caused by the stability providing effect of them (Becker, 2004), is that they can be a source of inertia (Nelson & Winter, 1982; Feldman & Pentland, 2003). Inertia is explained by Cohen et al. (1996) as a source of persistence for change. The inertial nature of routines can hinder the organization's ability to explore new solutions (Cohendet & Llerena, 2003). With established routines, the organization faces a challenge in changing the routines and adopting them to new situations (Nelson & Winter, 1982). Since the participants are used to one way of operating they might not be open to changing their behaviour (Nelson & Winter, 1982). When routines become the source of organizational inertia, it needs to be fought before new routines can be established (Davies & Brady, 2000).

Routines can also be disruptive. Nelson and Winter (1982) explain that even rule-breaking, lateness and defiance can be routinized in an organization. For example a routine of a manager constantly reminding subordinates of the tasks at hand takes up extra time and resources from both sides as the subordinates are conditioned to not do their tasks unless reminded of them. This could even go so far that if the nominal action, i.e. finishing the tasks without reminding or trusting the subordinates to do their jobs, would cause disruption (Nelson & Winter, 1982). Routines are often seen as a burden in organizations. In today's world of innovation and change, something constant and predictable is seen as a negative. Despite this, well-designed routines have many attributes the company can benefit from.

Routines can bring balance to organizations, since they are an important method for coordination, forming a 'truce' between the supervisor and the supervised in an intra-organizational conflict establishing an agreed method of operating (Nelson & Winter, 1982). The realized routine can also be seen as a compromise between different organizational groups, such as marketing, engineering, and accounting, as the different disciplines might hold different views, and have different incentives and success criteria (D'Adderio, 2008).

Another aspect of routine is the relative stability providing researchers with the opportunity to detect organizational change through the incremental change in routines. The stability

provided by the routines can also help with uncertainty; routines provide the support to act, even though the outcome of that action is unknown. (Becker, 2004)

One of the most important characteristics of routines is their ability to facilitate knowledge creation and transfer of tacit knowledge.

2.2.3.1 Routines facilitating learning and knowledge transfer

From Table 1, it is evident that knowledge and memory are recurring terms in the definition of routine. Routines also facilitate learning, reflecting on the outcome of executed routines can be an important way of gaining knowledge. By reflecting on the routines and the resulting outcomes, the participants can learn what works and what doesn't. (Pentland & Feldman, 2005) Routines are described as a key part of the knowledge creation and building of core competences in an organization (Cohendet & Llerena, 2003). Cohendet & Llerena (2003) bring up the example of routinized allocation of resources for developing or creating new knowledge or improving the organizations core competences. Routines are also said to be most important form of organization specific knowledge, and in particular tacit knowledge. (Nelson & Winter, 1982) "All routines, independently of their origins, contribute to the cumulative process of knowledge creation and of allocation, to the searching process, to the building of core competencies, but in different ways" (Cohendet & Llerena, P. 2003). Routines can carry a vast amount of knowledge and can often be referred to as the 'genes' of the organization (Nelson & Winter, 1982).

Routines also help to identify how the productive and tacit knowledge in companies is stored, changed and how it decays (Becker, 2004). Routines can carry knowledge and skills (Becker, 2008) and because routines are often the result of a practice that has proven to work, when they can be transmitted to other similar situations, learning can be speeded and loss of time prevented (Nelson & Winter, 1982).

Feldman and Pentland (2003) argue that the methods for transferring knowledge and know-how are different depending on the type of organization. Project organizations provide an interesting reflection point, since the knowledge and capabilities created in a project might be problematic to repatriate to the parent organization and future projects, especially if there is a conflict of interest between the project workers and the parent organization. Some may aim at developing the project's success or their own knowledge, creation instead of the success of the project organization (Cohendet & Llerena, 2003). The repatriation of knowledge from the

project organization to the parent organization, or to following projects can be challenging, it might not be possible to replicate new routines to different contexts (Cohendet & Llerena, 2008).

Another key aspect of routines is that they are strongly related to capabilities. The next chapter will explain how routines and capabilities are linked in literature.

2.2.3.2 Routines as building blocks of capabilities

The terms of capability is discussed in most routine articles. The two concepts are strongly interlinked in routine literature but the scholars differ in terms of which is the cause and which is the result. Some define capability as an ability to alter routines (Zollo & Winter, 2002), some see routines as a way to alter capabilities (Davies & Brady, 2000), while others simply see capabilities as routines (Eisenhardt & Martin, 2003; Winter, 2003). This chapter will introduce these different views on capabilities in relation to routines.

Many researchers have written from the aspect of routines as the building blocks of organization's capability. Winter describes organizational capability as "a high level routine or collection of routines that, together with its implementing input flows, confers upon an organization's management a set of decision options for producing significant outputs of a particular type". (Winter, 2003, 3) It has also been argued that the firm's ability to develop its dynamic capabilities derives from its business processes (e.g. routines) (Davies & Brady, 2000). Dynamic in this context "refers to the firm's ability to renew its capabilities and create innovative responses to meet the requirements of a changing business environment" (Davies & Brady, 2000, 935). By appropriately modifying and copying routines the company can truly develop its capabilities (Whitley, 2006).

Eisenhardt and Martin on the other hand bring up the notes of capabilities as routines. They connect capabilities and routines through learning, and their traditional view describes capabilities as "routines to learn routines" (2003, 1111). They re-conceptualize the term more precisely as "specific organizational and strategic process by which managers alter their resource base" e.g. create, integrate, recombine and release resources. (Eisenhardt & Martin, 2003, 1111)

The third view explains dynamic capabilities as the ability to develop appropriate routines. Zollo and Winter (2002b) define dynamic capabilities as; "learned and stable pattern of

collective activity through which the organization systematically generates and modifies its operating routines in pursuit of improved effectiveness”. They also emphasize that dynamic capabilities are structured and persistent. Dynamic capabilities can be said to arise from learning, and “constitute the firm’s systematic methods for modifying operating routines” (Zollo & Winter, 2002b, 340). Zollo and Winter (2002) strongly link together the learning mechanisms, (experience accumulation, knowledge articulation and knowledge codification) dynamic capabilities, and the evolution of operating routines. Evolution means the incremental development of routines through a continuous process. Experience accumulation refers to the learning process by which routines develop. Knowledge articulation means the articulation of implicit knowledge through collective discussions, debriefing sessions, and performance evaluation processes. Knowledge codification happens when the participants codify their understanding of performance implications of the internal routines into manuals, blueprints etc. (Zollo & Winter, 2002)

In Table 2, the definitions of capability in relation to routines are summarized.

Table 2 Summary of definitions of capability in relation to routines

Author	Definition	Key words
Eisenhardt & Martin (2003, 1107)	Specific organizational and strategic process by which managers alter their resource base. Dynamic capabilities thus are the organizational and strategic routines	Organizational and strategic routines
Zollo and Winter (2002b, 340)	Learned and stable pattern of collective activity through which the organization systematically generates and modifies its operating routines in pursuit of improved effectiveness.	Collective activity for developing effective routines
Davies & Brady (2000, 935)	Firm's ability to develop its dynamic capabilities derives from its business processes (e.g. routines)	Developed through business processes (e.g. routines)
Winter (2003, 3)	A high level routine (or collection of routines) that, together with its implementing input flows, confers upon an organization's management a set of decision options for producing significant outputs of a particular type	High level routine

As explained earlier, efficient routines benefit organizations greatly. It is crucial for organizations to be able to modify and develop their routines to better fit to changing situations. The next chapter will focus on how routines develop and how they can be modified.

2.2.4 The development of routines

Routines are created, modified and exhausted in two ways; routines can be knowingly moulded by the organization, or change by themselves, however most often the development is a combination of both. In this section the development of routines is discussed from both aspects mentioned.

Although some routines simply emerge, most routines are the result of attempts to develop efficient work practices (Pentland & Feldman, 2008). Pentland and Feldman (2008) describe guidelines for designing efficient, live routines. The ostensive aspect of the routine is in the

focus, not the artifacts. Routine is the result of the actions of everyone participating in it, therefore looking at the routine from the view of the participants is paramount, while also taking into account incentives and training. (Pentland & Feldman, 2008) Routines are triggered into action through two methods; actor-related triggers, and external cues (Becker, 2004; Van der Steen, 2009). Actor-related triggers include for instance messages from management, such as commands and recommendations, while messages from the external environment can include, a month changing that can trigger a monthly report or feedback from customers.

Rules and regulations alone do not make a live routine. When participants are empowered to make choices in the routine process, they in turn participate in the design of routines, and the routine becomes alive. Instead of emphasizing the whole routine process, a few necessarily, required control points are chosen and emphasized. The routine process needs to be observed continuously, to prevent unwanted development, as routines change constantly. (Pentland & Feldman, 2008) Knowledge articulation and codification can also help with the development of routines (Zollo & Winter, 2002). Also teaching and visioning can be used when trying to develop the ostensive aspect of the routine. The performative aspect of routines can be modified with surveillance, and positive and negative sanctions. Artifacts should also be transformed to support the development of the routines. (Pentland & Feldman, 2005)

As previously emphasised, learning is one of the key elements of routines. Routines are both modified through, and enable learning. Overall routines develop through experience accumulation (Zollo & Winter, 2002b, 341). Zollo and Winter (2002) argue that even from the first experience in a certain field an organization can develop a process for managing similar projects in a systematic way, and create the capabilities and routines for the next similar project. More precisely the evolution of routines happens through retention of past behaviour, and various processes of selection (Cohendet & Llerena, 2003; Gavetti & Levinthal, 2000). The selection mechanisms can affect the organization from both outside, through natural selection mechanisms' (Cohendet & Llerena, 2003, 276), and inside, by managers who indirectly influence the routines at all levels of the organization (Cohendet & Llerena, 2003).

Repetition is another key aspect in routines; through practice the people involved in the routine can learn more about the process, and develop more effective routines. By reflecting on the past behaviour patterns the routine participants can decide to alter the behaviour in the

future. The reasons behind the routine pattern, and the results from the actions can be identified, and behaviour can be moulded more easily. (Pentland & Feldman, 2005)

The experience gained from repetition can benefit the evolution of the organization's capabilities, but if the experiences come too fast, the actors can feel overwhelmed, and unable to transform the experience into practice and routines. In moderately dynamic markets, i.e. markets where change occurs in the context of stable industry structure and predictable change, the experience of similar situations is particularly effective in strengthening organizational and strategic routines. While in moderately dynamic markets the development of routines relies on relatively small but frequent variation, in high-velocity markets where industry structure is blurring and the change is nonlinear and unpredictable, routines are experimental, iterative and simple, selection is more relevant. The selection of what routines to keep from the situations is more important for expanding and developing capabilities, when the learning and processes are very rapid. (Eisenhardt & Martin, 2003)

Routines have been considered relatively constant and predictable, even depicted as the cause of inertia (Nelson & Winter, 1982), however despite this, the idea of constantly changing and adapting routines has covered ground from the end of the last century. As Pentland and Feldman (2005) emphasise, routines are indeed very varied. Some can be flexible and show variation, others are easily transferable, but some are not. Feldman (2000) has argued that the behaviour of people affects the routine, and because people's behaviour changes over time, then it is inevitable that routines too must change. She further suggests, that continuous change is endogenous to routines. Each time the routine is repeated, the context and participants have an influence on the routine, however the change is seen as incremental because only one or a few components of routines change at a time (Becker, 2004, p. 654). D'Adderio argues that routine might even seem unchanging from a distance (D'Adderio, 2008).

Zollo and Winter (2003) clarify three features of routine that have an effect on how routines develop; frequency, heterogeneity, and causal ambiguity. Frequency refers to how often the routine is triggered, how often the routine is performed. If a routine is triggered many times in a relatively short time span, it is likely to increase in speed and accumulate the participants' knowledge. Heterogeneity, describes how novel the routine appears to the participants each time it is executed. If the task is very homogenous each time, inferences are easier to make about the appropriate routine. Causal ambiguity relates to the relationship between the

decisions or actions taken, and the performance outcomes obtained. If the relationship is clear and easy to detect, it is easier for the participants to gain knowledge and mould the outcomes with their actions. If the routine, for example, involves multiple subunits, the relationship between one action and the ultimate result is less detectable. In short, causal ambiguity measures how easy it is to derive clear conclusions as to what should, or should not be done in the execution phase. By identifying these features, one can more easily identify the routine, the underlying reasons for the routine, and how it could be improved. (Zollo & Winter, 2003)

As explained previously, routines are strongly context-embedded. When the context changes, routines can become inefficient, and despite once being functional, through inertia they actually start providing resistance to development (Teece, 2004). When a routine proves to be impracticable, or just simply unprofitable, then it needs to be remoulded (Nelson & Winter, 1982). While maintaining routines in stable conditions can be a strength for the company, the inertia caused by maintaining established routines in a changed environment can cause problems (Davies & Brady, 2000). Changing a routine can be costly, and if not done appropriately can add further anxiety within the organization (Teece, 2004). Redesigning routines effectively is a hugely important managerial skill, and one that needs continuous dedication, as the gradual changing of routines is seen to be much more efficient than a more abrupt termination (Teece, 2004). But as Zollo and Winter (2003) put it “in a context where technological, regulatory, and competitive conditions are subject to rapid change, persistence in the same operating routines quickly becomes hazardous”. Fighting inertia and adapting routines and processes to new conditions may be required in order to be able to take advantage of new opportunities (Davies & Brady, 2000). Cohendet and Llerena (2003) further discuss the need for incentives to improve existing routines. Discovering the motives and reasons behind a routine can help create the right incentives for the participants to develop the routine (Cohendet & Llerena, 2003).

The renewing of out-dated routines, and the development of new ones, generates knowledge for the organization (Davies & Brady, 2000). A project context brings challenges to learning and knowledge sharing since they are mostly unique and temporary (Hobday, 1998) but Davies and Brady (2000) argue that despite this, learning and development of routines is also possible in project contexts since firms undertake similar projects that require same type of capabilities and routines. Learning and developing routines and organizational capabilities enable the firm to execute similar projects with increasing efficiency the next time (Davies &

Brady, 2000). Capabilities can be developed when the organization executes similar but not exactly the same type projects (Eisenhardt & Martin, 2000).

In a project context, both the parent and the project organization affect the modifying of routines. How much the parent organization can affect the routines of a project organization depends on the distance between the two. The more independent the project organization, the more freedom it has to develop its routines to fit its own need. (Modig, 2007) Sometimes the parent organization aims at transferring its successful routines into the projects. An example of this is a situation where a company expands into new geographical areas, and wants to replicate their best practices i.e. their successful routines (Winter & Szulanski, 2002). Another example is provided by Nelson and Winter (1982). When a company opens a new plant it can transfer knowledge and routines by transferring a small number of experienced personnel from the old plant to the new one (Nelson & Winter, 1982).

The challenges of replicating routines are discussed in Winter and Szulanski's (2002) article on the replication of routines. They explain that when the productive routine is replicated into a different context, the result is a replica that is quite similar to the original routine. The resources used to execute the routine in the new location are very similar to the old, however in order to successfully replicate a routine, it needs to be done meticulously. If only the surface of the routine is replicated it is a 'faux replication' (Winter & Szulanski, 2002) and the capabilities developed earlier may not be transferred. Replicating routines can be of broad or narrow scope, or something in between. Where a large – broad scope – routine can create, or greatly modify the organizational context or identity of the target organization, a small – narrow scope – routine will keep the organizational context relatively stable. (Winter & Szulanski, 2002)

When a company wants to replicate i.e. copy the routines as precisely as possible, one of the most crucial aspects is the organization's communication (Winter & Szulanski, 2002). Without sufficient communication methods and skills, replicating routines is hugely challenging. Why the routine is needed, and the implementation of the routine have to be communicated with the personnel appropriately. Winter and Szulanski highlight that the understanding of the organization's specific language is extremely important in this kind of communication. As the context affects the language, the context needs to be understood in order to sufficiently communicate the routines to the organization (Winter & Szulanski, 2002). The challenge in project organization is that the parent organization might not

completely understand the project organizations context. The routines might need to be developed so that they can be transferred to the different contexts.

Despite the need for developing routines, it is more easily said than done. Routines are often intertwined and therefore might not easily be separated, and changing one routine might cause an unwanted reaction in another. Also the tacit nature of routines makes it more difficult to recognize the whole routine and its outcome. Becker (2004) has argued that because of the context-dependent nature of routines, there are limitations in transferring the routine to other contexts, once transferred the routine might lose part of its tacit knowledge, hence its purpose. Due to the context related nature of routines, it is said that there can only be local ‘best’ solutions (Becker, 2004, 652). These local best solutions are often not intentionally planned, routines are changed through methods of trial and error experimentation (Cohendet & Llerena, 2003; Gavetti & Levinthal, 2000) and organizational search (Cohendet & Llerena, 2003).

Pentland and Feldman (2008) explain that some improvisation is inherent in the execution of routines, they present an interesting metaphor, where a musician needs to listen, paying attention to the other musicians, and the details of the situation, before he can join in. Participating in an improvised routine is quite similar. Becker explains that one of the attributes of routines is distributed knowledge, which means that the participants have common knowledge (Becker, 2004).

Another way for an organization to affect routines is through artifacts. Artifacts can guide routines in the right direction, preventing their unwanted development and also help to diagnose the outcome. The concept of artifacts will be discussed in more detail in the following chapter.

2.2.4.1 Developing routines through artifacts

Artifacts can be described as the physical manifestations of routines, or an attempt to codify the ostensive aspect of routines, and provide an important method for gathering information. Artifacts can both enable and constrain organizational routines, in the form of formal rules or standard operating procedures. Artifacts take many different forms, from written rules and procedures to the general physical setting. (Pentland & Feldman, 2005) Software and computers are also considered artifacts (Pentland & Feldman, 2008). In their article on artifacts and routines, Pentland and Feldman (2008) describe artifacts as ‘dead routines’,

rigid, mindless, and can be explicitly stored. Artifacts might be mistaken for ostensive routines, but they are not the same concept even though they are linked in a variety of ways, as seen in Figure 4 (Pentland & Feldman, 2008).

Artifacts can also arise after a routine has been developed, codifying the process into manuals, blueprints etc. Artifacts can help identify the reasons for success or failure, as they are the decoded result of a routine. (Zollo & Winter, 2002b, 342)

Despite the fact that artifacts have an effect on routines, one cannot rely solely on artifacts when modifying routines (Pentland & Feldman, 2005, 2008). As Pentland and Feldman (2008, 240) explain “artifacts- no matter how carefully designed – do not necessarily result in changes in the patterns of action”. In literature, the role and significance of artifacts on routines varies depending on what way you look at them. Most researchers seem to agree that both the human factor, and the formal rules and procedures, affect the overall process. Artifacts are often introduced to design, and manage routines, but the outcomes often do not match the expectations, because the context and the participants can have a stronger effect than anticipated (D’Adderio, 2008).

Another determinant that effects the extent to which artifacts can modify routines is the so-called rule following (D’Adderio, 2008). Rule following can be explained as the extent to which the participants follow the standard protocol, how much they modify the actual process. If the rules guiding the process are too stringent, the participants might have to “work around the rule to provide flexibility” (D’Adderio, 2008, 24). The standard operating procedures (SOPs) and rules, are also known as formal, “artifactual representations of routines” (D’Adderio, 2008, 29). If one organizational group makes the rules and procedures too rigid, without taking into consideration the needs and routines of other disciplines, conflicts can develop (D’Adderio, 2008). If for example, the sales team does not take into consideration the limitations or abilities of the production side, or if vice versa, the process will not work, “artifact-embedded rules and procedures constrain interpretation and shape subsequent action” (D’Adderio, 2008, 28). However, SOPs and rules often have room for interpretation, which is why the routine differs depending on the participants.

2.3 Summary of the literature

As one can conclude from the literature review, routines and projects have rarely been studied together. In project literature, routines are often ignored while the research emphasis is placed

on capabilities. This thesis will attempt to discuss routines in the project context in a more in-depth level than the previous research. Before continuing onto the methodology and presenting the results, the summary of literature is presented and the definitions used in this thesis will be specified.

The definition used in this thesis for projects is that of Artto et al. (2006), which identifies projects as; 1) one-off 2) complex 3) a combination of interrelated functions 4) limited in time, cost and scope and 5) target-oriented. Projects are seen as methods for implementing strategies (Artto & Wikström, 2005) and often implemented when a company wants to expand to new technology or market area (Davies et al., 2004). Strategies are also implemented through programs or large projects. A program can be defined as “a temporary organization in which a group of projects are managed together to deliver higher order strategic objectives not delivered by any of the projects on their own” (Turner & Müller, 2003, 7). Large projects have many stakeholders that might have different objectives for the project (Ruuska et al., 2009). A project with multiple organizations faces a challenge in transferring knowledge accumulated in the project to other projects or to the permanent organizations (Davies & Brady, 2000). Knowledge and insight gained is often transferred through transferring people, from one project to another, creating networks of people from appropriate organizations (Ruuska & Brady, 2011). Even though every project is unique, capabilities and routines developed in previous projects prepare the organization for the future projects (Davies & Brady, 2000).

Projects differ in terms of how much power the permanent organization has on the project organization, to what degree the work processes and routines are defined by the permanent organization and to what level of development takes place internally by the project organization (Modig, 2007).

Routines are explained as they are seen in this thesis, the definition consisting of a synthesis of ideas, based on past literature about routines (Nelson & Winter, 1982; Feldman & Pentland, 2003; Becker, 2004). Routines are identified as, recurring, dispositions of behaviour, that arise from the cognitive regularities of the participants. Routines are strongly context-related, therefore not easily copied or even explicitly identified (Pentland & Feldman, 2008). Routines involve multiple participants and in the routinized action knowledge is generated and stored. Routines are a key component of the organizations capabilities, which are defined in this thesis according to Winter (2003, 3) “high level routine or collection of

routines that, together with its implementing input flows, confers upon an organization's management a set of decision options for producing significant outputs of a particular type". Routines are also key component for learning (Pentland & Feldman, 2005), knowledge creation (Cohendet & Llerena, 2003) and knowledge transfer (Becker, 2008) in an organization.

Projects can be complex and unsure, (Modig, 2007) and routines can bring a certain stability and courage to act in uncertain situations (Becker, 2004). Routines are also used as methods for coordination (Nelson & Winter, 1982), which can be useful especially in projects where multiple organizations are involved. The realized routine can be seen as a compromise of the different parties involved, as it represents the agreed method of operation (Nelson & Winter, 1982). When different organizations and organizational groups have conflicting ideas about the appropriate routines, the realized routine can be examined as the truce (Nelson & Winter, 1982) between the parties.

It is crucial for an organization to understand and develop its routines. In order to design appropriate routines and modify them to fit the needs of the organization, the company needs to take into consideration a few things. The final routine is a combination of the influence of people participating in the routine, the context in which the routine happens, and the different artifacts (Pentland & Feldman, 2008). The motives and incentives of the participants of the routine have to be recognized and designed appropriately (Cohendet & Llerana, 2003). The artifacts affecting routines should guide the routines, not hinder them (D'Adderio, 2008). Routines can be a conscious creation by the participants and the organization, or they can emerge naturally (Pentland & Feldman, 2008).

In projects there are many factors that affect routines. In addition to the factors affecting routines in the traditional setting, such as the context, artifacts and the community, routines in projects are also affected by the project organization, permanent organization and the past projects. The distance between the project organization and permanent organization determines how much the permanent organizations artifacts, incentives and knowledge affect the project organizations routines. If there has been similar projects before, the project organization's routines are also affected by the capabilities and knowhow gained from the previous projects. When transferring routines from project to another, all of these factors should be considered.

3 Methodology

The methodology chapter of this thesis will first introduce the research design of the embedded case study and the logic behind it. The methods of collecting empirical data are presented after that. Thereafter the analysis of the data collected from the interviews is explained in detail. The methods of improving validity and reliability are discussed, and finally the case company, and subunits of analysis are introduced more thoroughly. The different actors involved in the case are also made clear.

This thesis was executed as part of a larger research project, called Large Project Governance (from hereon called LPG). The project is conducted in cooperation with different companies and research groups from Aalto University, Oulu University and Åbo Akademi University. LPG-research project is established under Aalto University's BIT Research Centre's Project Business-research group. The LPG-research project studies large, networked projects.

3.1 Case study as a qualitative research method

Due to the complex nature of the phenomenon investigated, a qualitative research method is appropriate. As Maxwell (2005) stated qualitative research is appropriate when the research purpose includes the need to understand 1) meaning for the participants, 2) the particular context and 3) the process by which events and actions take place. In order to be able to answer the research questions, I needed to understand how the participants in the Neste Oil projects "make sense" of the projects and the routines they are involved in. Without grasping the context of the consecutive projects, it is impossible to answer the research question. As this research seeks to recognize how routines evolve during the life of a program, the process is as important as the outcome. Therefore a qualitative research approach is an appropriate choice for this study.

Case studies have been described by Eisenhardt (1989) as a research strategy that focuses on understanding the dynamics present within a single setting. She has argued that a case study is particularly relevant when trying to understand a new topic, or area. Thomas (1996, ref. (Fletcher & Plakoyiannaki, 2011)) has stated that case studies take into consideration the environment characteristics, resource constraints, and cultural traits, and through these considerations, can provide in-depth contextual insight. A single case is suitable for clarifying relationships, building, and testing of theory, (Fletcher & Plakoyiannaki, 2011) and is

therefore suitable for this study. According to Easton (2010) single case studies enable the understanding of a phenomenon in depth and comprehensively.

As the case involves one case company, but four projects (subunits), the research design is a single embedded case study (Yin, 2009), but with multiple layers of analysis. The four renewable diesel plant projects are studied both as a program and as individual projects. The program was executed in two phases, first two plants in Finland and then two abroad. Most of the similarities and differences between the projects can be seen when comparing the domestic plants to the world-scale plants; the analysis however further includes a comparison of the large plants with the domestic. In addition to the context of the case, the context of the subunits (i.e. the contexts of the four projects) is also examined in order to understand the relationships between the subunits of analysis (Stake, 2005). The company as a whole, the industry and the product are also examined, in order to get a firm grasp of the context.

The study is a combination of both descriptive, and exploratory research design (Yin, 1984). The descriptive nature of the study aims to describe the relevant routines of the case company and its projects. Since the purpose of the research is to understand routines in a new context, exploratory design is also appropriate.

3.2 Collection of empirical data

Because of the nature of the special investment program involved, (explained later in this chapter) Neste Oil was interested in learning about how they could improve their projects, and saw the cooperation within the LPG- research project as an interesting opportunity. Neste Oil has been part of the research project since 2009. The already well-established relationship between the research group and Neste Oil enabled the gathering of the empirical data, and made the interviews relatively unreserved and straightforward.

The interviews were open qualitative interviews, executed with the help of an interview guide. Open qualitative interviews enabled the respondents to express their understanding in their own terms, which can give a greater depth of understanding, as it does not require the respondents to adapt their stories. (Patton, 1990) According to Patton (1990) a good interview guide increases the comprehensiveness of the data, making the gathering of data more systematic, while leaving room for the interviewer to use their limited time in the best possible way. The interview guide was constructed together with the LPG-research group.

In the case of Neste Oil, the researchers of the LPG-group conducted 29 semi-structured personal interviews. The interviewees included the key actors involved in the projects, such as project managers and senior managers, from both Neste Oil and the main contractor (Technip) of the world-scale projects. Most of the Neste Oil-interviewees had been working in Neste Oil for many years, some even decades. 17 interviews were conducted from November 2009 to May 2010, a further 12 in May 2011. The interviews were conducted by two to four interviewers. I was responsible for the design of more specific questions for the 12 second round interviews conducted during spring 2011, and participated in five of those interviews. The theme of routines was also evident in the earlier interviews of 2010, although I was not personally involved in the project at that point in time. All of the 29 interviews were utilised in this thesis.

The interviews lasted from 45 minutes to 2 hours. The majority of the interviewees were in Finnish, but the interviews were conducted in English when an English speaking co-researcher was present. Since the interviewees were used to working in an international environment, interviewing in English was not an issue for them, however there was a noticeable difference in the flow of the interviews when they were conducted in the interviewees' mother tongue, Finnish. In summary, 15 interviews were conducted in English, of which 2 were members of the Technip team, the remaining interviews were conducted in Finnish.

The interviews focused on subjects such as, the interviewees' personal background, project lifecycle, and project organization and environment. Work processes, standard practices, and operating procedures were also discussed in-depth. As explained earlier in the literature review, the word routine has a different meaning in colloquial language, which was also taken into account during the interviews. Instead of asking directly about the kinds of routines the interviewees participated in, the interviews were relatively open, with the focus on how the project organization worked. The aim was to let the interviewee explain in detail their work patterns, when more information was needed follow-up questions were asked.

3.3 Analysis of empirical data

The interviews were recorded and transcribed, since the desire was to capture the interviewees' perspective as accurately as possible. Recording the interviews also allowed the interviewers to concentrate on the actual interviewing process and the interviewees' stories. (Patton, 1990)

The transcribed interviews were analysed with the method of content analysis using codes designed in accordance to the research motives. Atlas-program was used as the analysis tool. The codes were:

- Neste Oil routines
- Project routines
- Program routines
- Artifacts
- Routine control
- Routine trigger
- Truce in the organization
- Technip routines

After the interviews were coded, the results were extracted and inserted to the program again. The extracted sections of the interviews were recoded with the specific routines already identified from the interviews. The codes of the second round were:

- Guiding the subcontractors
- Best Practice
- Communication between projects
- Communication within a project
- Development of procedures
- FEED-routine
- HR-routines
- Training
- Handover
- Maintenance
- Reporting
- Meetings
- Permit procedures
- Pre-treatment
- Procurement
- Project closing
- Project management
- Safety
- Sharing of practices
- Technology Office's own routines

The actors involved in the routines were coded as well in the second round of coding:

- Neste Oil Corporate organization
- Porvoo 1& 2 projects
- Rotterdam project
- Singapore project
- Owner's team
- Steering group
- Technip
- Technology Office
- Permanent plant organization

When the second round of coding was complete, the routines were transferred into an excel-file where the data was regrouped according to different purposes, such as which artifacts were relevant to the routines, who affected the routines, and who participated in the routines. Also any external context that had an affect on routines was identified.

As is common with case studies, the data analysis, and data collection overlapped at times during the study (Eisenhardt, 1989). The first round of interviews was examined before the interview guide for the second round of interviews was completed. The literature study was also continuous throughout the research process; the flexibility of overlapping allows the researcher to see what (and how much) additional data is needed, and what is the best method to collect the data (Eisenhardt, 1989).

Pentland and Feldman (2005) argue that when studying routines there are three points of view. One can study routines; 1) as a black box, 2) examining one perspective of routines, (ostensive, performative or artifact) and 3) looking at the interactions between the different aspects of routines. The limitations of studying routines as black box, means the internal structure of the routines can be overlooked, and the research can focus on the input and output of the routine. Routine as a black box is appropriate when the research question concerns a description, prediction or comparison of routine as a whole. Black box-perspective can provide a general, and simple view, but might not be accurate. The second approach aids a better understanding of the dynamics of a specific routine, by breaking the routine into parts (ostensive aspect, performances, related artifacts). For example, by focusing on the performative aspect and examining and comparing performances, the relationship between the change of context and action can be understood. Studying the interactions within routines on the other hand, could give a better understanding of the sources of stability, innovation,

flexibility and change in organizational routines. (Pentland & Feldman, 2005) This study was a combination of all three of these aspects, since the aim of the study was to find out what routines exist in the projects, what is their role in projects, what factors affect the routines and how are they developed in this context. An example of this was dividing the routines by artifacts in an excel-file, which enabled the comparison of routines.

3.4 Reliability and validity

Reliability can be used to describe “correctness or credibility of a description, conclusion, explanation, interpretation, or other sort of account“ (Maxwell, 2005). Yin (2009) describes reliability as testing that the operations such as data collection can be repeated with the same results. Since this research is about a very context related subject, the reliability of the research needs special attention. When considering case studies where the primary data comes from interviews, one has to take into consideration that the interviewees might speak about the case differently, depending on the time of the interview and the progress of the project. The context and time changes can have an impact on how the interviewees see the case (Yin, 2009). Yin (2009) also argues that using case study protocol and developing a case study database can improve the reliability. In this study the research plan, interview protocol and code list supported the reliability. All relevant files and documents were saved to a case study database, and all interviews were collected to the same Atlas-file that was used for coding the interviews.

The validity of research can be described as, whether or not the research truly studies what it set out to study (Yin, 2009). When testing the validity of the research design one should take into consideration the four different aspects explained by Yin (2009); construct validity, internal validity, external validity, and reliability. Construct validity refers to identifying the correct operational measurements for the different concepts being studied. Internal validity needs to be taken into concern in explanatory and causal research, when the causal relationship is studied. External validity relates to “defining the domain to which a study’s findings can be generalized”. (Yin, 2009) Yin explains that using multiple sources of evidence, establishing a chain of evidence and addressing rival explanations are methods for improving validity. Both the literature review, and the empirical study include multiple sources, while the 29 in-depth interviews provided enough data for the research. Rival explanations were also considered when drafting up the results. The concepts studied are

defined very clearly, and as explained previously the codes used in the data analysis were carefully determined-

Another important consideration in the embedded case design is the documentation of the study (Yin, 2009). As the study is part of a larger research project, the different stages have been reported throughout the process quite thoroughly. Also the careful recording, transcribing, and reporting of the interviews increases the validity (Maxwell, 2005) and all of these steps have been taken into consideration in this study. Yin (2009) explains that by having the key informants review the report of the case study it further increases the validity of the research. A representative of Neste Oil has reviewed this thesis.

3.5 Case description

Neste Oil is a Finnish oil refinery and marketing company that focuses on high-quality traffic fuels. The company is relatively small in the oil business, and therefore considered as an agile mover. In 2010 its turnover was 11.3 billion Euros, and it employed approximately 5000 people worldwide. Around half of Neste Oils revenue is generated in Finland, the rest divided between Europe, the US and Canada.

The case begins at the beginning of the 21st century, when the European Union (EU) aimed to increase the relative consumption of renewable fuels. In 2003 the EU launched a directive intending to increase the portion of renewable fuels by 2020, up to 10% of all transport fuel consumption. As Neste Oil had already developed its own renewable fuels in the 80's and 90's, the company saw this as a valuable opportunity. Neste Oil continued its research and development, and in 2003 decided to focus on a renewable diesel technology called NExBTL. NExBTL-technology is a second-generation renewable diesel, and is considered a premium quality renewable diesel. The quality is based on a range of aspects, better cold weather performance, broad choice of feedstock, greater fuel stability, and improved usability compared to other biofuels on the market.

In November 2005, the company decided to build their first commercial production NExBTL-facility, to test the viability of the technology. The first plant was integrated into the existing Neste Oil refinery in Porvoo, because of the existing infrastructure of the refinery. The initial plant, Porvoo 1, was established to meet the demand in the domestic market in Finland. In 2006 however, Neste Oil decided to aim at becoming the worlds' largest renewable diesel producer. This new strategy was somewhat controversial, since it targeted on very rapid

expansion. In the relatively conservative oil industry, Neste Oil decided to use its small size, and ability to adapt faster than the bigger oil companies as an advantage in its new strategy.

The unit responsible for these strategic goals is at present called Oil Products and Renewables. In 2010 the revenue coming from renewable fuels was 2%, compared to Neste Oil's other reporting segments (www.nesteoil.com). Neste Oil is aiming at increasing that number drastically, as can be seen from Figure 5.

Breakdown of annual EBITDA by segments (excluding Others)

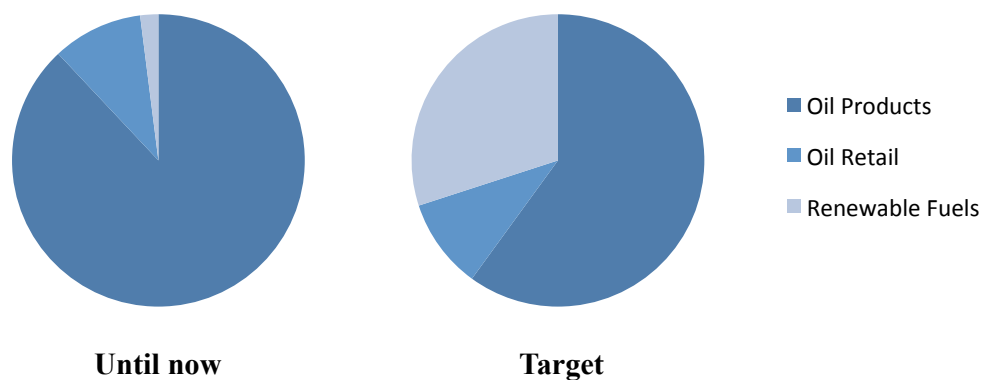


Figure 5 Neste Oil's annual EBITDA by reporting segments, current and target (adapted from Investor Presentation, 2011, 11)

To reach the growth target as fast as possible, and to gain first mover advantage, Neste Oil decided to use partial replication when building its other renewable diesel (NExBTL) plants. Before the first plant was even completed, the investment decision was underway on the second refinery-integrated plant in Porvoo in November 2006. Making the investment decision for the second plant before the first plant was fully operational was not a usual procedure for Neste Oil, since they normally build a reference plant before expanding capacity. The Porvoo plants were viewed as the first commercial reference plants, and the company wanted to scale-up the production as soon as possible. The investment decision for the much larger, world-scale standalone plant in Singapore was made in November 2007. While the Porvoo plants' production capacity was 190 kilotons per annum, the world-scale plants had a capacity of 800 kilotons per annum (Investor Presentation, 2011). Within a year of that investment decision, the second world-scale plant in Rotterdam was commissioned in June 2008. The NExBTL-investment program was developed in two parts; first the smaller plants in Finland and then the bigger plants in Singapore and Rotterdam. The timeline is

shown in Figure 6. The investment program's subunits researched are named therefore as, Porvoo 1, Porvoo 2, Singapore, and Rotterdam.

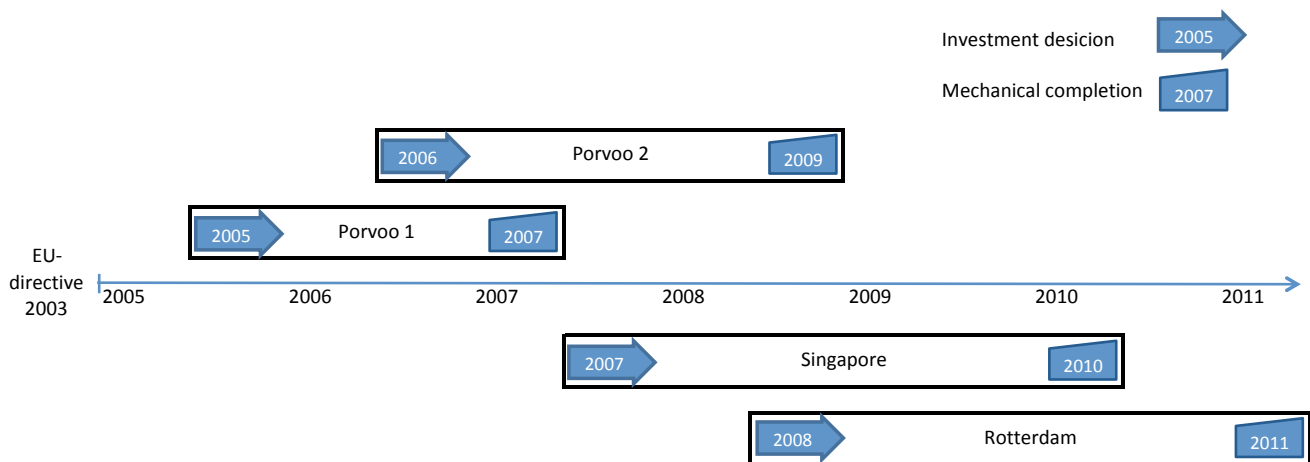


Figure 6 Timeline of the investment program

The company had used its subsidiary engineering company, Neste Jacobs, for the engineering of the Porvoo plants, but it became clear that Neste Jacobs did not have the resources to complete two world-scale projects at the same time. In 2007 Neste Oil decided to choose an EPCM (Engineering, Procurement, Construction Management) contractor, Technip, as the system integrator for the world-scale plants. The location of the two world-scale plants was decided based on distance to the markets, and distance to the feedstock. Rotterdam is in Europe, which was seen as NExBTL's primary market, and Singapore is close to the feedstock in Asia.

When the decision was made that Technip would be the main contractor, Neste Oil formed the owner's teams for the projects, and the owner's teams moved to Rome to Technip Italy's offices. Both the Singapore and Rotterdam team stayed in Rome for months before the design phase was far enough for the part of teams to move to the locations. Most of the procurement and planning was done in Rome at the same time for both standalone plants.

The original schedule for the two large plants was the same, but in the end Rotterdam's schedule was six months behind Singapore's. The major reason for the delay was the economic downturn. When the signs of the economic downturn were evident, Neste Oil ascertained that it could benefit from the downturn in terms of labour, procurement costs, and delivery time. Neste Oil decided to slow down the process and maximize the benefits from the downturn. The original deal with Technip was made during the boom, and finding an

appropriate work force was challenging in both Neste Jacobs and Technip. The delivery times and prices of the main components were also not ideal. The global economical downturn changed the entire situation within the next year, prices went down and a more skilled workforce was available. As the majority of the contracts were already signed, the benefits from the price drop were limited, but still had a positive effect on the Rotterdam projects budget. Despite the schedule delays, both Singapore and Rotterdam benefitted from the recession in respect to time, delivery times reduced, labour costs went down, and there was a much more skilled workforce in the market.

The difference between the two plants' schedules proved to be beneficial for the Rotterdam project also in terms of learning and knowledge transfer. Now there was time to prevent the problems and complications noticed in Singapore from happening in Rotterdam. Key individuals could also be transferred from Singapore to Rotterdam for training and implementation.

Other issues that had an affect on the schedule of the two plants were the local legislation and existing infrastructure. For example the permitting process in Rotterdam was more time-consuming than in Singapore and the scope had to be extended e.g. with a wastewater treatment and a jetty.

In October 2011 the Porvoo plants had been in operation for several years, the Singaporean unit for approximately a year, and the Rotterdam plant had been started up in September 2011. The NExBTL-program is extremely important for Neste Oil, since it is a key element in Neste Oil's strategy and a very big investment program. The Porvoo 1 costs were €100 million, and the Porvoo 2 over €100 million. The costs of the Rotterdam plant are estimated at around €670 million, while the total costs of the Singapore plant are valued at €550 million. (www.nesteoil.com) The comparisons of the four plants are presented in Figure 7.

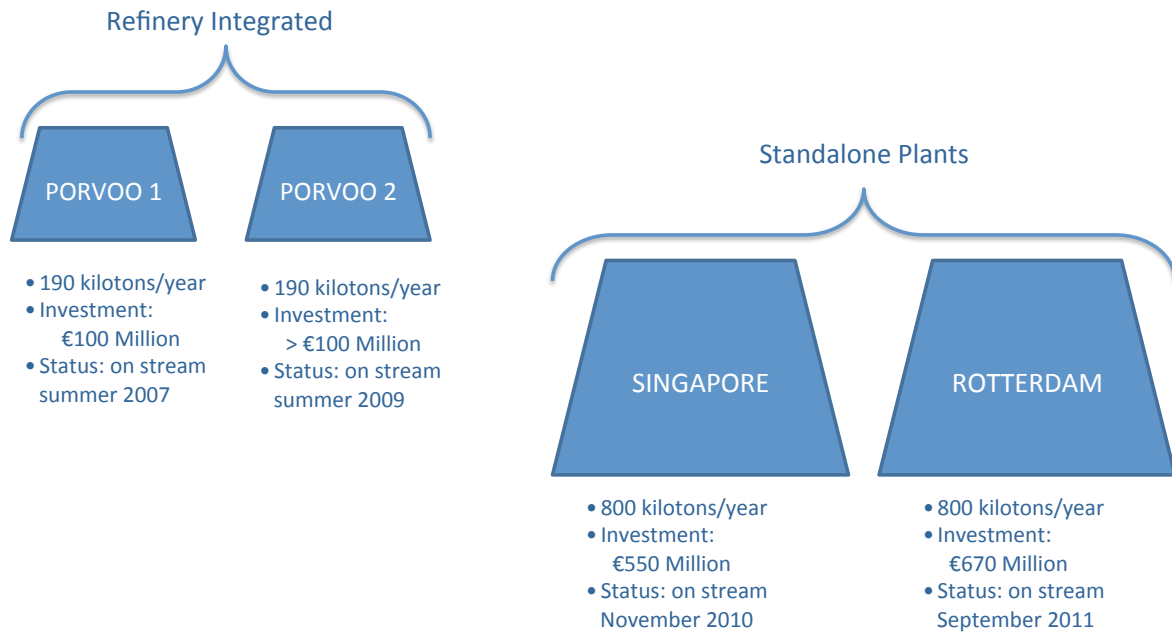


Figure 7 Visualization of the NExBTL-plants (data from Investor presentation, 2011, www.nesteoil.com)

3.5.1 Main actors in the projects

In this section the main actors in the project are introduced. In addition to the actual project team, these actors were strongly linked to the projects, affecting their implementation.

Neste Oil

Neste Oil has a strong technologically centered company profile. This can be seen in many ways in Neste Oil's projects. The company is technologically advanced and targets high-quality fuels. The employees involved in the projects had decades of experience with Neste Oil, and knew the company's culture and products particularly well. Neste Oil has a history of transferring knowledge between projects through the transfer of experienced people from its previous projects.

Neste Oil's projects tend to take a similar formation; the project organization has a project manager, a steering group, and a steering manager. The world-scale projects deviated a little from this process, but the differences were mostly due to the ECPM-contractor, and different type of owner's representation.

Next the different Neste Oil organizational actors involved in the projects are introduced.

Steering group

All Neste Oil projects have a steering group that is responsible for guiding the project and monitoring the budget. The steering group consists of corporate members, and makes decisions such as scope changes concerning the project. The chairman of the steering committee was the deputy CEO, who informed the executive board of the progress of the investment program. The project manager is accountable for the steering group, and reports to it regularly. The steering group of the world-scale plants convened approximately once a month.

Owner's teams

The owner's teams were established to represent Neste Oil onsite in Singapore and Rotterdam. The teams for both projects were located initially in Technip's premises in Rome. The owner's teams were composed of experienced individuals from Neste Jacobs and the project team. The owner's teams in Rotterdam and Singapore had some common individuals.

Operational organization

The operational organization is Neste Oil's permanent local branch, which takes care of the plant once in operation. In Porvoo, where the permanent organization is present, the cooperation was very close between the operational organization and the project organization, as well as other departments.

Technology Office (TO)

The Technology Office was created as a response to a problem highlighted in the first and second Porvoo projects. The projects needed an organization to collect knowledge, improve technology, and transfer information back to the other projects and plants. The Technology Office has three main functions; 1) acting as an internal technological licensor, 2) being responsible for the technological development and 3) gathering and maintaining of the technological information. The Technology Office is located in Porvoo and consists of four members from different parts of Neste Oil and Neste Jacobs. It works in close cooperation with the project teams, the plants, Neste Jacobs, and other departments in Neste Oil employing expertise from relevant disciplines where needed.

Neste Jacobs

Neste Jacobs is the subsidiary engineering company that has a close and long relationship with Neste Oil. Neste Oil owns 60 % of Neste Jacobs, the other 40 % owned by Jacobs Engineering (www.nestejacobs.com). Neste Jacobs acted as the systems integrator in both Porvoo projects, providing the basic engineering and design. Neste Jacobs's offices are located in the same premises with Neste Oil in the Porvoo site.

Technip

Technip was chosen as the EPCM-contractor for the world-scale project in 2007. Technip as a large, experienced, international systems integrator company had sufficient resources and capabilities for such large projects. Technip also had well established procurement practices and contacts, which were used for the world-scale plants. Technip usually operates as a lump-sum turnkey contractor, but for the NExBTL-plans a reimbursable contract was preferred by Neste Oil.

Other suppliers and contractors

The company tried to use the same contractors where possible in the projects. The suppliers and contractors used in Porvoo 1 were used again in Porvoo 2, if they were proved adequate and available. There was also an incentive in gaining economies of scale when buying from the same supplier. Neste Oil also tried to use the same partners in both Singapore and Rotterdam, and the vast majority of the procurement was finished at the same time for both world-scale plants.

The existing infrastructure made the process easier in Porvoo, but the infrastructure in Rotterdam and Singapore were different. Some of the key partners and facilities were easily located, but some of the infrastructure in Singapore and Rotterdam had to be built by Neste Oil. Due to difficulties in finding suitable partners, some of the infrastructure had to be built in order to get the plant operational, which naturally added extra costs.

Local authorities as stakeholders

The local government and authorities also had a major impact on the projects, and they will be discussed shortly. As Neste Oil is a well-known Finnish company, it has great knowledge of local authorities and cooperation in Porvoo was relatively smooth. The use of animal fat in

the NExBTL-process was new for Neste Oil, but given their intimate knowledge of the Finnish standards, it was relatively easy to adjust to the rules.

In Singapore, the local authorities included the Economic Development Board, which was very cooperative with the company. The local authorities and regulations were also business friendly, and for example licensing procedures were done swiftly. This was in direct contrast with Rotterdam, where the process for granting building permits could take months. The Port of Rotterdam, which was in possession of the land where the plant was located, was able to aid the permit issues to some degree, and enable the zoning exemption process.

The different actors in the investment program are summarized in Table 3.

Table 3 Main actors' roles throughout the investment program

	Porvoo 1	Porvoo 2	Singapore	Rotterdam
Neste Oil	Owner organization	Owner organization	Owner organization	Owner organization
• Steering Group	Guiding the project	Guiding the project	Guiding the project	Guiding the project
• Owner's team	-	-	Representing the owner on the site	Representing the owner on the site
• Operations / Permanent Plant Organization	Present in Porvoo throughout the project	Present in Porvoo throughout the project	Only few representatives present before implementation	Only few representatives present before implementation
• Technology Office	-	Founded during project	Key player in knowledge creation & transfer	Key player in knowledge creation & transfer
Neste Jacobs	Basic engineering / systems integrator	Basic engineering / systems integrator	Owner's team / Discipline expertise	Owner's team / Discipline expertise
Technip	-	-	ECPM-contractor	ECPM-contractor
Local authorities	Familiar environment	Familiar environment	Cooperative	Bureaucratic

4 Results

The findings are presented in this chapter. The first part brings up the project perspective discussed in the interviews, introduces routines discovered in the investment program, and explains how routines role were perceived in the projects. Next the different factors affecting the routines are explained. How routines changed and developed throughout the program is explained thereafter. Finally the key results are summarized.

In the following the context is clarified as explained by the interviewees.

4.1 The investment program of four NExBTL-projects

The term program was used in the higher level of management, but the actual project teams considered the projects as individual, rather than a program. The management saw replication, i.e. transfer of practices and technologies (Ruuska & Brady, 2011), as a way to increase capacity in a very short time. This was seen as necessary to gain market control quickly. As one of Neste Oil's business representatives explained:

We were thinking of this about as an investment program, so basically not one single project at the time.

Well basically we made the process design, then we looked at the point that we made the process area plot plan, and said that "okay this is the plot, how it's gonna look like". So after that the idea was that we can fit this in different sites. Now, what can change is the tank farm, how the utilities are supplied, how the harbour is with, but the process design or the process area is the same

Although the idea to use replication in the investment program was outlined, it was confined mostly to the main technology. The idea of copying nearly everything did not realize, as one interviewee from the project management explained:

The project was sold me as a nice copy plant and then it was completely different.

For example routines were not even attempted to replicate. Most of the interviewees expressed that they felt that the replication strategy was challenging because of the lack of experience of the technology:

In my opinion it's impossible idea cause we didn't have any operational experience from Porvoo 1, which was the first, let's say totally new process.

In addition, most of the project work was adapted to the location, project team and situation. The interviewees emphasized the differences rather than the similarities. The two world-scale plants had some similar practices and processes (such as procurement) but there was relatively little in common between the Porvoo-project teams and the world-scale-project teams. The teams in Singapore and Rotterdam felt that they were far away from Porvoo, and that their projects were very different because the plants were bigger, the plants did not have a refinery attached to them and because of the international aspect. They felt that they needed to adapt to the special needs, and that there was relatively little to learn from the Porvoo projects. The insight transferred to Singapore and Rotterdam from Porvoo, was concerned mainly with technology, and the operation of the plant. The project teams understood that the technological know-how was in Porvoo, but felt that this was the only aspect through which they could relate:

But from technical point of view there's a lot of learnings that we try to take from Porvoo. Not organizationally...

The standalone plant projects in Singapore and Rotterdam were also seen as different from the Porvoo projects because the operations were not as closely involved in them as they were in Porvoo, where the plants were refinery integrated. One interviewee explained the situations saying that:

They [the standalone plants] were completely disconnected from the doing [operations]

The distance – both mental and geographical – between the projects also had an impact. Porvoo teams worked together at the same premises in Porvoo, and the world-scale teams worked together in Rome for a certain period of time. This time spent together also connected the teams. On the other hand, the world-scale teams felt very far away from the Porvoo teams.

When talking about the potential future plants, the interviewees seemed to think that the next plant could be a replication, in terms of both the technology but also work processes and best practices. The company has maintained a best practice plan, in order to have a clear and detailed plan of the technology that needs to be transferred to future plants. It became clear

from the interviews that the interviewees were more confident about using replication in the future. They saw that the lessons learned would be more easily transferred and that there wouldn't be so many exceptions the next time.

Next the routines discovered from the interviews are explained.

4.2 Identified routines

In the interviews there were many differences in how routines and procedures were seen. The interviewees mainly talked about what happened in the projects, explaining through stories and examples how they did things, instead of explicitly talking about their routines. As the interviewees progressed, routines became more easily identified, although most routines were strongly interlinked with each other. In general routines were seen as rather trivial; “these are just ways of doing things, how things are used to be done here” and the copying of the best practices and behaviour patterns were done quite lightly. Although the mechanical details were emphasized greatly, the project management and reporting was not very systematic and these routines mostly were not transferred from one project to another.

Neste Oil has had a tradition of transferring knowledge and good practices by using experienced people in its projects, as was the case in the NExBTL-programs as well. Transferring experienced individuals was a key method for transferring good practices and know-how. The individuals involved in the projects were very experienced in the Neste Oil projects, and they had accumulated knowledge on different aspects of Neste Oil's operations throughout their long careers. This method for transferring knowledge was effective but also faced challenges when people retired and because of the projects being partially overlapping. In the world-scale projects there were not many of Neste Oil's own people, but Neste Jacobs' and Technip's teams comprised the project team.

The importance of wide-ranging knowledge base was reflected also in the training of new people, they were taught with a very hands-on method, first sending the people to the Porvoo plant to learn how the plant is operated, and then using the same people in Singapore's initialization as well as in Rotterdam. When the same people were involved in more than one project, the information and know-how was transferred. The experience in the actual operation was also emphasized. How different routines were executed depended greatly on the background and prioritizing of the individuals in the project teams.

The interviews also indicated that the connection between the project team and the operation team was crucial. The good practices developed were often designed to make operations smoother. When the connection and communication between these two parties worked, the reasons for modifying routines in the project were more evident. In Porvoo the operations team was present since the project had an existing plant organization around them. As one of the interviewees said:

They [Porvoo 1& 2] sort of did the plant for themselves and to their colleagues. One can imagine that if it goes bad and doesn't work or accidents happen or something, they'll get the feedback.

The routines in the program can be viewed from many different perspectives. Depending on the actors involved, the scope of the routine and perspective, the same routine can be described differently. A routine of problem identification can be explained as an example. The problem identification routine was a combination of multiple smaller scale routines, and a result of the actions of different actors. The routines cannot be separated into different entities as they are strongly linked, and changing or moving one affects the other routines as well.

Next the thesis will introduce different categories of large routines in detail. Communication and reporting, as well as the development of best practices in technology, were identified as important for the transfer of knowledge and routines from one project to another. Also the regulated routines are explained.

4.2.1 Communication and reporting

The communication between different projects relied immensely on personal relationships and connections. Informal communication between the different disciplines was key in communicating problems. An important aspect in relation to the project-to-project communication was the time the Singapore and Rotterdam teams spent in Rome, this allowed the teams to get to know each other and create a common team spirit. While in the same offices, the teams even blended together and the boundaries were blurry. In Rome the two teams were seen as one:

Then we were practically one group but we had two projects. So we had continuous connection. And we mixed so that Singapore people did Rotterdam's jobs and vice versa.

The importance of personal connections in Neste Oil was well recognized by the project teams. To improve communication between the Porvoo plants and Rotterdam team, the Rotterdam project had a routine of introducing “the new guy” to the people in Porvoo:

What we have tried to do is to, when the new guy comes in, take him or her here in Porvoo and explain how the things are done and who is responsible that he knows the face, and if there's some problems or discussions needed, he can directly connect to right people.

The communication between the world-scale plants decreased significantly when the teams separated and left Rome to go to the sites, communication between projects mostly limited to occasions when problems were encountered. Everyone seemed to think that information would automatically transfer from project to project. An example of this is the monthly report, which was sent to other projects as well. Even though the report was sent to the other projects, it was quite evident that the project managers did not have time to get to know the report in-depth.

The communication also relied on the owners' teams, Technology Office and Technip's organizations located in Singapore and Rotterdam. As the owner's teams were in contact with each other approximately once a week, the information travelled from one project to another. Some communication also happened through the steering groups that convened approximately once a month to hear the project managers' report and discuss the progress of the projects. The most crucial issues were communicated through Technology Office as well. Also Technip had teams in Singapore and Rotterdam that communicated with each other. It seems this type of communication was not officially recognized which can be interpreted from what a member of the Rotterdam team said:

But we sort of did get weekly information, or so, about Singapore's experiences and observations, you know, directly between the owner's teams. And between Technip's own organizations in Singapore and here.

In the Porvoo projects the engineering, operational and technological divisions of Neste Oil and Neste Jacobs usually work together and in close cooperation. As one interviewee explained, Neste Oil and Neste Jacobs have a very good relationship in Porvoo with a shared motive for making the plant work. The cooperation has a long history since the two organizations have been working together in Porvoo for years. The cooperation was

emphasized with the project teams being a combination of both organizations. Also the common offices and infrastructure has supported the interaction. From the interviews it was clear that the two companies were in a way blended together. The interviewees did not make a clear distinction between Neste Oil and Neste Jacobs, as explained by an interviewee.

Up until now we've been lucky in that perspective compared to many other oil refiners that we [Neste Oil and Neste Jacobs] have been in a way the same company. And we don't need lawyers to settle everything but we can agree on matters here the best possible way...

The free communication and exchange of thought was seen as very important in making the projects work. This seemed to vary between the projects, and was dependent for example on how the different disciplines communicated across projects. Another aspect that influenced the communication routines was Technip's position in the world-scale projects.

Communicating and decision making involved low hierarchical communication in Neste Oil, and decisions were made in "enough low level" as one of the interviewees explained, with communication being relatively straightforward. In the world-scale project though, only the owner's team was able to communicate difficulties and potential changes with Technip. The routine was to first communicate the problem to the owner's team, then the owner's team communicated the problem to certain individuals in Technip's organization, and then the Technip organization discussed the issue. After that the discussion either continued with the owner's team and Technip or the possible corrections were made. The official correspondence happened through the project managers of Neste Oil and Technip.

One standardized method for reporting and communicating was the monthly report. The main purpose of the report was to inform the Neste Oil management about the projects but it was also used to communicate across projects and to Technology Office. The monthly report from the Singapore and Rotterdam projects was directed to a wider group that included the steering group, the head office, the Technology Office and the world-scale NExBTL-projects. The report started off as a simple report from Technip to Neste Oil but was gradually modified by Neste Oil, the project teams and Technip to fit the needs of the different organizations and the project itself. In the end, the monthly report became a ten-chapter progress report including reports of the progress of different disciplines, details of the project as well as issues of the

permanent plant organization. The report was also distributed to the other world-scale project, but it remained unclear if the report was actually read by the other project team.

Other reporting routines in the projects include the collection and writing of the final report at the end of the project, as well as the reporting of the different technological stages, which was coordinated by Technology Office.

The communication within the projects relied on internal meetings and informal communication. Informal discussion in the coffee room was an important routine in the Porvoo projects. Another routine established in Porvoo 2 project was the project manager touring the plant site with the site manager and different disciplines every week. This enabled the project manager to focus on one discipline at a time, and gave the disciplines the opportunity to explain their specific situation and problems more in-depth. More formal discussions were organized twice a year in the form of seminars that involved all the different disciplines. These seminars were called the “stepping signs” and the routine is explained more in-depth in the next chapter.

4.2.2 Development of best practice in technology

The context of these projects is extremely technology centred which reflected on the routines as well. The routines to develop best practices in technology seemed to be the most organised and recognised. The technological problems were taken seriously and resources were allocated to fix them. Documentation of the technological challenges and solutions seemed to have been the most routinized. An example of this is the problem solving in the projects.

There are three interlinked procedures in the investment program concerning problem solving. When a problem is identified in one project, it is first communicated to the Technology Office with a formal mechanism called change request. A change request is an email query sent to Technology Office about a problem encountered relating to NExBTL. The request is normally a request for the Technology Office to solve an issue faced in the NExBTL-plants. Technology Office has created a standard procedure on how to make a change request and what happens after the request is handed in. Technology Office has appointed a person in charge of change requests, who makes sure that the request is saved to Technology Office’s system and gathers the people with the appropriate skills needed to solve the problem. The system is open to everyone in the Technology Office so that everyone can participate and see the status of the request. In the third stage, after the Technology Office has solved the issue,

they reply to the source, and in many cases develop a statement to all the plants stating the appropriate course of action or warning the plants about the possible problem. The problem solving routine is visualized in Figure 8.

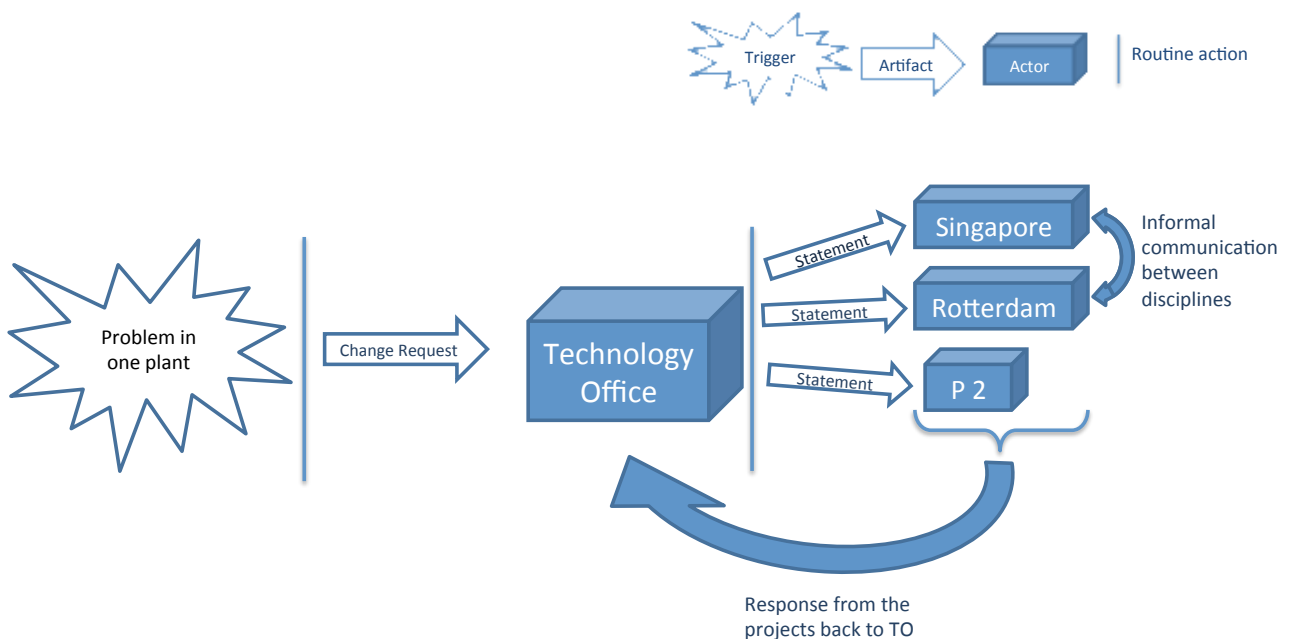


Figure 8 Problem solving routine

Before Technology Office was established problem solving happened often in informal conversations between the team members, a lot of the discussions happening during coffee breaks in the teams’ coffee room. Once a problem manifested, the team discussed with different individuals who had some knowledge on the area where the problem occurred.

Another, more official way of developing best practices and solving problems was the spring and fall “stepping signs” in Porvoo 2, here explained by a member from the project team:

We had these fall and spring stepping signs... The idea was to get our design, execution and business representatives there, to discuss where the project really is. Everyone had their own idea about that and about where the threats were. We went to a lecture room, and it was practically full. These were good events. ... We gathered everyone together, and there was no second-hand information but we could discuss direct.

After the seminars a memo was written to record the main points of the seminar. The stepping signs were important routines used to develop the technology, the process and whole project. Other similar routines were established such as the project manager's routine to tour the plant site with different disciplines to learn about the concrete problems encountered on the site. Neither the stepping signs routine nor the individual face time was transferred to the consecutive projects.

4.2.3 Regulated routines

The routines regulated by either the local authorities or Neste Oil and Technip include among others, permission processes (such as zoning permits) and safety regulations. Also training of the operation engineers was a key routine.

Technology Office organized the training for both world-scale plants. The training of the operational engineers was done in two phases. First the engineers were taught the technology in-depth, making sure that the engineers know what to do and why it is done as it is. This phase makes it easier for the Technology Office to explain the second phase to the operators. The second step included several weeks' training for the actual operation, where the engineers were brought to Porvoo to experience the operations first hand and to get to know the relevant experts. Technology Office explains how the plant runs, what is crucial to know and how to prepare for different situations. The world-scale projects also had a training simulator they used in training the operators. The delay between Singapore and Rotterdam additionally enabled the Rotterdam people to participate in Singapore's implementation.

In Singapore safety training on the site was emphasized, and the project organization took advantage of the low labor cost by spending much time, and effort in training the employees, and the subcontractors to understand the importance of safety regulation. A representative of Technip explained the situation saying:

We deployed a very big effort because we discovered that the culture concerning [Health Security and Environment] in Singapore is very very very poor, and so we had to deploy together a very big effort in order to try to realign the subcontractors to our culture and to our idea of respect for human life and for everything that is concerned by health and safety.

The regulations and safety routines were also written out in detail to manuals in Singapore. The safety regulations were also monitored very carefully in Singapore. Safety routines were also key in the Porvoo projects, as one interviewee from Porvoo 2 project indicated. When the interviewee was asked about what should be replicated from the project, he answered:

It's particularly the safety. I have to say that we managed it very well.

In Porvoo 1 and 2 the safety coordinator came from the refinery. The changing laws in Finland affected the project because the new legislation required the operation and maintenance safety to be taken into consideration already in the building phase.

Both in Singapore and Rotterdam the project needed help from the local consultants when it came to the permission process. The permission process regarding construction of the plant was coordinated by Technip. In Rotterdam, the Port of Rotterdam, as the landowner, assisted in the zoning process of the land, but the process was still very slow before the different consents were received. In other aspects Dutch consultants had to be used, since the authorities did not cooperate in English. The Singapore project differed greatly partly because the Singaporean government was friendly towards these kinds of investments. The authorities cooperativeness smoothed the processes in many situations. Another difference between Singapore and Rotterdam was that in Singapore most of the permission processes was taken care of by a 'qualified person' since according to the local practice the owner of the project doesn't apply for the construction permits. Each project in Singapore has to have a qualified person who is responsible for ensuring that everything is done according to the local regulations. The qualified person and his employees approved the different plans for the plant but they were also responsible for the decisions. One interviewee explained the situation like this:

Sure they check everything and might question something but once it has gone through the qualified person, they have the responsibility. In the end [if something goes wrong] he is the one going to jail, and maybe the CEO. In Singapore the law of course is very strict in these matters, this is how it has been divided.

In Porvoo, the regulations and licencing procedures were well organized and the refinery organization knew how to take care of the procedures. Also the Finnish authorities were familiar which meant that there were no big surprises from the authorities side. In the Porvoo

projects, the existing organization took care of many regulated routines, as one interviewee explained:

The Neste Oil Porvoo refinery governs, gets the licenses, gives the commodities, takes care of the employee maintenance, things like that [for the Porvoo 1 project]

Other regulated routines included among other things financial, HR and accounting routines.

4.2.4 Other identified routines

There were other identified routines that do not fall into the previously mentioned categories and these routines are introduced here.

The different projects had also some routines that were not adapted to other projects. One project manager emphasized the informal communication, which affected meeting routines as well as other process. For example celebrating different milestones or fulfilled objectives such as 50 days without accidents was common. The project manager called this way of management as “management by treats”.

Other examples of identified routines include the routines of project management and procurement. The procurement routine in Porvoo 1 included a call for bids, procurement definitions and finally a negotiation phase with the chosen companies. In Porvoo 2, the project tried to use the partners that were proven good in the previous project. The partners that were unavailable for the new project or did not fill the requirements were changed through a new procurement round. When moving to the world-scale projects, the procurement was handled mostly by Technip, who had quite substantial connections as well as the ability get the prices down because they are such an influential player in the market. Also because of the change in scale and country, not very many partners remained the same. The procurement was done for both world-scale projects at the same time by the same person, using Technip’s selection criteria as well. The process included technical and commercial evaluations, shortlisting and face-to-face negotiations.

The project management routines also changed when moving from Porvoo to the world-scale projects. In Porvoo Neste Oil’s own quality programs were used for project management control. When Technip became the main contractor, the projects started using Technip’s Site Management Control-systems. As Technip had extensive experience using its systems, the world-scale teams agreed to switch to Technip’s systems. Another project management aspect

was the measurement systems used in Singapore and Rotterdam. In Singapore they used physical progress measurement and in Rotterdam quality progress measurement. One interviewee suspected that both projects were supposed to use quality progress measurement but Singapore switched to physical progress measurement because of lack of time. The project management tools affected the reporting routine as well since different type of data reports can be extracted from different tools.

Another large-scale routine in Neste Oil’s projects was the project staffing. As explained earlier, Neste Oil had traditionally used experienced people from its previous projects. This was done as much as possible in the boundaries of resources and retirements. Establishing a steering group for projects is also a routine common for Neste Oil’s projects.

In Table 4 the routines identified from the interviews are presented together with the subroutines connected to them.

Table 4 Identified routines

Routine	Examples of subroutines	Category
Communication between projects	Monthly reporting, owner's team meetings, Technip's own meetings	Communication & Reporting (4.2.1.)
Communication between projects and permanent organizations	Steering group meetings, showing the ropes to new team members	Communication & Reporting (4.2.1.)
Communication within the project	Internal meetings, coffee breaks, Stepping Signs-seminars	Communication & Reporting (4.2.1.)
Reporting	Final reports, documentation of technological development, monthly reporting	Communication & Reporting (4.2.1.)
Problem solving	Change Request, TO's internal processes, Statement, Stepping Signs-seminars	Developing best practices (4.2.2.)
Permission process	Communicating with authorities, meetings with consultants	Regulated routines (4.2.3.)
Safety	Safety training, writing safety guides, monitoring safety regulations, etc.	Regulated routines (4.2.3.)
Training	Technology training, introducing relevant experts, operations simulations	Regulated routines (4.2.3.)
Project staffing	NO's traditions in HR, Steering group, etc.	Other routines (4.2.4.)
Project Management Control	Measurement selections, approving quality documents	Other routines (4.2.4.)
Procurement	Evaluation of previous partners, call for bids, negotiations	Other routines (4.2.4.)

4.3 Routines role in NExBTL-projects

In general routines were not expressed very directly. Most of the interviewees seemed to think that there were not many routines in the projects, and that the routines were not transferred

from the consecutive projects. Overall the interviewees working in the projects did not see the projects' similarities or recognize the common routines. What was interesting is that as the interviews continued more routines were unravelled, as if the interviewee did not recognize them formally as routines but as 'just how they do it'. It was evident that mostly routines did not have an official role in the projects. The interviewees did not acknowledge the routines as very important.

Nevertheless, self-proclaimed crucial aspects of their projects were built on routines. The capabilities recognized by the interviewees, such as safety or the technology, were developed and maintained by routines. Also routines were used to transfer knowhow and create new knowledge.

As mentioned earlier the technological knowledge was emphasized in the projects and the awareness of the details of the technology was seen as important. These priorities were supported by the routines in the project. Training the operators in both the actual operations as well as the technology is one example. The way Neste Oil has been executing its projects is not only technology oriented but also operation oriented. The project organizations in Porvoo had a clear vision that the operation should be made as smooth and efficient as possible.

Another aspect of routines' function was to enable knowledge transfer. The communication routines were strongly related to informal change of information in Porvoo projects. Knowing the right people to talk to was important and this was conveyed in for example the routines of introducing the new guy to the Porvoo-people and transferring experienced project people to new projects.

Informal communication was important in Neste Oil's communication and transfer of knowledge but once the projects moved from common offices to separate sites they faced an issue. How to maintain their ability to communicate fluently in a new context and situation? The world-scale projects needed more organizing and control due to their big size, international aspect and having Technip as a main contractor. Technip as large international company had very organized and even hierarchical routines that supported the control and order in their projects. The structure of the routines was facilitated by the use of artifacts. The routine of communicating problems and changes to Technip is an example of how routines supported coordination in the projects. The procedure was formally articulated in a standard

procedure that guided the routine. This also differed from the practices of Neste Oil where the individuals had more power to influence the communication.

Routines were also executed to support priorities and values, such as safety.

4.4 Factors affecting routines

The multiple factors affecting the routines - their emergence, development and fading - in the projects were quite clearly indicated in the interviews. The interviewees explained that it would not even be possible to have the same procedures in all the projects because of changing circumstances. The factors were different in the Porvoo projects and the world-scale projects because of many things. Firstly the project teams were different. The individuals working on the projects had an impact on the routines, how routines were executed in each project was as a result of the different actors. When it comes to procedures or regulations, the participants of the routine make the ultimate decision as to what degree they will follow them. Their motivation, knowledge and experience have an affect on how the routines are performed.

Secondly, the external environment changed in many aspects. The culture and legislation changed when moving from Finland to Singapore and the Netherlands. Also the fact that Rotterdam and Singapore-plants were standalone, i.e. did not have the pre-existing infrastructure that the Porvoo's refinery integrated plants had, changed the context of the project.

Thirdly, the project team worked in close cooperation with their key partners, and these partners affected the project greatly. Technip had a great impact on the routines in the world-scale projects. Technip coordinated the licensing processes, coordinated the procurement process and chose most of the subcontractors. Another substantial cooperation partner in the project was the internal licensor, Technology Office. Technology Office also emphasized the technological development's effect on routines. What proved to be a very interesting aspect was which organizations were involved in the routine. The nature of the routine changed in relation to which parties were involved in executing the routine. Another informative aspect was routine control, in this case, who has the power to modify the routines.

The previously mentioned factors were related to artifacts; the contract between Technip and Neste Oil defined Technip's power over the projects' routines, the surrounding infrastructure

is an artifact affecting routines, and Technology Office is often triggered to action by an artifact. These factors affect the routines through different artifacts as well; through Statements, Project Management-tools or local legislation. Therefore, the different artifacts are also introduced before presenting the development of routines.

4.4.1 Project team

Even though the technology has been very thoroughly reported and described in detail, the management part of the project relies heavily on individuals. When it comes to the best practices in storing experience, gathering people and building the organization, there are no handbooks or systems to guide the process. How the projects were run was mostly left for the project managers. As one of the interviewees said when talking about transferring the tacit knowledge:

We know that we should utilize the experience if we would do it in a third place or replicate it somewhere. We would like to of course use the information. But there's no plan how to do it. That is very true. There's no. If the key people for example would leave, nothing would be left to Neste.

As explained earlier Neste Oil usually transfers knowledge by using experienced individual in projects. In this investment program, the projects were partly overlapping which meant that the most experienced people could not be used in all of the projects. This presented a challenge for transferring knowledge from one project to another. Also the retirement of some key individuals caused a gap in the knowledge transfer.

There were some ways the organization tried to prevent the loss of experience. The fixed routines and artifacts, such as some reports or meetings were seen as methods for “history documentation” as one interviewee explained, but they were not used as instruments for guiding the project management. It seemed that the project teams wrote the reports and had the sum-up-meetings but they did not feel that the reports were meant to guide the project management in the future. The importance of the reports and information documents was questioned, since there seemed to be a consensus that the reports are most likely left unread by the next project managers. One interviewee presented that the reason for this is that the project managers are strong, experienced persons with their own mind-sets:

Project managers are that type of people, they have so strong self-esteem, that they don't believe anyone else can do it as well as they can. They don't need anyone else's opinions.

Basically the project involved experienced project people who had built up the skill to adapt to changing situations. Even though the world-scale plants were very big projects in Neste Oil's scale, the project managers had the attitude of "been here, done that". Nothing can truly surprise them, as one of the interviewees said:

There are new experiences and new problems but no more surprises.

The project managers emphasized different routines depending on their priorities. One project manager felt that the informal communication, presence in the site and regular contact with the different disciplines was key for a successful project, and modified the project's routines accordingly. One interviewee explained that the routine of celebrating milestones and accomplishments improved work motivation:

And the gang truly appreciated it. And our group always added celebration in the middle of the work when it was justified.

Individuals can also affect how artifacts guide the routines. How important the artifacts are affects the power of the contracts, as individuals can ignore the artifacts. As one of the interviewees said:

First of all, these specifications and how the plant is made, is a result of the combination of Technip's and Neste Oil's specs. ... And then they have tried to incorporate the local legislation. ... But in the end, it's about the individual. They either read the procedure, and then they either adopt it or not, and follow it or not follow it.

In other words, what really matters is how the individuals feel about the procedures and routines, since they can decide to what degree they will follow the guidelines and standard procedures. Their motives and incentives therefore affect routines.

The background and experience of the teams was seen as very important in implementing, developing and transferring routines. When talking about unsuccessful transfer of a routine from Porvoo to the world-scale projects, an interviewee explained that even though the

routine was communicated to the world-scale projects, it was not successfully adopted mainly due to these reasons:

a) it didn't receive understanding there, b) the contracts were already signed, and they were afraid that there wouldn't be enough staff or know-how to do it

When asked about why there were difficulties in passing a successful routine to Singapore and Rotterdam, one interviewee said:

It shows that the designers don't understand these things, these are the type of issues, that you must have experience, and if one lacks it one doesn't see the importance of these.

This is another example of how the background and knowhow of the participants has a clear impact on how the routine is accepted and executed. Some routines such as the one mentioned about introducing “new guys” to the Porvoo team, were designed to improve the teams' knowhow and understanding of the NExBTL-product.

Routines are not isolated events in a project; the external environment also affected them greatly.

4.4.2 External environment

The external environment includes many factors that somehow have an effect on the project's routines. What happened in the outside world also affected different processes in all of the projects. The international currency regulations affected the accounting routines, the economic downturn slowed down the project in Rotterdam and the economic boom affected the availability of contractors.

The interviewees brought up few aspects of the external environment that had significant effect on the routines, these being the local culture and legislation and the infrastructure available.

Local culture and legislation

The surrounding environment of the project had a dramatic effect on the execution and selection of routines. The external context included the culture, legislation, and local habits of the location. For example in Singapore, the rules and regulations on the site were described in

detail and followed precisely. As one of the interviewees explained the authoritarian culture of the country meant that even simple guidelines were decoded into extensive descriptions. Another interviewee explained that the cheap labour cost in Singapore also affected many procedures such as maintenance and automation:

The workforce is cheaper. It's not worth to automatize so much, if it's only a matter of labour, it should be done in a certain way. ... We calculated that with the work hours that we used [in Singapore], transformed to a Finnish cost, all the money would have gone to just labour cost. So in that sense it was a different kind of culture.

Also the safety routines were affected by the Singaporean culture as explained earlier. The health, security and environmental responsibility culture was not as developed as in Finland, which meant that the project needed more training and emphasis on the safety regulations.

In Rotterdam the external environment affected different procedures. The communication with the authorities for example, differed because the officials didn't speak English. This meant that the Rotterdam project had to use more external consultants in dealing with the authorities.

Of course we have had consulting agencies daily to help us, because there are officials that for example don't speak English.

The surrounding environment also had a huge impact because of the local legislation, including HR, environmental regulations, investment protocol and so on. The local environment towards investments and foreign companies made a big difference in routines in Singapore and Rotterdam. Another aspect of the external environment is the existing infrastructure around the plant.

Existing infrastructure

As explained earlier, the Porvoo plants were refinery-integrated which means that they have a well-established infrastructure around them. This includes basically everything necessary from waste treatment to maintenance. Neste Oil's Porvoo refineries area is a large entity and recognized by the surrounding environment. They have also built relationships with the necessary officials which makes communicating with the Finnish authorities easier.

The existing infrastructure also holds Neste Oil's and Neste Jacobs's offices. Different teams from engineering to operations are located in the same premises, which improves the communication between disciplines. In Porvoo the whole spectrum of Neste Oil's business is visible, and the operations, support, and knowhow is available.

There were also many differences between Singapore's and Rotterdam's existing infrastructure. Neste Oil tried to gain as much synergy from neighbors as possible, but in some cases the infrastructure needed to be built by Neste Oil, particularly when appropriate providers were not located. For example the jetty in Singapore was outsourced to a partner, but in Rotterdam the jetty had to be built and run by Neste Oil, which affected the routines of the project as well as the future plant.

4.4.3 Key partners

The partners that the project team collaborated the most affected the routines in many ways. The project team adapted routines from these organizations and the organizations' artifacts affected the routines in the project organization. In this chapter two partners that were involved in the projects the most are introduced. Other key partners include Neste Oil's corporate organization and Neste Jacobs. For example a change in Neste Oil's company policies affected the projects' routines as well.

Technology Office

As the Technology Office was established after the Porvoo 1 project was completed and Porvoo 2 was close to completion, Technology Office did not affect the Porvoo projects to the same degree as the world-scale projects. Most of the Technology Office team had however, been involved in the Porvoo projects and knew the projects well, which meant that they had the experience of which routines worked the best in Porvoo. The team also included people who had plenty of experience on the operations. As the team was practically handpicked they were one of the best, they had the necessary contacts and knew Neste Oil and its other projects and products well.

The Technology Office was also in charge of the technological development, which at its own had an impact on the projects routines. As the NExBTL-technology advanced, new routines were created and other routines became futile.

Technology Office was a key player in the communication between the projects. The information flow was quite informal between the projects but when something critical happened the formal message came from the Technology Office, as one interviewee from the Rotterdam project explained.

And of course the most important [information] and that sorts went from Singapore to Technology Office and Technology Office sent them sort of as a boomerang straight back to us.

The training routine established by the Technology Office for the operational engineers before start-up is a good example of how the Technology Office tried to develop the knowhow on the site. As one of the interviewees said:

So that the operational engineers, they don't know only what to do, but they must know why to do that.

The Technology Office had a great impact on routines mainly because of two reasons. Firstly, the Technology Office's knowhow of the product, technology and operations was acknowledged and respected by the project teams. Secondly, the Technology Office's legitimacy was supported by an official mandate from Neste Oil's top management. These both reasons can be applied to the main contractor, Technip, as well.

Technip

Technip influenced the routines in the world-scale project for many reasons. One of the most important reasons was that before the Singapore and Rotterdam projects started, Neste Oil and Technip signed a detailed contract that stated how the project would be executed. As one of the interviewees said about the world-scale plants:

The way the projects were going to be executed was determined beforehand, and afterwards it was impossible to influence it anymore.

In the interviews with the Singapore and Rotterdam project team, Technip was explained as having a great impact on the routines and procedures. One interviewee explained the situation this way:

Let's say that routines and things like that, they came mainly from Technip, because we, the owner's team and Neste Jacobs, just approved them, Neste Oil on the other hand had fairly little to say.

Also the interviewees saw that it was better to let Technip do things their way to avoid confusion:

And we let Technip do things according to their procedures because they were used to doing things like that. If you go and change them, they will lose their tools, they won't know what to do, then they'll keep coming to ask "how should we do this, how should we do that?"

The project teams seemed to trust Technip's expertise and know-how. Technip's size and experience in projects was recognized, and as one interviewee explained, Neste Oil's teams didn't want to be arrogant:

Technip, after all, it is the world's biggest gas and oil engineering agency. You don't want to go telling them with great confidence that "this is the way to do it".

Another aspect that was emphasized by Technip was coordination, and to some degree hierarchy. The need for coordination affected among other things the communication routines between the contractor and the project team.

The factors already presented – key partners, external environment and project team – all affected routines through different types of artifacts. Different artifacts resulting from the project's routines also affected the actors in return.

4.4.4 Artifacts affecting routines

There were two main types of artifacts in the program; artifacts guiding the routines and artifacts resulting from the routines. Some of the artifacts can be counted as both because they are results from one routine, and act as a trigger to another routine. An example of this is the routine of solving technological problems. Once a problem is identified in the project, the change request i.e. artifact, is sent to Technology Office. Technology Office researches the problem and uses the best resources to resolve the issue. Once they have developed a solution, they send out a statement, another artifact, for the projects stating the appropriate measures that should be taken to correct the problem or to avoid it.

As explained in the previous chapters the surrounding infrastructure, such as the existing refinery, shared offices or a common coffee room affect routines in many ways, they might improve communication or simply minimize needed routines. The local legislation and safety regulations affect the permission process and the safety procedures. The programs and tools, such as the project management programs, already in use in the permanent organization or main partner organizations, were adopted to the project organization and therefore affected the routines relating to reporting, project management and procurement.

Most of the routines also produce some kind of a trace in physical form. Whether it is a memo, report or a contract, it is a result of an established routine. For example well-organized safety routines affect the plants accident statistics positively by minimizing accidents. Emails and meeting minutes represent common artifacts documenting the result of a routine.

In Table 5 different artifacts are introduced in relation to routines, as either affecting routines or resulting from them (NO=Neste Oil).

Table 5 Examples of detected artifacts in relation to routines

Artifact affecting routine	Routine	Resulting artifact
Shared offices	Communication between projects	Emails
Surrounding refinery	Communication between projects and permanent organizations	Meeting minutes from Steering Group meetings
Common coffee room	Communication within the project	Memo from Stepping Signs
Project management-tools	Reporting	Monthly report
Change Request	Problem solving	Statement
Local legislation	Permission process	Building consent
Safety regulations	Safety	Improved accident statistics
Training simulator	Training	–
NO's HR-guidelines	Project staffing	–
Technip's project management programs	Project Management Control	Reports from the Site Management Control-program
Technip's procurement criteria	Procurement	Contracts

4.5 Development of routines

There were not very many recognized routines that remained the same throughout the investment program. The interviews indicated many reasons for this, as explained earlier. The routines were both knowingly developed by the project's stakeholders but other indistinctive reasons also affected the routines. In this chapter the routines' change is analysed and the reasons behind the change are discussed. As mentioned in the previous chapter, different factors affected routines differently. Some actors made conscious efforts to develop the routines to better fit the need.

Routines that were developed throughout the program seemed to become more detailed and precise, such as the problem solving routine that was introduced earlier, developed by the Technology Office. The statement-part of the problem solving routine is an example of how a routine was modified to the need. Statements were sent to the project teams when a development idea was discovered. Although the statement was aimed at improving the projects and sharing good practices and information, it seemed that the statement did not get the wanted response. Technology Office discovered that the project teams did not react to the statements due to lack of time, lack of distribution of responsibilities and different prioritizing. Technology Offices made a small modification to the statement and added a deadline for responding to it and appointed a person in the project team in charge of the response. Technology Office also wanted the response to include information about what the project team is going to do about the suggested improvement, and if nothing, then why. This improved the response percentage and made the statement more useful. The statement-process in itself is used to modify project routines since it distributes information and suggestions on how to improve the practices in the projects.

In many situations, the project organization realized a need for improvement; such as the monthly report, that expanded throughout the project. Other development derived from the organizations involved, their capabilities and knowhow. Not all routines changed for better. Some efficient routines were not transferred to the new contexts and some did not suit the new situation or culture.

Routines changed very much during the investment program. The large routines remained identifiable, but subroutines that were part of executing the routines changed when moving from one project to another. In Table 6 the large routines are tracked and broken down to

detailed subroutines in each project. As seen in the table, the routines changed quite much but the development was not necessarily the same for all the projects. Also what is noticeable is that some routines could not be identified for all the projects. The blank cells indicate that the routine could not be identified for the project from the interviews. One explanation for the blank cells could be that the routine did not exist in the project, or it differed greatly from the routines in the other projects. The reasons for the development are also summarized in the table, based on the factors affecting the routines the most. (NO=Neste Oil, To=Technology Office, P1=Porvoo, P2=Porvoo 2, S=Singapore, R=Rotterdam, WS=world-scale)

Table 6 Development of routines during the investment program

Routine	Porvoo 1	Porvoo 2	Singapore	Rotterdam	Reasons for the development
Communication between projects	Shared offices and same key people in both projects		Effective while in Rome, afterwards through TO, Technip, owner's team and informal communication between disciplines		Common offices and work history enabled fluent communication
Communication between projects and permanent organizations	Very fluent cooperation between NO and Neste Jacobs The project located in the same premises as the engineering, operational and technological divisions of NO and Neste Jacobs		Owner's team met once 1/week, Steering group met 1/month – Introducing the new guy to the key people in Porvoo		The corporate culture developed in both NO and Neste Jacobs, communicating was easier when located in same premises using same infrastructure
Communication within the project	Straightforward and face to face communication,		More hierarchical and official; problems communicated only through project managers and owner's team Monthly report started of as a simpler report but as the projects developed more details were added		Larger projects, new organizations involved and Technip's different organizational culture
Reporting	–	Documentation of technological challenges and breakthroughs very thorough			As projects proceeded, there was a need for more extensive information
Problem solving	Informal discussions within the team	Stepping signs, Informal discussions within the team and between P1 and P2 teams, project manager touring the site with different disciplines	TO's problem-solving routines; change request and statement		Learned from the previous projects the importance of an organized method for gathering best practices
Permission process	Communication mainly directly with Finnish authorities, organized by NO's refinery organization		Technip coordinated, using local consultancies and a qualified person		The R officials did not speak English and in S the permission protocol included having a qualified person
Safety	Safety coordinator from the refinery	Safety coordinator from the refinery. Legislation change required that operations and maintenance safety are taken into consideration in the building phase	Undeveloped safety-culture in Singapore required extra effort from Technip and NO, All the guidelines written in detail for the local workers		Legislation and local safety culture affected the safety routines, Low labor cost in Singapore enabled extra attention on training
Training	–		Training by TO (technology and practical training) + training simulator	Participated in the implementation of S + training by TO + training simulator	The delay in R's schedule enabled the R's team to learn from Singapore's implementation
Project staffing	Use of experienced NO and Neste Jacobs personnel, key people transferred from P1 to P2		Neste Jacobs and Technip, Same steering group in both WS-projects		NO transferred knowledge by transferring experienced people. NO's resources were limited in the WS-projects
Project Management Control	NO's quality programs		Technip's Site Management Control-system Physical Progress Measurement	Quality Progress Measurement	Technip as a big international company wanted to use its own PM-systems, to which the WS-teams agreed on Both projects were planned to use quality progress method but partly due to lack of time S switched to using physical progress measurement
Procurement	First call for bids, then procurement definitions, then negotiation	Mostly same suppliers than in P 1	Mostly procurement done by the same person for both S and R at the same time. Technip's selection criteria is used in preselecting the vendors.		Technip has established criteria and processes how the selection is done, including technical and commercial evaluations, negotiations and short-listing

4.6 Summary of the research findings

The routines were relatively difficult to identify since they were very strongly linked to each other and to different artifacts. The larger scale routines were identified, their change being detected through the examination of the subroutines comprising the larger routine. The routines explained by the interviews were very much linked to the individual projects. Even though the projects had some similar routines, most were adjusted to the specific project they were implemented in. The interviewees expressed more differences between projects than similarities. The similarities were mostly between the two Porvoo projects and the two world-scale projects.

The difficulties in identifying the routines were partly due to the unofficial nature of the routines. The role of routines was not officially recognized and the interviewees did not identify their behaviour as routines. It was noticeable from the interviewees that even though some routines did not work, most of the interviewees did not spend much time reflecting on the outcomes, the actual routine or why the routine did not work. Routines in the NExBTL-projects were nonetheless used to support knowledge creation and transfer as well as the company values and capabilities.

The context in this case included among other things the project organization, the external environment and the key partners. The surrounding environment changed project routines quite much. The local legislation, and culture affected routines but also the labour cost and availability (especially in Singapore) modified routines. The key partners, such as the main contractor and the internal licensor modified the routines in many different ways as explained in the previous chapters. They brought in new routines and modified the existing routines. Also the strategy of Neste Oil had an impact since it emphasized the fast entry to the market, which meant strict timelines for the project.

The project team's background, motivation and previous knowledge had a great impact. Whether the individuals had been involved in previous Neste Oil-projects, previous NExBTL-projects or if they were newcomers, had an affect. The experience and knowledge gained from previous projects, engineering or operations had an impact on what kind of motivation the individuals had. The personal connections created was also emphasised greatly as affecting different routines.

Most of the factors mentioned previously involved some type of an artifact that had an affect on the routines. Artifacts were introduced as influencing routines as well as documenting the results of routines.

The different factors affecting the routines are summarized in Figure 9.

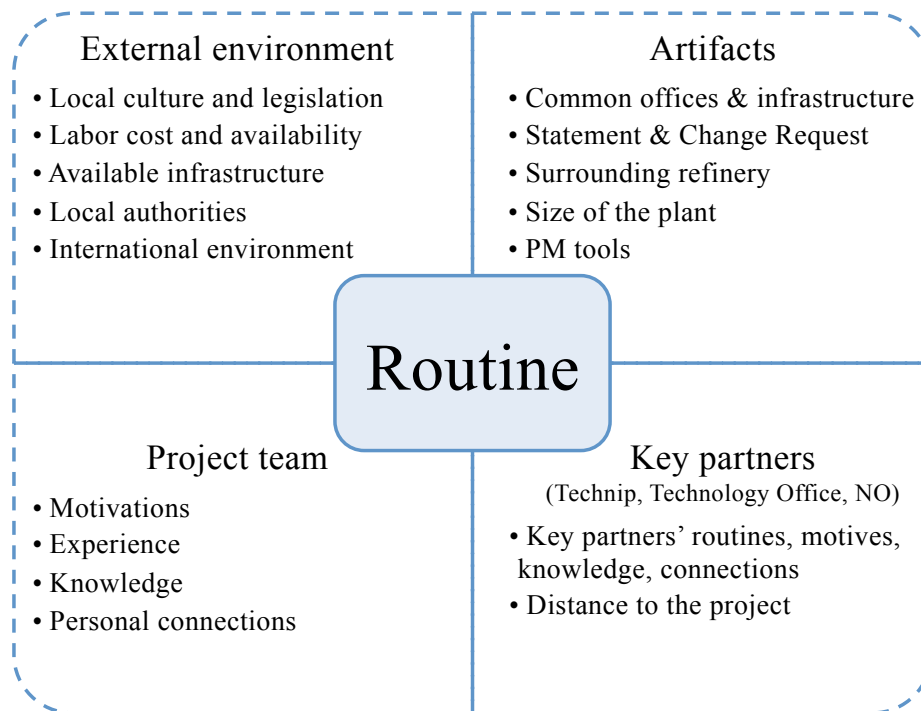


Figure 9 Factors affecting routines

The routines developed throughout the investment program. Some routines were not transferred from previous projects, others were partially transferred and each project had some new routines that were not identified in other projects. Routines were not necessarily changing for the better but because of the many factors affecting routines, they were constantly changing nonetheless.

The reasons behind these results are discussed next in the discussion section.

5 Discussion

In this chapter the results of the empirical study will be discussed in relation to the previous research introduced in the literature review.

The first section of the discussion will connect the routines detected from the interviews to the literature on routines and projects. From there the discussion will continue to discuss routine's role in the projects, as well as what were the key factors influencing routines. After this the development of routines and the methods used in the investment program for creating, developing, and adapting routines are discussed in relation to the literature.

5.1 Defining routines in project context

In this section routines, as seen in the empirical research, are discussed together with the different definitions of routine presented in the literature.

To sum up the main characteristics of routines that arose from the literature review (Table 1), routines were seen as:

- 1) Behaviour patterns (Hodgson & Knudsen, 2004; Nelson & Winter, 1982; Van der Steen, 2009; Zollo & Winter, 2002)
- 2) Capabilities (Cohen et al., 1996; Teece, 2004)
- 3) Memory and dependent on knowledge (Becker, 2008; Cohendet & Llerena, 2003; Hannan & Freeman, 1989; Nelson & Winter, 1982)

and

- 4) Collective (Becker, 2008; Feldman & Pentland, 2003; Hannan & Freeman, 1989; Van der Steen, 2009).

These views are all supported to some degree by the empirical findings as explained next through an example of the problem solving routine. As researchers have previously expressed, a routine is triggered into action (Becker, 2004; Van der Steen, 2009). The behaviour patterns that follow are similar, since they withhold the tacit knowledge and dispositions the participants possess. Even though the trigger is the same, (for example a problem in the plant) the action, i.e. routine following from that might change when the context or the participants

change. In the Porvoo projects when a problem was encountered, the routine was to discuss it face to face with different disciplines who could provide the necessary information to resolve the issue. This was a very straightforward behaviour pattern, reliant on tacit knowledge (who could know the answer to the problem), was collective (involved different individuals operating together), and developed the group's capabilities (how routines enable capability building is discussed more in-depth later on in this chapter). The behaviour patterns changed however, as the problem solving routine was developed into a more systematic method, when the scale of operations increased. The founding of Technology Office made the routine more systematic and predefined. The context also changed since the necessary knowledge was not necessary available within walking distance, as it is in Porvoo. This example shows how the behaviour patterns can change as the context changes, or as the tacit knowledge increases. The routines changed throughout the investment program.

The difference between routines was more apparent between the Porvoo projects and the standalone plants. The teams from Rotterdam and Singapore seemed to have more routines in common with each other than with Porvoo, just as the Porvoo project had more similarities with one another, as can be seen in table 6 (Development of routines during the investment program). One possible explanation for the similarities and differences in routines was the time spent together. The Porvoo teams worked in the same facilities in Porvoo, while the Rotterdam and Singapore teams had common offices in Rome for several months. The common offices enabled fluent communication, sharing of experiences, and getting to know one another, which meant that the tacit knowledge needed to execute the routines was shared between the teams.

The routines discovered in the interviews were not explicitly expressed in the beginning, but as the interviews progressed the routines became apparent through the examples and stories of the interviewees. The interviews indicated that the interviewees did not recognize most of the routines they participated in as being a routine. They either did not see routines as important, or simply did not recognize them – routines just happened. This can be the result of either not paying attention to the recurring behaviour, or what Pentland and Feldman (2005) argued about well established routines – once a routine is internalized it becomes harder to verbalize. Another explanation could be that as project workers, the interviewees saw that everything in a project as one-off and original. The interviewees often seemed to ignore the recurring patterns but reflected more on differences and individual incidents. The project teams focused

more on the adaptation than transferring of existing routines. The interviewees explained that the changing situation, environment, and technological development, as well as the different stakeholders, meant that the procedures couldn't be the same. Despite this the interviews revealed many routines in the investment program that were repeated in more than one project. Routines, in the same way as the projects were never completely replicated. As the projects differed, the context of the routines changed as well. This affected the routines greatly; some routines faded, new routines emerged in the middle of the investment program, and some routines changed. The routines that were detected in all of the projects were adapted to the context and the needs of the participants. This supports the idea of constantly changing routines presented by Feldman (2000) and supported by Becker (2004) in his review of routines, as well as the concept of strongly context-related routines (Cohendet & Llerena, 2003; Becker, 2004).

When defining what routines are, one cannot overlook what they do. What is routines function and role, and how they were used in the NExBTL-investment program is discussed next.

5.2 Routines role in Neste Oil's projects

Authors have previously discussed routines as providing stability in an organization (Becker, 2004), which can be seen in the NExBTL-projects as well. An example of the stability provided by the routines is the use of Technip's project management tools. The project team wanted to provide stability and the tools for the Technip's team to do what they know best, and agreed to use Technip's tools instead of the tools they were used to use themselves. The selected routine was also acting as a form of truce between the organizations as Nelson and Winter (1982) discussed. Routines create a balance between the different actors (Nelson & Winter, 1982) and as explained by Cohendet and Llerena (2003), project communities are often a combination of people coming from different organizations. This can create conflicts since people might have different objectives (Ruuska et al., 2009). Routines can help the community handle possible conflicts, as the realized routine is the compromise between different ideas of what is an appropriate routine (D'Adderio, 2008) establishing an agreed method of operation (Nelson & Winter, 1982). In the interviews this was reflected through an example from the world-scale projects. The owner's team agreed to use Technip's project routines in most cases. The team considered that without them compromising, the situation could get out of hand.

Routines in the projects were also acting as a truce between the different disciplines (D'Adderio, 2008). An example of this is the project manager's routine to tour the plant site with the different disciplines. This was a method for communicating the issues and problems encountered by each discipline, providing them with the attention they needed.

Routines were also used as a method for coordination (Nelson & Winter, 1982) in the case of communicating problems and changes between the project team and Technip. The same routine was also used to reflect a change in culture. Becker (2004) explains that the organizational change can be detected from observing routines. Previously problems encountered and required changes were communicated quite informally and straightforward to the necessary parties, now the routine was controlled and involved hierarchy and an organized structure, ensuring that everyone knows their role. The same change happened to some degree in the organizational culture when moving from Porvoo to the world-scale projects.

5.2.1 Routines assisting knowledge creation and transfer

Another key aspect of routines is that they are said to be a key part of the knowledge creation and building of core competencies in an organization (Cohendet & Llerena, 2003). In the Neste Oil's case many routines were used to increase knowledge about technology. The participants of the routines learned the importance of the technology and operations, such as in the training routine. When Technology Office trained the operations of Rotterdam and Singapore, it taught the technology in-depth instead of focusing on just operations. In that way routines also carried knowledge (Becker, 2008).

The routines of communicating also relied on the participants' knowledge on who to talk to when a problem was encountered. The importance of personal connections was further spread by the routine of introducing the new guy to the Porvoo organization.

Pentland and Feldman (2005) argue that participants of a routine can learn what works and what doesn't by reflecting on routines and the resulting outcomes. This was lacking in the researched projects. As the routines were not appropriately identified as relevant for the project, most of the interviewees hardly reflected on their routines and the resulting outcomes.

One of the most important functions routines had in this case was routines ability to develop capabilities.

5.2.2 Routines developing Neste Oil's capabilities

A company can develop capabilities in projects because it takes up similar categories of projects, and the projects need the same type of capabilities and routines (Davies & Brady, 2000). The investment program was an opportunity for Neste Oil to develop its capabilities since the projects were similar but not the same (Eisenhardt & Martin, 2003). During the NExBTL-investment program Neste Oil developed its capabilities in different aspects, but especially project management, technology and operational aspects. From the Porvoo projects Neste Oil had developed a capability in developing the technology. Also the operations oriented view in the projects can be seen as a capability. The interviewees also recognized safety as a capability. These three aspects (technology, operations and safety) are the culmination of the routines in the consecutive projects. The motives behind these were used to guide most of the project routines. These were also the indicators of Neste Oil's handprint in the projects, "the Neste Oil way of doing things" as one interviewee said.

A company can use its initial experience in a certain field to develop a process for managing similar projects in a systematic and relatively predictable way, and in that way have the necessary capabilities for the next similar project (Zollo & Winter, 2002). This is an interesting viewpoint in relation to Neste Oil's projects. From the first Porvoo project they started paying more attention to technical reporting, for example. Upon developing the routines, they then emphasized the execution of them by adding the authority of the Technology Office.

An example of Neste Oil's developed capability is the ability to take into consideration the operation's needs. The existing knowledge on what is convenient and what works in the operations phase of a plant has been gathered from Neste Oil's refineries throughout many years. Having the engineers, scientists, and operations working together in the same facilities increases understanding. An example of this is the quote "They [Porvoo 1 & 2] sort of did the plant for themselves and to their colleagues". Understanding the whole lifeline of the plant, and implementing the existing knowledge into the routines means that the routines become more detailed and precise. As Eisenhardt and Martin (2003) explain, in a stable industry structure, such as the oil industry, the capabilities are built on detailed and precise routines, that rely on existing knowledge, in this case mostly on Neste Oil's knowledge on technology and operations as well as Technip's knowledge on executing large projects.

Neste Oil has put a lot of effort into ensuring that the technological development, operations, and safety perspectives are taken into account in the routines. The capabilities in the word-scale projects were a combination of the capabilities of Neste Oil, and the capabilities of Technip. Technip as a project-based firm was very experienced in large international projects. Ruuska et al. (2009) have said that the capabilities in the project network are a combination of the unique capabilities of the actors. This also happened in Rotterdam and Singapore, where the experience of Technip was utilized in the project management.

5.3 Context and actors affecting routines

The routine literature emphasizes the context-related (Cohen et al., 1996; Cohendet & Llerena, 2003; Becker, 2004; Winter & Szulanski, 2002) nature of the routines. Another key feature of routines is how much the participants can mold it (Becker, 2004). In the case of the NExBTL-projects, both of these factors had a great impact and they are now discussed as the two most important factors affecting routines.

5.3.1 Project Context

The researched projects were established to implement a new strategy for Neste Oil, which fits the description on projects, by many authors (Artto & Wikström, 2005; Davies et al., 2004; Ruuska et al., 2011). The NExBTL-plant projects were part of an investment program of partly coexistent projects, which fits to Artto et al.'s (2006) definition of a program.

The investment program was established in several parts, but originally it started as a defensive base-moving strategy, explained by Davies et al. (2004) as a strategy used when the external environment pushes the company to expand to new areas. The new directive forced Neste Oil to prepare for providing the domestic market with enough renewable fuel. From there the company decided to alter its strategy into a more offensive, base moving strategy (Davies, et al., 2004). They decided to expand to new markets with their renewable fuels, and aimed at creating first mover advantage by quickly expanding their production.

The planning and building of the four large renewable diesel plants were large projects (Ruuska et al., 2009) that contained multiple stakeholders with different agendas. The projects were also affected by the impacts of a wider socio-political environment (Ruuska et al., 2009), particularly in Singapore and Rotterdam. The government support in Singapore, as

along with the different regulations and permits needed in Rotterdam, were clear indicators of how the projects were influenced.

Ruuska et al. (2009) recognized the problems large projects face in coordinating the activities of the diverse actors from the different organizations. In these projects the problem seems to be that valuable lessons learned from Porvoo projects were not transferred to the world-scale projects in terms of good practices, and even design. The coordination in general was relatively good, but as the actors were different some information blackouts did occur. Davies and Brady (2000) among others talk about the fact that projects with multiple organizations and shared responsibility, risk losing capability between the projects.

The relationships between the different organizations involved in the projects developed during the investment program. In terms of the project business framework by Artto and Kujala (2008), Neste Oil's projects can be seen to focus on the management of a business network. Fitting to Artto et al.'s (2011) description, the focus in the projects was project network in the short-term and when viewed in the long-term it became more like a business network. The relationship between Neste Oil and Neste Jacobs is more permanent and they cooperate on different projects, which means that their cooperation projects can be classified as a business network (Artto et al., 2011). Even Technip's role was seen as changing into a more permanent role, which also fits under the category of business network (Artto et al., 2011). All of the parties involved seemed to have a common understanding that it is very likely their cooperation will continue if the investment program is extended.

5.3.2 The main actors involved in the routines

Becker (2004) explained that routines are triggered into action through actor-related triggers and external cues. In project context the actor-related trigger can come from the project organization or from a parent organization.

In the case of the world-scale projects, Technip and Neste Jacobs could also be seen as the parent organization. The roles of Neste Oil, Neste Jacobs, and Technip were sometimes unclear. Modig (2007) differentiated project organizations in terms of how much power the parent organization has over the project organization, and among other things its routines. Modig (2007) states that the more independent the project organization is from the parent organization, the more freedom it has to develop its routines according to the situation. In this case it is interesting to study on whose terms were routines developed. It seems from the

interviews that the Porvoo projects were much closer to Neste Oil than Singapore and Rotterdam. When Technip was the main contractor, the order in which the organizations affected the routines changed. According to the interviews, the main influencer was Technip, then the local authorities and legislation, and finally Neste Oil.

Neste Oil provided many technological guidelines, but other than that the project organizations were given relatively free reign to act according to the situation. Reporting to the steering group was quite wide-ranging, which kept the parent organization in the loop. The company itself was less involved in the actual project, leaving it up to management and the contractors, Technip and Neste Jacobs.

The guidelines on the implementation of world-scale projects came largely from Technip, which, to some extent, makes them the permanent organization described by Modig (2007). Even though Technip is not the projects' parent organization, it has a huge influence on the projects' work processes, and resource network. Through the processes and networks, Technip actually influenced the project organizations' routines more than Neste Oil. The project teams in Rotterdam and Singapore supported this, since the expertise of implementing these kinds of large international projects was in Technip. The routines and procedures predefined by Technip, were those already established in Technip's other projects.

From Modig's continuum of projects, the resource network was also more Technip's than Neste Oil's. Most of the contacts and resources (excluding budget) were provided by Technip. In Modig's article (2007) the aspect of project having multiple parent organizations was not taken into consideration, but in this situation it seems that the project organization was a temporary organization that had several stationary parent organizations.

Cohendet and Llerena (2003) explained how the type of community where the routines are executed affects the routines. As explained by the interviewees, Technip seems to have a more hierarchical community, and the decision process and protocol is also quite strict. As Cohendet and Llerena (2003) say, this can improve organizational memory and the routine's power of replication, but also provide unwanted inertia.

Another actor that influenced the projects' routines even though it was not involved in the execution of the routines was the local authorities and players, which can be linked to what Winter and Szulanski (2002) said about the surrounding culture can having a great affect on the outcome of the routine. With the context affecting the details, the whole routine could

change. This can be seen in many routines, especially in Rotterdam and Singapore. An example of the permission processes in the two projects can show how differently it was approached. In Singapore the appropriate connections, and employment of a qualified person to manage the process made it much easier and faster. In Rotterdam, there was no way of making the permission process faster, not even the political power of the Port of Rotterdam could speed up the process.

From the Neste Oil's perspective the actor mostly affecting the project organizations' routines was Technology office. Technology Office developed by Neste Oil after the first two NExBTL-plants, has been an invaluable part of developing appropriate processes, technology, and routines for the world-scale plants. Neste Oil established the internal consultancy Technology Office to make sure the capabilities, knowhow and insights were collected, codified, and communicated appropriately. Davies and Brady (2000) explained a similar concept of internal consultancy, explaining that it can improve knowledge transfer, capture knowledge and lessons learned from previous projects, and transfer them into the future projects, which is exactly what Technology Office did. Technology Office has been in charge of recording, improving, and maintaining information on routines.

Technology Office had an important role in developing routines in the NExBTL-projects. Technology Office also transfers routines and capabilities from the permanent organization to the project organization, and vice versa. Technology Office has been mandated by Neste Oil's top management, and Neste Oil is committed to the development of technology through Technology Office. Technology Office also has the legitimacy, given their access to the very best specialists of Neste Oil and Neste Jacobs, and the best know-how of the NExBTL-process. All of these factors support Technology Offices role in developing routines.

The next section will discuss how these actors developed and modified routines in the investment program.

5.4 Developing routines in the consecutive projects

Routines in the four consecutive NExBTL-projects developed and were modified throughout the investment program. Routines were born when new necessities were discovered, and some routines faded instead of being transferred to the following projects. Routines faded because of several reasons, often because of lack of knowledge or inefficient communication between

the project teams. Routines were also modified and developed intentionally. There were different methods used for designing and modifying effective routines, most of them relying on communication and spreading knowledge.

Some methods for modifying routines were designed by Neste Oil's corporate organization, some by Technology Office and some by the individual projects. Most methods for designing routines take the form of an artifact, such as the Statement provided by the Technology Office. Other methods include in-depth conversations aimed at together finding the best way to do things, training, using incentives and empowering. In this chapter the different methods are discussed in relation to previous literature.

5.4.1 Knowledge supporting routines' development

As explained earlier, routines are based on tacit knowledge. For the routine to be executed appropriately the participants need to understand the reasons behind the routine. The transfer of tacit knowledge from previous projects is crucial if routines want to be transferred. Ruuska and Brady (2011) explain that moving appropriate people within organizations, or creating networks of people from relevant organizations can complete the transfer of knowledge. Neste Oil has previously transferred knowledge by using the same key individuals in demanding projects. With the NExBTL-projects partly overlapping and key individuals retiring, the company could not use the same people in both projects, which created a need for a different type of knowledge transfer system. Technology Office became essential in this process.

The training routine is an example on how spreading knowledge can affect the adapting of routines. It is also a good example why Technology Office is able to influence the project organizations' routines to such an extent. Instead of just trying to change a routine through artifacts, they explain the need for change. From there the participants can see for themselves why the suggested change is necessary and accept it more easily. Researchers such as Pentland and Feldman (2008) have recognized the role of training in designing effective routines.

Zollo and Winter (2002) suggest that acquiring experience, articulating the knowledge created from those experiences, and codifying the knowledge can help with the development of routines. This was also to some extent true in the investment program. Technology Office codified the knowledge, which made the transfer and development of routines possible.

Technology Office affected routines and capabilities in the projects by improving knowledge transfer and insight from the technological and operational point of view. As they were in charge of recording and maintaining information on the routines, they also were able to learn from them as well as affect them.

5.4.2 Artifacts

Pentland and Feldman (2005, 2008) explain that artifacts can be used to modify routines, but the organization cannot rely only on artifacts when modifying routines. In this context, artifacts such as common offices modified the routines the most. The parent organization Neste Oil stayed relatively distant to the Singapore and Rotterdam projects in terms of affecting routines. Neste Oil affected the routines in Singapore and Rotterdam mainly through Technology Office and the contract with Technip. The Porvoo project routines were affected by the HR-practices and existing infrastructure. Infrastructure also affected since the Porvoo teams were working in the same offices and communicated with each other continuously.

The artifacts such as the contract between Technip and Neste Oil determine and modify the routines. As Davies and Brady (2000) among others say, maintaining established routines in a changed environment can be problematic. Too rigid routines that are controlled by strict artifacts can prevent the routines developing and adapting to the situation. The contract between Technip and Neste Oil established most routines in advance, which meant that the participants could not modify (or at least easily modify) the routines later on to fit the changing context, such as the developing technology. Cohendet and Llerena (2003) argue that routines are developed through trial and error experimentation, but in this case the artifact dictated the routines to a great degree.

5.4.3 Incentives and Empowering

Motivating participants to implement routines has been discussed by many authors (Becker, 2004; Cohendet & Llerena, 2003; Nelson & Winter, 1982). Pentland and Feldman (2008) also identified incentives as important in motivating the participants to develop routines. Another incentive used to encourage the routine participants to do their best was the “management by treats” approach in the Porvoo 2 project. When the project succeeded in minimizing accidents or had worked hard to gain a milestone, the team got treated to a small party.

Additional method for improving the acceptance of routines is empowerment (Pentland & Feldman, 2008). When the participants are involved in planning the routines and the related artifacts, they modify their behaviour in the right direction. It remained somewhat unclear as to who was in charge of drawing up the contract with Technip. The contract was a pivotal artifact guiding the routines in Rotterdam and Singapore. It was described as very comprehensive and detailed. The contract could have been too detailed and too strict in guiding routines, and it may have prevented the routines in adjusting to the changing situation within the project. If the routines are unable to change they can become useless and eventually cause inertia in the project (Nelson & Winter, 1982).

6 Conclusions

The key findings are summarized in this chapter, after which the findings are reflected upon from the perspective of the case company. Thereafter the recommendations for further actions are presented. The strengths and weaknesses of the study are discussed as well as ideas for further research questions.

6.1 Summary of key findings and contribution to existing knowledge

This research set out to understand routines in project context, and their role in a program of consecutive projects. The research also intended to examine how routines are developed and adapted in the project, and what factors affect them.

Routines in a project context have been rarely taken into consideration in project or routine literature, and when they have been discussed, it is in a passing sentence in some other research article. Routines and projects are sometimes misleadingly introduced as contrasting phenomena (Lindkvist, 2008). This research shows that routines and projects are not opposites; routines exist in projects, regardless of the fact that they are not as easily identified as in more permanent organizations.

Routines in consecutive projects can enable the transfer of tacit knowledge between projects. Routines also accumulate knowledge and capabilities in projects, but if the routines are not transferred appropriately the know-how will be lost between projects. Within a project, there is a need for recognizing the importance of the routines, as well as identifying them. If the routines are not recognized, they cannot be transferred or adapted to changing needs.

From the research, it can be concluded that routines are not isolated events; they are often intertwined with other routines and artifacts, and changing one artifact or routine can cause unwanted and unanticipated reactions.

Many factors, and even actors that are not directly participating in the routine can affect the routine. When modifying a routine these factors need to be taken into consideration and modified if necessary:

- *Context*; permanent organization and external environment
- *Actors affecting the routine*; their previous experience, knowledge and motives
- *The artifacts related to the routine*; hindering and aiding the routine

These factors affect routines in all kinds of organizations but in a project organization the factors need to be taken into account from both the project's as well as the permanent organizations' perspective.

What was interesting about the results was that one of the strongest factor that affected routines was also reinforced by routines. The knowledge created and stored in routines also allowed the development of routines. In this research, the debate in routine literature about routines as capabilities or capabilities as routines, can be answered by saying that both answers are true. The capabilities and knowledge obtained by the organization supports the development of routines but at the same time, they are supported by routines as well.

In order for a routine to be efficient the different factors need to be taken into consideration in terms of the ostensive and performative aspect of the routine. The artifacts surrounding the routine should be designed to guide but not restrict the routine. The routines (as well as the artifacts) should not be defined too strictly, as when the context or the participants change, the routine might require some modification. The results indicate that in project context the routines seem to change drastically as the context changes. If the different factors and perspectives of routine are identified the routine can remain efficient.

The ostensive aspect of the routine can be developed through training and knowledge articulation. Targeting the motivation of the participants through incentives and education is effective as the participants' motives and knowhow affect how the routine is performed. If the participants do not agree on changing the routine, the modifications are superficial and the routine might become inefficient. Empowering the participants and having them involved in designing the routines also creates a good starting point for the routine, since then the tacit knowledge of the participants is naturally taken into account. By having participants involved, the most common obstacles to live routines are prevented.

The distance between the permanent organization and the project organization seems to affect the emergence, modification, and transferring of routines from one project to another. If the permanent organization or the preceding projects are too far away from the project, the general view is unclear. The tacit knowledge behind the routine transferred from previous projects or permanent organizations need to be recognized by the project organization in order for the routine to be accepted. Also the personal connections to the preceding and subsequent

projects are important. As in the Neste Oil-case, one of the most effective way to transfer routines is to transfer key people from the preceding projects.

It seems that in a project environment, the project people do not recognize routines. In their project-oriented minds everything happens once, but thorough research can uncover many routines. Since the routines are seen by the project organization as something consistent and stable that doesn't belong to the temporary, ever changing project context, routines are not necessarily developed or followed to prevent them from becoming inefficient.

Routines in project context also provided an interesting viewpoint to Technip. Technip as a company that works solely on projects seems to have very standardized routines and procedures. These routines were not easily modified (at least from the perspective of Neste Oil). It would be interesting to continue to research a company with only projects, since it would seem that that kind of a company is particularly keen on establishing routines as a method for coordination.

6.2 Recommendations for the case company

The main recommendations for the case company are first presented in bullet point format, after which the recommendations are explained in more detail.

From the research four main points are drawn.

- Routines are necessary for the capability building of the company
- Routines can aid the development and storing of knowledge
- Capabilities and knowledge can be transferred from project to another with the help of routines
- Routines can be developed by increasing knowledge and motivation

The routines developed in a project should be transferred to the parent organization and to future projects. An internal licensor such as Technology Office can be used to advance the transfer of routines. The establishment of Technology Office enabled the reproduction of some technology related routines but there seems to be a need for other aspects as well. Focusing on just technology ignores the other aspects of the projects, such as the capabilities developed in the project. This does not mean that the technology is not the fundamental part of the projects, but that the supporting structure also requires attention. In order to be able to

develop capability-building routines a few things need to be taken into consideration. The background of the project and the context need to be understood by the project team, in this case the project is a part of a program where previous projects have already developed capabilities and routines that could be used in following projects. Even though the projects are different, they still have much to learn from one another and the projects should understand this to be able to benefit from the previous insights.

If the routines are ignored, information and knowhow might get lost between projects. In the NExBTL-program knowhow was transferred mostly through the transfer of experienced individuals to the newer projects, but due to retirements and overlapping projects, it is essential to maintain knowledge transfer in a variety of other ways. In the future the projects might not have people with the NExBTL-experience needed to rebuild the necessary routines and capabilities.

One of Neste Oil's capabilities included the ability to contemplate the operations stage. The Porvoo teams felt that they were not just part of a project, but aimed at making the plant easy to maintain and operate. When moving to Rotterdam and Singapore, the operations organization was at a distance, so the project team focused essentially on the project, keeping it in budget and on time.

A major factor affecting routines in Rotterdam and Singapore projects was the main contractor, Technip, they had much power over the routines in the world scale projects, and many of Technip's routines were transferred to the projects. This can be understood from the perspective of utilizing all of Technip's capabilities, but it is important to consider how much of Neste Oil's capabilities needed to be transferred to the project. Neste Oil should also consider what kind of new capabilities it could learn from the projects. The project organization should consider to what degree should routines be transferred from the contractors.

Often routines are mixed up with the standard operating procedures (i.e. organizations written prescriptions on repetitive procedures) or even the way we would like to perform. In these situations honesty and self-awareness is a useful tool, are we really doing what we think we are doing? The example of the monthly report is appropriate; yes, the report is sent to the other projects and in principal it is read, but when studied in more detail it is revealed that the routine has been ineffective most of the time.

6.3 Evaluation of the study and suggestions for future research

This research aimed at studying routines in consecutive projects in a program where replication was the intended strategy. The projects ended up being quite different because, among other things the changing context. The routines in the projects differed also, and in the end there were not that many routines that existed in all of the projects.

Researching routines with semi-conducted interviews is relatively challenging. Most of the routines involved many details, and even hidden agendas, which cannot easily be translated in an interview. As stated in the literature, when an action becomes routinized it is more difficult to explain it explicitly. One possible way to research routines is a combination of observation and interviews. As the participants often mix up routines, artifacts, and what they would ideally like to do, or indeed might not even be able to recognize their routines, a detailed study of their work might be somewhat more revealing. A combination of interviews and observation would be appropriate because then the possible contradictions could be recognized and analysed.

Another valuable point of view in this study could be the viewpoint of the main contractor. The interviews included only two interviewees from the main contractor, with a more thorough reflection on Technip's routines, the relationship between the main contractor's routines and project organization's routines could be detected.

The third aspect that impacted the research was that there were several interviewees with different research agendas. Although the different research subjects were linked and everyone had time to ask the relevant questions in the interview, the subjects changed quite rapidly during the interview and the interviewee did not get the opportunity to discuss all the subjects in an in-depth manner.

The results are based on one single case company and may not work as a generalisation between other companies or industries. This research focused on one case company, in a moderately dynamic market. Routines in projects in high-velocity markets might be more difficult to identify or research, but it could provide more insight in how routines adapt to a rapidly changing project environment.

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