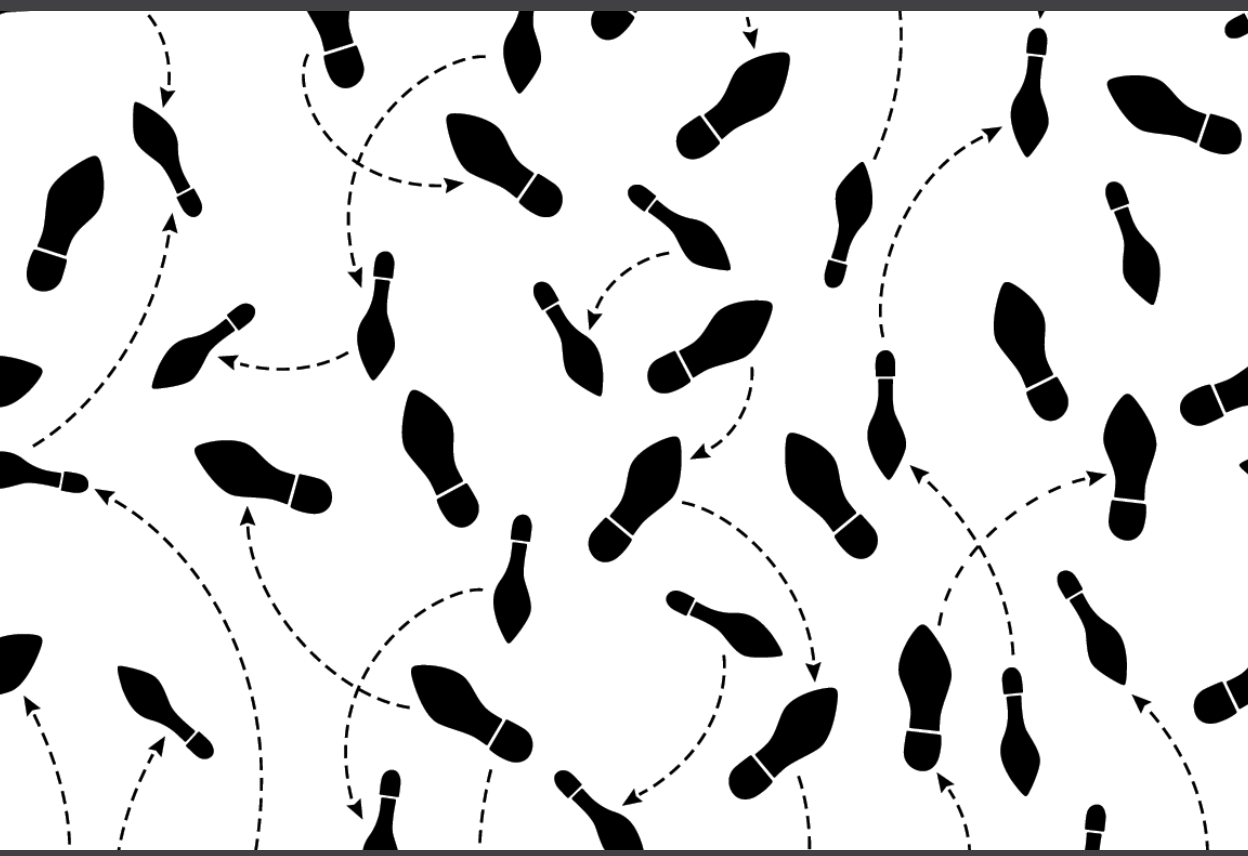
Maria Booth

NOBODY FOLLOWS THE PROCESS ANYWAY

HOW ARTEFACTUAL REPRESENTATIONS OF ROUTINES SHAPE ROUTINE PERFORMANCES



STOCKHOLM SCHOOL OF ECONOMICS

NOBODY FOLLOWS THE PROCESS ANYWAY

Organisational routines are important building blocks of what organisations do. By following a new product development project in a large, multinational infrastructure provider, this thesis studies how process descriptions, conceptualised as artefactual routine representations, affect how routines are performed and developed over time. Process descriptions can be considered quite mundane and are often frowned upon. Comments such as "in this organisation things work despite of the process descriptions", "if we were to follow the process descriptions, nothing would get done around here", or just the simple "nobody follows the process anyway" are common. However, as this thesis shows, the relationship between organisational routines and their artefactual representations is more complex than that. Looking into how artefactual routine representations, such as process descriptions, are put into use in practice, this thesis found that even though the process descriptions were by no means treated as "the law", they were also not ignored. Instead, even when they were not followed, they still affected what the actors did. The actors also found a way of dealing with process descriptions that were often considered poor representations of the new product development routine by separating working with the process description, artefact work, from working with the task of developing new products, task work. By performing the task as one routine and following the requirements of the process descriptions in another, the actors manage the tensions and conflicts that would otherwise arise between a dynamic task and a rigid representation. By selectively and dynamically connecting and disconnecting the task from the process description the actors can both follow and violate its requirements without losing legitimacy of either task or process description. The result is that they can maintain the stability provided by the process descriptions, while still be able to perform their job with the flexibility it requires. However, as tensions and conflicts are not exposed, the organisation might not recognise the need for change.

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ISBN 978-91-7731-163-8

DOCTORAL DISSERTATION IN BUSINESS ADMINISTRATION
STOCKHOLM SCHOOL OF ECONOMICS, SWEDEN 2020

Nobody Follows the Process Anyway

How Artefactual Representations of Routines Shape Routine Performances

Maria Booth

Akademisk avhandling

som för avläggande av ekonomie doktorsexamen
vid Handelshögskolan i Stockholm
framläggs för offentlig granskning
fredagen den 27 mars 2020, kl 13.15,
sal Torsten, Handelshögskolan,
Sveavägen 65, Stockholm

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Dissertation for the Degree of Doctor of Philosophy, Ph.D.,
in Business Administration
Stockholm School of Economics, 2020

Nobody follows the process anyway : how artefactual representations of routines shape routine performances

ISBN 978-91-7731-163-8 (printed)
ISBN 978-91-7731-164-5 (pdf)

Front cover illustration:
© dikobraziy/Shutterstock.com

Back cover photo:
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Printed by:
BrandFactory, Gothenburg, 2020

Keywords:
Organisational routines, artefacts, routine representations, stability and change, process descriptions

To
Mark, Mae and Erika

Foreword

This volume is the result of a research project carried out at the Department of Entrepreneurship, Innovation and Technology at the Stockholm School of Economics (SSE).

The volume is submitted as a doctoral thesis at SSE. In keeping with the policies of SSE, the author has been entirely free to conduct and present her research in the manner of her choosing as an expression of her own ideas.

SSE is grateful for the financial support provided by Ericsson, Stiftelsen Louis Fraenckels Stipendiefond and C.F. Liljevalch donationsfond, which has made it possible to carry out the project.

Göran Lindqvist

Director of Research
Stockholm School of Economics

Magnus Mähring

Professor and Head of the
Department of Entrepreneurship,
Innovation and Technology

Acknowledgements

When I first set out on this journey too many years ago, I had no idea what a long, winding and bumpy road it would be. There have been some good times and some truly horrible ones when I seriously doubted this book would ever get written. Doing a PhD is a deeply personal thing and at times it is also very lonely. Having said that, it also wouldn't have happened without the support of some amazing people that I would like to take this opportunity to thank.

First and foremost, my main supervisor, Magnus Mähring, without whom I don't think this would have happened. You took me on when I was close to giving up and have, in equal parts, supported and pushed me ever since. Thank you for keeping me sane throughout. I would also like to thank the other members of my supervisor committee, Anna Essén and Thorvald Hærem. Anna, your ability to question assumptions and ask that extra 'why?' has often been uncomfortable, but always very productive. You have also continued to encourage and cheer me on, and in general just been a very good friend. Thorvald, you came in towards the end, but have, by providing a new perspective, contributed immensely to the quality of the final product. Your ability to put on the auditor's hat has also not gone amiss. I am also thankful for the invaluable feedback I received from my mock opponent, Nathalie Lazaric.

This thesis would not have happened had it not been for Global Tech that provided me with the context I needed to carry out my empirical studies. I am forever grateful to the organisation and all the employees in house 81 and house 9 who let me in to their group, allowed me to attend their meetings and took me out for lunch. Without people like Jeanette, Eva, Kenneth, Noriko, Cecilia, Bo, Gunnar, Calle, Peter, Martin and all the

members of the "Rocky" project, to mention a few, this journey wouldn't have been half as interesting.

All my fantastic colleagues, first at CIOM and then at House of Innovation, have also contributed to making this an overall agreeable endeavour. Special thanks go out to Anders Richtnér for bringing me into the research project in the first place and also for putting me on the routines-track. Pär Åhlström and Mattia Bianchi were also greatly involved at the early stages of the process where they contributed with insightful comments and support. Pär Mårtensson, Andrew Schenkel and Kerstin Wedin, I am grateful that you were always there, making the fourth-floor corridor an enjoyable place to be. My former roommate Katrin Laestander, I miss our chats and your insightful comments on the difference between academia and practice. My current roommate Lotta Hultin, thank you for being both fun and reliable. It's good to know there are certain things you can always count on.

Many things have changed during this time, and many people have come and gone. One of the few constants has been Sofie Sagfossen and our double macchiatos at Sosta. Thank you for keeping my caffeine levels stable and for providing an excuse to get out. Sofie and Hannah Altmann, I am not sure whether you have actually speeded this process up or delayed its conclusion, but I am forever grateful for your support and our interesting, and sometimes very long, conversations about academia, life and everything else.

I have also been fortunate enough to have some amazing friends. Anna, Marcus and Elsa who at different points in time have told me to stop doubting myself and get on with it, deserve a special mention. As do Eva and Inger without whom my mental health would have suffered a lot more than it did, and Paul and Helena who have always been a reliable fixture in the lives of the Booths.

Finally, I would like to thank my family. My father who hasn't followed a process in his life, but somehow turned out alright anyway, and my mother who's the rock that everyone else relies on. My parents have always believed in me no matter what and their support has been invaluable. My younger brothers Erik and Johan who have in their own way inspired and motivated me; and my sister-from-another-mister (but almost the same

mother), my cousin Olivia, who always understands me in at least four languages. Last, but definitely not least, my daughters Mae and Erika who have been remarkably patient with their absent and distracted mother. And of course, Mark. There are not words enough to describe how thankful I am for your support, encouragement and love. To know that you've always got my back makes everything in life so much easier.

Stockholm, February 12, 2020

Maria Booth

Contents

Chapter 1

Introduction

Organisational routines have been established as important sources of both organisational stability and change (Feldman and Pentland, 2003; Pentland et al., 2011; Danner-Schröder and Geiger, 2016) and as such they are often targeted when organisations wish to shape, change or stabilise organisational performances (Feldman, 2000; D'Adderio, 2014; Cohendet and Simon, 2016; Kremser and Schreyögg, 2016; Glaser, 2017). While earlier research often pointed to the stabilising role of organisational routines (Nelson and Winter, 1982), the performative turn in routines theory has provided exciting new insights into the potential for change, enabled through routine enactment and reproduction (Aroles and McLean, 2016; Danner-Schröder and Geiger, 2016; Feldman et al., 2016). When conceptualising routines as consisting of both specific actions and general abstract patterns, the dynamics between these two mutually constitutive and recursively related aspects is what allows for organisational routines to be stabilising *as well as* enablers of change (Feldman and Pentland, 2003).

In the study of organisational routines, standard operating procedures, process descriptions and software systems, are seen as artefactual routine representations, that is, artefacts that are, in one way or another, supposed to reflect the routine they represent (D'Adderio, 2008, 2011). Even though artefactual routine representations are *not the same* as the routine they represent (Brown and Duguid, 1991; Hutchins, 1991; Cohen et al., 1996; Pentland and Feldman, 2008a), they are often seen as proxies of it (Pentland and Feldman, 2005, 2008a). As artefactual representations are

more identifiable than other aspects of routines, they are often in the spotlight when organisations try to change (Pentland and Feldman, 2008a; Glaser, 2017).

The artefactual representations studied in this thesis are process descriptions aimed at guiding and controlling the new product development routines at Global Tech (pseudonym), a large Swedish infrastructure provider. These process descriptions, materialised, for example, as workflows described on an intranet, checklists, templates for decision making material, information systems, status code assignment rules, or lists of requirements that must be fulfilled to secure future financing. The process descriptions are therefore formal in the sense that their content has been agreed upon and decided by the organisation. They must be followed, to a certain degree, for a product development project to proceed.

Within the field of new product development research, such formal process descriptions are referred to as, for example, formal processes (Griffin, 1997), and structured approaches to new product development (Christiansen and Varnes, 2009). The importance of formal process descriptions is well documented in research on new product development. Furthermore, it has been shown in multiple studies that organisations that use process descriptions with some degree of formality are better at new product development than those that do not have such process descriptions in place (for example Barczak et al., 2009). However, studies also show that success is dependent on the structure and flexibility of the process description (Cunha and Gomes, 2003; Adams-Bigelow, 2006; McCarthy et al., 2006), the organisational context (de Brentani, 2001; MacCormack and Verganti, 2003), and how strictly the formal process descriptions are enforced (Sethi and Iqbal, 2008; Cooper et al., 2010). In addition, there are important differences in how these process descriptions are designed and implemented, for example, Christiansen and Varnes (2009) show that a series of sensemaking mechanisms can lead to process descriptions being used in unintended ways.

While the concepts of performative and ostensive aspects of organisational routines and their internal dynamics (Feldman and Pentland, 2003) have been firmly established in the literature, the role of artefactual routine representations and other artefacts in routine dynamics have only

recently attracted attention (D'Adderio, 2011). According to early work on organisational routine dynamics, artefacts can be enrolled in the enactment of the routine at the discretion of the participants but are seen as situated outside of, and separated from, the generative system of ostensive and performative aspects of routines. As such, the artefacts should not be mistaken for the ostensive aspect of the routine, nor seen as determining how routines are performed (Pentland and Feldman, 2005).

More recent studies have, however, moved towards considering artefacts in general as integral parts of routine dynamics. D'Adderio (2008, 2011) argues that artefactual representations of routines are dynamically performed through iterative cycles of framing, convergence/divergence in performance, and further re-framing of the routine representation (D'Adderio, 2008). Hence the artefactual routine representation is brought to life by reflecting the intentions, logics and motivations of its maker/designer, and by the agency of those who use it in their performances. This implies that artefactual representations influence the performative aspect of the organisational routine and they are also themselves influenced and changed as a result of how they are performed by agentic actors in specific contexts (D'Adderio, 2011).

However, artefacts can be rigidified objects that require considerable time and effort to change (Latour, 1991). Additionally, even though the artefact might allow for some interpretive flexibility, it can still have rigid material properties (Orlikowski, 1992) or, conversely, the material properties of an artefact can be changed without this leading to any changes in how it is interpreted or used (Konlechner et al., 2016). Artefacts that have been in use for some time, as is often the case in mature organisations, can also be particularly rigid and hard to change (Tyre and Orlikowski, 1994). Hence, when the artefact is not malleable, reframing might not be possible. In a case such as this, divergence between a rigid artefactual representation and a dynamic routine will persist. When artefactual representation becomes a barrier to routine performances, such as when it creates extra work or prevents work from taking place (Gasser, 1986; Davenport, 1998), the arising tensions between routine performances and artefactual routine representation can thus remain unsolved.

Given this, and following the recent call for more research on the role of materiality in routine dynamics by Feldman et al. (2016), I argue that a richer understanding of how artefactual representations of routines are enacted and put to use, from both a performative and an ostensive perspective, and why this matters for routine dynamics, is a central question for routines theory that warrants further research.

The aim of this thesis is therefore to explore the role of artefactual routine representations in routine performances, by answering the following research questions:

1) How are stable artefactual representations of routines enacted in evolving routine performances?
2) How are tensions between dynamic routines and stable artefactual representations coped with?
3) How does the relationship between artefactual representations and routine performances influence stability and change in the routine and its representation over time?

I pursue these research questions through an inductive, longitudinal case study of a new product development project at 'Global Tech'. The analysis shows that, by directly and indirectly affecting both the ostensive and performative aspects of the routine, as well as moderating their recursive relationship, the artefactual representation is enrolled in routine performances in a way that leads to the emergence of an artefact routine consisting of recursively related ostensive and performative aspects, operating in parallel with the underlying task routine.

Skilful actors often transition between these two routines effortlessly, fulfilling the requirements of the process description as well as completing the task of developing new products. However, when the process description requirements go against what is perceived as necessary action, fulfilment of both task and artefact is no longer achievable. In such situations, the conflict was resolved by ignoring either the ostensive aspect of the task routine *or* the process description, in what can be described as a dynamic and selectively discontinuous way of relating to the task routine on one hand and the artefactual representation on the other. By separating enactment of the task routine from enactment of the artefact routine, legitimacy of both the task routine and the artefactual representation were

maintained, even when one of them had been temporarily ignored. While this provides a sense of predictability and stability to the actors involved, it also has consequences for the organisation's ability to change.

1.1. New product development

The study undertaken for this thesis was carried out within the context of new product development. To get an idea of the characteristics and challenges of this particular context, the PDMA (Product Development & Management Association) Comparative Performance Assessment Study is a good place to start. The study which has been carried out four times since its start in 1990, provides a good view of the current and long-term issues related to product development (Page, 1993; Griffin, 1997; Barczak et al., 2009; Markham and Lee, 2013).

According to the PDMA 2012 study (Markham and Lee, 2013), even though development cycle times have decreased for highly innovative projects, new product development projects are rarely completed on time and budget. Among the most radical development projects, only 29% were delivered on time and just 32% were on budget. These figures are 43% and 49% respectively for projects classed as 'more innovative' and 58% and 62% for 'incremental' innovation projects. When it comes to meeting technical and market objectives, the figures are significantly better, with around 50% of 'radical' projects, around 60% of 'more innovative' projects and around 70% of 'incremental' projects meeting targets respectively. This indicates that the current issues in product development in general are not primarily related to the quality of the innovations as such, but rather the development process itself.

One of the reasons the new product development process is so hard to manage is the uncertainty and unpredictability that is inevitable if the development project is to claim even the slightest degree of innovativeness. If we assume that successful innovation is based on knowledge and a combination of creativity and management (Freeman, 1982) it can be argued that new product development is about the knowledge we have at the start of a development project as well as the knowledge that is created during the course of said project. There is a large body of research referring

to new product development as an act of information processing in one way or another (Burns and Stalker, 1961; Abernathy and Clark, 1985; Brown and Eisenhardt, 1995). Browning et al. (2002) take the idea of seeing product development as knowledge creation a step further by arguing that the purpose of the product development process is to create knowledge and reduce uncertainty during the course of a project so that eventually, at launch, all uncertainties have been cleared and a stable and reliable product has been achieved. Following this reasoning, value created during the product development process can be measured in terms of uncertainty reduced (Browning et al., 2002). Hence, even though various degrees of uncertainty and unpredictability means that a process is difficult to manage, from an innovation and product development perspective it is also the basis and underlying purpose of the exercise in the first place.

As mentioned earlier, within the field of new product development research, the type of artefactual representations of routines discussed in this thesis have been established as important factors for successful new product development (Griffin, 1997; Barczak et al., 2009; Markham and Lee, 2013). The design and content of such formal process descriptions have, however, been shown to differ significantly from case to case. Important and potentially outcome-influencing characteristics include level of formality, the use of sequential vs concurrent methods, level of structure, and strictness with regard to adherence and enforcement (Cunha and Gomes, 2003; Adams-Bigelow, 2006; McCarthy et al., 2006). The usefulness of process descriptions have likewise been shown to be dependent on the context and nature of the specific new product development project (for example de Brentani, 2001; MacCormack and Verganti, 2003).

How strictly process descriptions should be followed and enforced has also been debated. For example, Sethi and Iqbal (2008) argue that when process descriptions for new product development are too rigid it can be counterproductive. Cooper et al. (2010) take the opposite view and argue that the more disciplined the application of the process description, the better it is for the quality of new product development outcome. Other studies show that it is not a question of either being strict *or* flexible, but rather about the importance of finding a balance between rigidity and

flexibility in process design and execution (for example Tatikonda and Rosenthal, 2000). Beyond the different types of design and execution, scholars have pointed to the need for a deeper understanding of how the process description is enacted in practice, showing that factors as diverse as the role of sensemaking (Christiansen and Varnes, 2009), creativity (Stevens et al., 1999), and organisational maturity (Marion and Simpson, 2009) can affect how process descriptions shape new product development outcome.

1.2. Empirical background – New product development and process descriptions in Global Tech

At Global Tech, a large Swedish industrial firm developing and producing complex capital goods for infrastructure services, managers received a wake-up call when an important customer exclaimed that

> Your thoughts are good, but your development times are waaaaay to long.

Global Tech, who, up until then had been able to rely on their, arguably, superior technology, started to feel that competition was closing in and that the long development cycles were partly to blame.

Being criticised for being too slow was alarming for the managers at the new product development unit at Global Tech. They started looking for alternative ways of organising these crucial operations. As many organisations before them, Global Tech turned to Lean Management to improve time-to-market of new products. As part of this change initiative Global Tech invited researchers from the Stockholm School of Economics to study the unfolding of the transformation from 'old' to 'lean'. As a newly recruited PhD-student I thus entered Global Tech a year after the first steps of the change initiative had been taken, around the same time as it was launched across the organisation.

Even though the lean management philosophy was first developed in a world of repetitive production systems, where stability and predictability were considerably important, it has since been developed and successfully

applied to such uncertain and unpredictable processes as innovation and new product development (Ward et al., 1995; Karlsson and Åhlström, 1996; Browning and Sanders, 2012; Thomke and Reinertsen, 2012). Much has been written about lean and there are many interpretations of and opinions on what lean management 'actually' entails. However, common for all these is the importance of flow rather than resource efficiency and how the use of certain tools such as visualisation boards, stand-up meetings and short feedback cycles can assist in achieving flow by eliminating wasteful activities from the process (Modig and Åhlström, 2012).

I first set out to familiarise myself with the work processes of Global Tech to be able to understand what they were changing, why they were changing it and what they were trying to change it into. Early on, I therefore participated in a two-day workshop on the organisation's new product development process and how it could be shortened. There were more than 50 participants in the workshop and all parties involved in the process were present. Still it took them more than one day to map out the current new product development process. When they were done, it was widely debated if this was actually a correct representation of how the new product development process was carried out. What was clear though, was that the existing description of the process, found in documents and on intranet sites, constituted a poor and inadequate reflection of what the participants in the workshop said they were doing in practice. In the words of routines theory, the artefactual representation of the routine did not correspond to how the routine was actually performed (Pentland and Feldman, 2005, 2008a; D'Adderio, 2008, 2011).

As part of the change initiative at Global Tech, attention turned to the various formal and informal process descriptions in the organisation aimed at describing, directing or controlling the ways of working. There were several work groups formed that were looking into different levels and parts of the process descriptions related to the development of new products within the business unit. I was asked to participate in one of these groups whose aim was to implement a new model for managing the new product development projects on a business unit level. The model, from now on referred to as the NPD Decisions Directive (NPD is short for new product development), described the high-level stages a development

project goes through (from opportunity analysis to commercial release). The purpose of the NPD Decisions Directive was to provide the business unit with the information needed to decide on whether a product development project was fit to pass 'through the gate' to the next stage or not. These decisions would in turn be crucial for a project's financing going forward. The new NPD Decisions Directive was supposed to enable gating decisions to be taken from a business case perspective and was seen as constituting a dramatic change from how these decisions had previously been taken.

The group consisted of representatives from different parts of the organisation; designers, project leaders and management were all represented. Together, the members had a thorough understanding of what the people working with new product development at Global Tech actually did and what they required in order to do it well. Nonetheless, when the new model was implemented, the original purpose of creating a supporting tool to make good business case-based decisions was not fulfilled. Instead, according to general opinion (as indicated by a survey distributed to a random selection of users, see Chapter 3 for a more detailed description), the decision model turned into a checklist-ticking exercise. Instead of being based on the progress or quality of the product under development, gating decisions were taken based on which items were still left un-ticked in the checklist.

At the same time, I was asked to take a look at the process description aimed at day-to-day operations in a new product development project.

NPD Operations Directive referred to a different level of the new product development routine than NPD Decisions Directive, and the two process descriptions had also been developed in different ways. Whereas NPD Decisions Directive had been consciously designed by a special team, NPD Operations Directive had developed organically over time. No-one I spoke to was able to recall where it first came from, and, over the years, it had been adjusted as new product development projects discovered areas of improvements, inconsistencies, etc. As an outsider, this process description looked like an instruction manual for which documents should be used at which review status at which points in time, rather than a guide

for developing new products. As such, it didn't seem to resonate well with the customer-focused lean principles the organisation was implementing.

Although the two process descriptions were different in how they had emerged and targeted two different levels and types of development work, the decisions taken under NPD Operations Directive fed into the decision process in NPD Decisions Directive. At the same time, the two process descriptions were very similar in that they seemed to focus on the same details, which didn't coincide with their overall objectives (for a more detailed account of NPD Decisions Directive and NPD Operations Directive, how they are connected and their respective target audiences, please see Chapter 3).

The two directives were also similar in that they were both formal process descriptions and as such, people were more or less forced to follow them, at least as far as the decision points were concerned. Hence, despite the apparent mismatch between the process descriptions and the desired lean way of working, actors had no choice but to both fulfil the requirements of the process descriptions while at the same time also perform flow efficient and customer-focused product development. The question was therefore not so much whether the process descriptions were followed or not, but rather how they were followed, as well as if and how the actors could balance the apparently incommensurate demands of the process descriptions on one hand and the lean principles on the other.

1.3. Process descriptions as artefactual representations of routines

This research is thus inductive as it takes empirical observations as the starting point for the discovery of theoretical concepts. During the early familiarisation stage of my research, the empirical observations and reflections triggered a theoretical interest in this topic. Early on I found organisational routines theory particularly useful for these purposes as it focuses on the actual enactment of routines and how conceptions of routines and routine practice influence each other (Feldman and Pentland, 2003). Specifically, routines are repetitive, recognisable patterns of

interdependent actions, involving multiple actors, that consist of both ostensive (the idea, pattern or general structure of the routine) and performative aspects (individual actions taken in routine enactment) (Feldman and Pentland, 2003). In brief, the ostensive aspect enables and constrains the performative, whereas the performative creates and recreates the ostensive, resulting in a regenerative, dynamic system. Artefacts, in turn, interact with the performative and ostensive aspects of the routine (Pentland and Feldman, 2005).

In organisational routines theory, process descriptions, such as NPD Decisions Directive and NPD Operations Directive, are considered artefacts or more specifically artefactual representations of routines (D'Adderio, 2008, 2011). As the description suggests, these are artefacts that have been designed to represent their underlying routine, in this case the new product development routine, and their purpose is to guide, describe and regulate how the routine is performed. The idea is that organisational memory and knowledge is codified and delegated to the artefactual representation for distribution within the organisation (D'Adderio, 2003).

Artefacts, and especially artefactual representations of routines, are often confused with the routine's ostensive aspects, but can be considerably different if the artefactual representations are not in line with what people perceive as established routine practice. At the same time, performativity can also diverge from the artefactual representation when the actors cannot, or will not, carry out the actions the representation stipulates (D'Adderio, 2008, 2011; Pentland and Feldman, 2008a). When there is an inevitable element of uncertainty, as in new product development (see for example Abernathy and Clark 1985; Fleming 2001; Browning et al. 2002), it is difficult, maybe even impossible, for the artefactual representation to accurately predict and describe all possible outcomes and scenarios and the actions they require (Woods and Shattuck, 2000). The complexity of the interplay between artefactual representations and the ostensive and performative aspects of routine enactment can therefore be expected to be greater in this context, where adherence to what the artefactual representation stipulates, to at least some degree, becomes dependent on subjective interpretations. For example, Christiansen and Varnes (2009)

show that the following of formal process descriptions in new product development is characterised by a high degree of context influenced sensemaking from the part of those enacting it. As a result of this, what the organisation actually does in terms of new product development practices might differ significantly from what the company says or thinks it does. In other words, the performative and ostensive aspects of a new product development routine cannot be expected to fully be reflected by its artefactual representation, making this a particularly interesting context in which to study how artefactual representations and routine practices interact.

In response to the initial observations in Global Tech, I therefore set out on a more systematic study specifically into the role of artefactual representations in routine enactment, applying a grounded theory approach (Glaser and Strauss, 1967). Grounded theory is especially suitable for the analysis of how people make sense of complex situations (Suddaby, 2006) – in this case contradictions and tensions between a representation and the routine it represents – and translate them into purposeful action. It is also suitable for the analysis of process data when, as in this case, the aim is to analyse "… a more micro level to explore the interpretations and emotions of different individuals or groups living through the same processes" (Langley, 1999, p. 700). In line with the recommendations by Gioia et al. (2013) I thus carried out data collection and coding in several cycles, allowing for flexibility and exploration of emergent themes as the study went along. The main part of the study evolved around a specific product development project, the Rocky project, and the interactions between the project team members. I followed the Rocky project in phases over a total of 2.5 years which meant that I studied the project from more or less beginning to end. During the course of the project, in team meetings as well as interviews, the team members showed a wide variety of ways to relate to, or not relate to, both NPD Operations Directive and NPD Decisions Directive.

Early findings showed that artefactual representations such as process descriptions had a central role in how routines evolved and were enacted at Global Tech. Specifically, these process descriptions, such as NPD Decisions Directive and NPD Operations Directive, were regularly leaned

upon as a means for stabilising routine enactment, while on other occasions a process description that had previously been treated as immutable could suddenly be ignored when actors perceived this as necessary. Furthermore, the switch from following the mandated requirements and restrictions of the process description to ignoring them, and back, appeared to be seamlessly intertwined with decision making and routine enactment. I found that this active, dynamic and recurring way of relating to, connecting and disconnecting performances from the artefactual routine representation could not be fully explained by existing theory on routine dynamics. This insight led to the formulation of the previously mentioned research questions related to how artefactual representations of routines, such as process descriptions, shape routine performances, how tensions between artefactual routine representations and routine performances are coped with, and how this affects stability and change in the routine and its representation over time.

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The remainder of the thesis is structured as follows: the next chapter, Chapter 2, reviews existing research on organisational routines, artefactual representations of routines in general and process descriptions in new product development in particular. The aim of this chapter is to set the theoretical back-drop for the remainder of the thesis, and also to point towards a few yet underdeveloped areas that the thesis intends to explore further. The following chapter, Chapter 3, describes the methodology used for the collection and analysis of the data and discusses the ontological and methodological considerations and assumptions the research is based on. This chapter introduces the grounded theory coding structure and explains the empirical context of the study. The organisation, Global Tech, is introduced as well as the particular new product development project, Rocky, which has been the main focus of the study. This chapter also describes the change initiative that was introduced at Global Tech and provides an introduction to the principles of lean management that were at the core of the transformation. The specific process descriptions are also

described as well as my own iterative journey towards the specific problem formulation that eventually led to this thesis.

Chapter 4 presents the first order concepts resulting from the study. Chapter 5 develops these first order concepts into second order themes and theoretical dimensions whereas Chapter 6 uses the findings to develop a model suggesting that artefactual representations of routines and the task of the routine they are representing are enacted as different, yet intertwined, routines with recursively related ostensive and performative aspects

Building on the literature reviewed in Chapter 2, Chapter 7 discusses these findings in the light of existing research and attempts to theorise what these findings imply for artefactual representations of routines and routine performances. The final chapter, Chapter 8, summarises the outcome of the discussion and provides the conclusions of the study alongside the practical implications of the findings. Here the limitations of the present study are presented as well as suggestions for further research. The references are listed at the end of the thesis.

Chapter 2

Literature review

In this chapter I review the literature on organisational routines and process descriptions in new product development. The chapter includes an overview of the contributions of these research areas to our understanding of how process descriptions shape the way organisational routines are performed.

2.1. History and development of routines theory

The focus of this literature review will be the line of organisational routines research normally associated with the work of Martha Feldman and Brian Pentland; commonly referred to as the practice perspective (Parmigiani and Howard-Grenville, 2011) or performative view (Dionysiou and Tsoukas, 2013) on routines. However, research on organisational routines has been around for a long time. An early researcher to introduce the concept was Stene (1940) who argued that "organisation routine is that part of any organisation's activities which has become habitual because of repetition and which is followed regularly without specific directions or detailed supervision by any member of the organisation" (Stene, 1940, p. 1129). To him, routines were a means for the facilitation of efficient cooperation (or coöperation as was the spelling used by Stene) within an organisation. The idea that organisational routines entail some sort of multi-actor setting has been key ever since (Becker, 2004). While the earlier research considered organisational routines as cognitive regularities and focused on the rule-like

properties of routines such as performance programs (March and Simon, 1958) and standard operating procedures (Cyert and March, 1963), the field has moved towards considering routines more as activity regularities or behavioural patterns (Becker, 2004). Today, the seminal work by Nelson and Winter (1982) is often considered a turning point in routines theory (c.f. Becker, 2004). Nelson and Winter (1982) brought organisational routines into the spotlight by making them an integral part of their evolutionary perspective on economic change, and approached them as "genes [that]… are a persistent feature of the organism and determine its possible behaviour (even though *actual* behaviour is determined also by the environment)" (Nelson and Winter, 1982, p. 14). According to their view, routines were fairly stable 'things' that changed as a response to exogenous factors (Feldman et al., 2016).

The performative view, however, sees organisational routines as generative systems with their own internal dynamics, consisting of mutually constitutive, recursively related aspects (Feldman and Pentland, 2003; Pentland and Feldman, 2005). Feldman and Pentland (2003) define organisational routines as patterns of action, or more specifically a "repetitive, recognisable pattern of interdependent actions, involving multiple actors" (Feldman and Pentland, 2003; p. 96). This definition neatly covers the key characteristics of organisational routines: they are repetitive; the pattern that emerges from the enactment is recognizable; they are constituted by interdependent actions; and they are collective (Feldman and Pentland, 2003; Becker, 2004). Even though the definitions have varied over time, it is now commonly agreed that these characteristics are central to the concept of organisational routines. Thanks to these characteristics organisational routines are also widely recognised within organisational research as important building blocks of what organisations do (see for example Becker, 2004). Due to these characteristics, organisational routines can have all the different roles and functions that have been attributed to them since Stene (1940) mentioned their coordinative powers and argued that there is a direct correlation between the organisation's ability to coordinate and the degree of routinisation of its functions (p. 1129). In addition, even though their roles and function are discussed diversely, depending on the phenomena they are applied to, a common theme is that

routines provide stability, predictability and coordination between those involved in their enactment.

At the same time, there is also a large body of research which shows that organisational routines can be important sources for flexibility and change (Feldman, 2000; Feldman and Pentland, 2003; Akgun et al., 2006; Essén, 2008). The following section will discuss these two supposedly conflicting characteristics and discuss how the performative view shows that organisational routines can provide both flexibility and stability simultaneously.

2.2. Stability and change

Organisational routines are repetitive by nature, they provide regularity and predictability to what could otherwise be more complex and variable processes than any one individual could fully grasp and manage (Cohen and Bacdayan, 1994). Hence, organisational routines provide an intermediary through which valuable knowledge about the possible actions taken by agents can be stored and distributed (Bapuji et al., 2012). They "enable people who perform organisational tasks to develop shared understandings about what actions will be taken in a specific routine and how these actions relate to a larger organisational picture" (Feldman and Rafaeli, 2002, p. 310). Moreover, routinisation of tasks reduces uncertainty regarding the actions of others, thereby facilitating decision-making. Hence, routines provide information about the actions of others, and also about what actions are expected to be taken by oneself (Nelson and Winter, 1982; Cohen and Bacdayan, 1994; Pentland and Rueter, 1994; Cohen et al., 1996). In addition, the recognisable pattern of the routine stores knowledge and information with regard to the past, thus facilitating the distribution of that knowledge across actors (Nelson and Winter, 1982; Cohen and Bacdayan, 1994; Cohen et al., 1996; Lazaric, 2000). Therefore, it is established that, as routines are commonly seen as being stored in the procedural memory of their enactors, this knowledge is also easily accessible when needed (Cohen and Bacdayan, 1994).

The downside of the stability provided by routines' repetitiveness is that organisational routines can sometimes be accused of being a source of

rigidity and organisational inertia (for example Hannan and Freeman, 1984). As routines become increasingly embedded in the organisation's ways of working, they become harder to change. This view is based on the assumption that routines would be mindless or automated in how they are carried out (c.f. Ashforth and Fried, 1988; Lazaric, 2000; Becker, 2004), even though the mindless nature of routine performances is also why routines can allow for allocation of cognitive resources to what is considered more complex matters. For example, Stene (1940) compares routinisation to muscles knowing how to walk even without the mind's direct involvement, thus allowing for the mind to engage in other activities.

When routines are performed mindlessly, there is also a risk that problems and issues with the routine are not adequately identified (for example Levitt and March, 1988). In that case, inferior routines are not changed due to lack of feedback. Sometimes, there is substantial negative feedback; however, this feedback is ignored and the inferior routine remains the same (see, for example, Leonard-Barton, 1992). Resistance to change within an organisation can also occur for a variety of other reasons. For example, Levitt and March (1988) argue that routinisation can lead to the formation of competency traps, that is, when experience and competence have been built up with an inferior procedure or technology, changing to the superior one can be considered too much of an investment in terms of both time and resources. Yet, even when change is welcome, organisational routines can be hard to alter due to, for example, differences in how actors perceive established ways of working or an unwillingness to enact the new ways (Feldman, 2004). Organisational routines have also been seen as showing signs of path dependent development (for example Cohen et al., 1996; Levitt and March, 1988) implying that even if routines change, they do so based on their past and current states.

Earlier research on organisational routines also described changing routines. For example, Cyert and March (1963) mention the adaptation of routines and Nelson and Winter (1982) their mutation. These studies do, however, assume that change comes about as a response to external forces. Later research has shown that not only can routines themselves be changed or flexibly performed, they can also be an important source of flexibility and a driver for change within the larger organisation (for example Becker

et al., 2005; Feldman, 2000). Pentland and Rueter, (1994) argue that there is a contradiction already in the word itself where 'routines' describe patterns of action, whereas 'routineness' indicates passivity. They also argue that routines are not at all mindless, automated responses to pre-programmed triggers, but rather highly skilled and effortful accomplishments. By comparing organisational routines to grammars they show that routines provide rules without being deterministic (Pentland and Rueter, 1994). Just like grammar they can provide structure without dictating exactly how the structure should be filled. This allows for routines to maintain their structural element, but still be flexibly performed.

Several researchers have talked about the issues of identifying and defining 'stability' and 'change'. Becker (2005) asks the question how big a change can be before it should be categorised as new behaviour rather than just repetition of the old. Along the same lines, Howard-Grenville (2005), show that organisational routines can be performed with a high degree of flexibility and variation without overall organisational behaviour necessarily changing as well. Pentland (2003a, 2003b) discusses the difference between task variety and sequential variety, that is variety in how things are done and the order in which they are done. He shows that depending on what type of variety is studied, different answers to the question of whether the process is stable or changing can be found.

The relationship between organisational routines and stability and change is thus far from straightforward. Not only are there different views on what the relationship between routines and stability and change looks like, there is also more than one possible way of studying the relationship depending on how stability and change are defined. The performative view on organisational routines provides an alternative ontology of routines that allows for some of this complexity to be dissolved.

2.3. The performative view

In their seminal paper from 2003, Martha Feldman and Brian Pentland provided an explanation for how routines can be a cause of both organisational inertia and change. They theorise routines as enacted and reproduced through co-constitutive interplay between their recursively

related ostensive and performative aspects (Feldman and Pentland, 2003; Pentland and Feldman, 2005). The ostensive aspect entails the idea, pattern or general structure of the routine, whereas the performative aspect represents the individual actions taken in the enactment of the routine (Feldman and Pentland, 2003). Performative and ostensive aspects of organisational routines are thus mutually constitutive parts of a 'generative system' where one aspect is continually affecting the other (Feldman and Pentland, 2003).

2.3.1. Performative and ostensive aspects of organisational routines

The different parts of routines, the ostensive and performative aspects respectively, are reflected already in the definition suggested by Feldman and Pentland (2003) at the beginning of the chapter whereby 'pattern' represents the ostensive aspect and 'action' represents the performative aspect of the routine. The definition of what constitutes the performative aspect is quite clear. It is what people actually do or "…specific actions, carried out by specific people at specific times and places…" (Feldman and Pentland, 2003, p. 94). The ostensive aspect, however, is defined in different ways by different papers, sometimes even by the same authors. While Feldman and Pentland (2003) say the ostensive represents the idea of the routine, what the idea entails has been up for different interpretations. On the one hand, they are sometimes referred to as 'ostensive patterns' defined as the abstract pattern that emerges when the routine is performed. This means that performative actions create ostensive patterns. (Rerup and Feldman, 2011; LeBaron et al., 2016) On the other hand, they are sometimes referred to as the structure, guide or plan, (Feldman and Orlikowski, 2011; Bapuji et al., 2012; Felin et al., 2012; Kraaijenbrink, 2012; Bresman, 2013) indicating that the ostensive aspect creates the performative. Some, like Labatut et al. (2012) manage to combine these two different approaches to defining ostensive aspects into the same sentence; "the ostensive aspect of routines is their abstract pattern, a script used by participants to guide their action"(p. 42). The different definitions of the ostensive aspect are thus reflecting the duality of organisational routines, embodying both agency and structure (Feldman and Pentland, 2003).

As for stability and change, the ostensive aspect is commonly understood as embodying understandings widely shared between routine participants (for example Turner and Rindova, 2012), thus providing the structure that accounts for the stabilising effect of routines. However, both ostensive and performative aspects of organisational routines are in themselves multiple (Pentland and Feldman, 2005). How the routine is performed will, by definition, vary, if only ever so slightly, from time to time or person to person. At the same time, how the routine is ostensively understood also depends on the individual, which parts of the routine are referred to, as well as the specific time and place (Pentland and Feldman, 2005, 2008b). High variability in the performative aspect is not necessarily related to high variability in the ostensive aspect (Pentland and Feldman, 2005) and divergence or convergence between the two will have different outcomes with regard to stability and change. Howard-Grenville (2005), for example, show that flexible performances can still have stable ostensive patterns, thereby causing a sense of inertia, whereas Pentland et al. (2011) show that seemingly small changes in performativity can lead to large changes in the ostensive pattern. Zbaracki and Bergen (2010), for example, show that different ostensive understandings between subgroups can lead to conflict and eventually the collapse of the routine. Hence, the distribution of both aspects over time, space and agents can impact the direction of the routine in different ways. Even though we define routines as repetitive and recognisable patterns, there are many ways in which they can be changing not *despite* but *because* of this repetitiveness: "organisational routines are dynamic because they exist through a process of (re)production, over time and space, through the ongoing effort of actants (people and things)" (Feldman et al., 2016, p. 505).

2.3.2. Routine dynamics

Routines become versatile because of their internal dynamics and the recursive and mutually constitutive relationship between ostensive and performative aspects. The ostensive aspect enables and constrains the performative through a process of guiding (defining the script or intended pattern), accounting (explaining or justifying actions) and referring (simplifying complex interactions into comprehensible patterns). At the

same time, the performative aspect affects the creation, maintenance and modification of the ostensive (Feldman and Pentland, 2003). This leads to a system where the ostensive aspect guides the performance of the routine, while at the same time the performance might create a new pattern of action, hence modifying the ostensive aspect, which in turn will guide the performance in a new direction, and so on. The result is that "when people enact routines, they can maintain the ostensive aspect of the routine, but they can also deviate from it" (Feldman and Pentland, 2003, p. 108). Furthermore, when deviating "they alter the potential repertoire of activities that creates and recreates the ostensive aspect of the routine" (Feldman and Pentland, 2003, p. 108). This means that even though performative actions change, the ostensive pattern can remain the same (Howard-Grenville, 2005). It also means that seemingly small changes in performativity can trigger larger changes when they alter the ostensive pattern (Pentland et al., 2011). This way the long term goal of the routine can also be allowed to evolve in accordance with performative constrains as well as short term intentions (Dittrich and Seidl, 2018).

Identifying how ostensive and performative aspects interact with each other as recursively related parts of organisational routines Feldman and Pentland (2003) and Pentland and Feldman (2005) did not only show how routines can be stabilising, flexibly performed and sources of both inertia and change. They also laid the foundations for further research into how the internal dynamics of organisational routines can shed light on a variety of organisational phenomena (Feldman et al., 2016). Now "…the term 'routine dynamics' has come to stand for the study of the dynamics within and across routines as they are enacted in practice" (Feldman et al., 2016; p. 506). According to Feldman et al. (2016), the study of routine dynamics is based on three underlying observations that form the basic assumptions upon which the field relies (p. 506).

Firstly, action in organisational routines is situated, which means that the key unit of observation (actions) take place in specific times and places, inseparable from the sociomaterial context in which the routines are enacted (Feldman et al., 2016). Actants, both human and non-human, are interesting as they carry out the actions (Orlikowski and Scott, 2008); nonetheless, the foci of study are the actions, the associations between

actions and the patterns of action that emerge. The actions under study form the performative aspect of the organisational routine, whereas the resulting patterns of actions can be understood as the ostensive aspect. Secondly, actors are knowledgeable and often capable of and engaged in reflection. This relates back to the observation that routines are effortful accomplishments rather than mindless automated responses to particular triggers (Pentland and Rueter, 1994). At the same time, they are ongoing accomplishments as each instance they are enacted provides an opportunity for variation (Feldman, 2000). Thirdly, routines are stable, but only temporarily and keeping them stable can require significant effort (Feldman et al., 2016). It takes effort and active adaptation to maintain the repetitive, recognisable pattern in response to external conditions, as well as the internal variation resulting from the routines' ongoing enactment (Pentland, 2003b).

These three important assumptions underlie the study of how routines emerge as well as how they can be replicated and transferred. When routines emerge they do so as a result of repeated situated actions, through which the actors create stability in an otherwise unknown environment (Becker, 2005; Dionysiou and Tsoukas, 2013). Cohen and Bacdayan, (1994) show that routinisation can be created spontaneously when a group of actors are faced with instructions that are less than complete and Becker (2005) argues along the same lines that task complexity, uncertainty and time constraints are all important antecedents to routinised activity. Replication and transfer of routines also rely on knowledgeable actors to adapt routine performance to the new context (D'Adderio, 2014) and also to make an effort to learn how the routine should be performed (Bresman, 2013). Additionally, Dittrich and Seidl (2018) show that intentions in routine performances are also changing over time, adapting the long-term goals of the routine to the short term ends-in-view and the means currently at hand.

Thus, routine performances are not entirely pre-programmed. Instead, they rely on the effortful accomplishments of knowledgeable actors in specific contexts. These findings also form important assumptions regarding the relationship between structure and agency upon which the analysis and subsequent conclusions of the present study relies.

2.4. Changing organisations by influencing organisational routines

As organisational routines are an important source of both flexibility and inertia, having influence over them can be a significant basis for influence and control in the organization at large. The creation and enforcement of organisational routines have therefore always been a way for management to control the behaviour of subordinates (see for example Braverman, 1974). However, there are different bases for power in an organisation and the structural power of a manager can be offset by the relational power of a subordinate (French and Raven, 1959). As a result, those enacting the routine might partially resist the structural power imposed on them by whoever tries to influence how the routine is enacted.

Artefactual representations of routines, such as process descriptions, are one way of trying to exercise managerial control. It would, however, be a mistake to simply think that subordinates' enactment of the routine represents the performative aspect and that a manager's idea represents the ostensive and that the alignment of these would be an indication of which of them is the strongest. Of course, the design and enforcement of a process description can act as a way of controlling the ostensivity; how the routine is ultimately ostensively enacted, however, depends on how it is performed (see, for example, Feldman and Pentland, 2003; Parmigiani and Howard-Grenville, 2011). Alternatively, as stated by Feldman and Pentland (2003), "individuals or groups with power to identify particular performances as 'routine' have the power to turn exceptions into rules and, thus, to enact the organisation in ways they think appropriate" (p. 110).

This indicates that power is determined by who controls the ostensive aspect. Nevertheless, as organisational routines are generative systems of mutually constitutive aspects of performativity and ostensivity, control over the ostensive aspect of the routine can be gained either by 'owning' the shared definition, thereby creating the desired pattern in the performativity, or by creating the ostensive pattern indirectly through 'ownership' of the performativity (Kryger Aggerholm and Asmuß, 2016). However, who has the upper hand can change over time and from situation to situation.

Kryger Aggerholm and Asmuß (2016), for example, show how the power relationship can be negotiated by manager and employee throughout the performance of a routine using both structural and relational power.

Consequently, through their internal dynamics, organisational routines are important drivers for both organisational change and stability, and as such they can be important for creating, maintaining and avoiding control within an organisation (Pentland and Feldman, 2005). Therefore, influence over how they are shaped is of interest to many actors within an organisation. From a manager's perspective, one way of trying to achieve that influence is using artefacts that are designed to condition how organisational routines are performed. The following section will discuss existing research on how these artefactual representations of routines, such as standard operating procedures, ISO-standards or other process descriptions (D'Adderio, 2008, 2011), contribute to the enactment of organisational routines.

2.5. Process descriptions as artefactual representations of routines

Artefacts in general can be described as the physical manifestations and representations of routines (Pentland and Feldman, 2005). They are the things that we normally 'see' when we think about an organisational routine, such as the physical layout of an office, software, procedures manuals or documented rules. They can codify and articulate knowledge to coordinate actions (D'Adderio, 2001) and delegate memory (D'Adderio, 2003; Cacciatori, 2008) across actors and communities.

As they are generally more tangible than the other aspects of organisational routines, artefacts are commonly targeted when attempting to change organisational behaviour (Pentland and Feldman, 2008a; Glaser, 2017). However, artefacts are not monolithic objects but can themselves consist of several aspects or dimensions. They can, for example, be discussed along the dimensions of instrumentality, aesthetics and symbolism (Rafaeli and Vilnai-Yavetz, 2004), spirit and structural features

(DeSanctis and Poole, 1994), or functional affordances and symbolic expressions (Markus and Silver, 2008).

Artefacts are known to influence both the performative and the ostensive aspects of routines. They should, however, not be mistaken for either, even though artefacts such as standard operating procedures and written guidelines can be seen as reflections of the ostensive aspect in the same way that logs and reports can be used as proxies for the performative (Pentland and Feldman, 2005). Hence, "routines may also be documented with a set of formal procedures or rules, but that is not an essential part of the core definition" (Feldman and Pentland, 2003, p. 96).

Standard operating procedures and other process descriptions have been conceptualised as cognitive artefacts (Norman, 1991; Cohen et al., 1996; Gao et al., 2018), process representations (Cacciatori, 2012) or artefactual representations of routines (D'Adderio, 2008, 2011), which is the term used in this thesis. As such they are a formal description of the actions that *should* occur according to the person or persons who designed and deployed them and are commonly used with the intention to shape organisational behaviour (Cohen et al., 1996; Pentland and Feldman, 2008a; Glaser, 2017). Nonetheless, the agency of those enacting them can result in practices that differ from those originally intended (Becker and Zirpoli, 2008; Pentland and Feldman, 2008a). Actors can intentionally deviate from the artefactual representation of the routine when they perceive it as dated or inefficient (Dekker, 2003; Morrison, 2006; Desai, 2010) or when the benefits provided by it can only be seen on a system rather than individual level (Norman, 1991). Actors can also follow the artefactual representation of the routine they are performing when it would have been better not to (Woods and Shattuck, 2000).

The usefulness of an artefactual representation can be evaluated on the basis of how complicated the environment is to evaluate and act upon, and how well the artefactual representation supports the actors in doing so (Norman, 1991). Yet, even when the design of the artefactual representation is considered good, the uncertainty inherent in many routines, such as new product development, prohibits artefactual representations, such as process descriptions, from predicting all possible situations. This, in turn, results in incomplete process descriptions (Woods

and Shattuck, 2000). With incomplete descriptions, actors make use of what they perceive as 'routine' (Reynaud, 2005) to guide their actions in the face of unforeseen events. In addition, different sensemaking mechanisms can also lead to further deviations from the intended behavioural patterns (Christiansen and Varnes, 2009). This indicates a relationship between the artefactual representation, the process description, and the enactment of the routine itself, which goes beyond just the material properties of the artefactual representation's design and actors' willingness to comply.

A complementary way of seeing the artefactual representation is that its main purpose is to distribute routine-following through the delegation of the functions it describes rather than determining a particular action pattern (D'Adderio, 2011). The relationship between the artefact and the agency of the actors is also discussed by Glaser (2017) who argues that the way in which the artefact distributes agency is one of the key aspects of the artefact design process. D'Adderio further extends the theoretical understanding of artefacts in routines theory (D'Adderio, 2008, 2011), arguing that as representations of routines, artefacts are not just the material objects we might consider them to be. Instead, they can be seen as "multifaceted entities that can influence the course of routines, while at the same time themselves evolving as a consequence of their appropriation by certain agencies in specific contexts" (D'Adderio, 2011, pp. 198-199). A similar argument is put forward by Hales and Tidd (2009), who propose a dialectical and mediating, rather than linear and genetic, relationship between routines and their formal representations. Artefacts such as process descriptions are thus not necessarily either fully prescriptive or fully descriptive. They are not just rules that people follow blindly, nor are they just a description of a routine that no one ever uses. Artefacts are also neither entirely realist, with stable inherent properties, nor entirely socially constructed mediators between the material and social context. Instead, they are rather an emerging mix of the two (D'Adderio, 2011).

Drawing on performativity theory, D'Adderio (2008, 2011) argues that artefactual representations of routines are dynamically *performed* through iterative cycles of framing, convergence/divergence in performance, and further re-framing of the routine representation (D'Adderio, 2008). This iteration occurs partly due to the process of translation from artefactual

representation to actual performance and vice versa, and involves both actors and artefactual representations (D'Adderio, 2011). Hence, the artefactual representation is brought to life by reflecting the intentions, logics and motivations of its maker/designer, and also by the agency of those enacting it. As such, the artefactual representation directly influences the performative aspect of the organisational routine, and can also itself be influenced and changed as a result of this performance (D'Adderio, 2011).

However, this view assumes that the artefact can be, and is, reframed. While there might be some flexibility in how the artefact is performatively put to use, its material properties might not be as adaptable. Artefacts can be rigidified objects that require considerable time and effort to change (for example, Latour, 1991) and in such cases, re-framing might not be taking place when performances and artefact diverge, increasing the possibility of tensions arising between the artefactual representation and the evolving routine performance.

In summary, while artefactual routine representations and other artefacts are central to how routines are shaped and enacted, there is a need to further explore how artefactual representations of routines are enrolled in routine enactment, and how actors negotiate the interdependencies between artefactual representations and routines as well as the agency distributed through them in routine performances.

2.6. Designing artefactual representations of routines

The purpose of an artefactual routine representation's design is to make the achievement of proposed goals possible within the environment in which it is operating (Simon, 1970). However, human agency means that practices can differ significantly from what the designer of the artefactual representation intended (Pentland and Feldman, 2008a). Actors can intentionally not follow the artefactual representation or follow it when inappropriate, and small changes in the design of the process description can also have large effects on routine performances (Bapuji et al., 2012). Nevertheless, research, such as Dvir and Lechler (2004), shows that the

quality of the planning process is not of central importance when the execution takes place in unstable environments, for example, new product development.

In contrast, a large body of research points to the importance of communicating intentions, rather than actions, already through the design of the artefactual representation. Bapuji et al. (2012) show that when the intentions are clearly and unambiguously transmitted through, for example, a process description, the action patterns emerging from its enactment become stronger. Along the same lines, Dooley (1997) argues that the end result of self-organisation cannot be controlled, only influenced by shared value and purpose. On the topic of design, Orlikowski (1992) shows that technologies aimed at guiding behaviour, as process descriptions, are designed by actors and also by the meanings attached to them through both design and enactment. Hence, meaning is designed into the process description, and is also a result of how it is being enacted.

The blurred line between design and enactment is also discussed by Pollock and Williams (2016) who argue that the use and design of an artefact have to be studied together. Glaser (2017) develops this further by studying how organisational actors design artefacts to intentionally change routine performances. He shows that by engaging in a series of "…organisational actions to create an artefact in order to intentionally change (or influence) a routine" (Glaser, 2017, p 2133), conceptualised as *design performances*, actors make use of four mechanisms to connect the artefact to how the routine is and/or should be enacted.

The first of these mechanisms is abstracting grammars of actions. Glaser (2017) uses the definition for grammars of action developed by Pentland and Rueter (1994) that these are "a set of possibilities from among which members accomplish specific sequences of actions" (Pentland and Rueter, 1994, p. 486). In design performances this consists of drawing a map of the spatial and temporal environment, in which the process description will be enacted, as well as listing actors and resources necessary for its fulfilment and the actions they can perform (Glaser, 2017). Through reflective talk and continuous discussions about these abstract grammars of actions the second mechanism, exposing assumptions, is activated. When exposing and subsequently questioning the assumptions on which the

artefact relies, a design team can modify the design of the artefact accordingly (Glaser, 2017).

The third mechanism used in design performances relates to the actors that are supposed to use the artefact once it has been deployed. Glaser (2017) conceptualises this as the distribution of agency and argues that depending on the level of abstraction of the described grammars of action, the actors involved in the artefact's enactment will be given more or less agency and opportunity to use their own judgement. The lower the level of abstraction, the more detailed the instructions given by the artefact and vice versa. However, the distribution of agency also involves reflections around the opportunities given to actors to override the artefact in the face of, for example, new information or environmental circumstances (Glaser, 2017).

When reflecting on the artefact and testing it, either theoretically or physically, the design performances also allow for appraising and re-appraising of the outcomes of the artefact's design. This fourth mechanism, triggered by design performances, allows actors to evaluate both if the artefact's design facilitates for the actors involved in its enactment as well as if it does the job better than alternative designs (Glaser, 2017). Hence, by engaging in a series of design performances, the actors involved in the design of the artefact connect the artefact to the routine by reflecting over whether it describes the desired action pattern, which assumptions it is based on, who is supposed to do what, and what the expected outcomes of following the artefact are.

However, as Glaser also states himself, his study covers the design of an artefact from scratch, while artefactual representations of routines can also be changed incrementally after they have already been introduced and used. Orlikowski (1992) argues that even though the initial physical construction of a technology is separated in time and space from its use, its social construction takes place as agents attach meaning to it through their ongoing use and reproduction of the technology. This allows for the technology to be amended continuously. At the same time, even though ongoing changes can be made, Tyre and Orlikowski (1994) show that the increased routinisation and institutionalisation that occurs when a technology is reproduced within the organisation means that larger modifications to the technology are only possible within small windows of

opportunity. Outside of those windows, unresolved problems become embedded in organisational practice and actors' interpretations and expectations of the technology are amended accordingly (Tyre and Orlikowski, 1994). Hence, in the absence of ongoing reflective design performances, the design of the artefactual representation will inevitably become dated, thus provoking further tensions between the artefactual representation and the routine it represents to emerge.

Nevertheless, even if the design process is ongoing and both mindful and reflective, considering construal level theory (Trope and Liberman, 2010), not only is it practically impossible for the representation to predict all possible scenarios in which the product development team might find themselves, but the temporal, spatial and cognitive distance between the event in which the artefactual representation is designed and the point where it is used is also of importance to how the artefactual representation is followed. According to construal level theory of psychological distance, the further away the designer is from an object, the more abstract and general the level at which it can be depicted (Trope and Liberman, 2010). Differences in construal level between designers and users imply a multitude of openings for the users to perform the artefactual representation in other ways than those intended by the designer.

Moving from a concrete to an abstract representation of an object involves retaining central features and omitting features that by the very act of abstraction are deemed incidental (Trope and Liberman, 2010). Hence, on a high level of abstraction, designers and users might have the same idea of what the product development process looks like and how this connects to the process description. However, when this idea is translated into practice the stripped representation will again be filled out with performances that, when put together, might not allow for the intended pattern to be recreated. Hence, even when an artefactual representation has been carefully designed and is followed to the letter by the users, the outcome might be different from what was originally intended.

2.7. Process descriptions and the new product development routine

The following section will take a de-tour from research on organisational routines to introduce the literature about the specific routine studied in this thesis, namely new product development. New product development is a particularly interesting routine to study as it is set in an environment inherently characterised by uncertainty and unpredictability. It is also a field in which artefactual representations of routines, referred to as 'formal processes' in the new product development literature, play an important but under-theorised role. New product development thus constitutes a fruitful setting for the study of how artefactual representations get involved in routine dynamics. As the term 'formal process' is rather undefined in the new product development literature and could also involve structural aspects of the new product development process, I prefer 'process description' to talk about artefactual routine representations in new product development as an empirical phenomenon.

Within new product development as a research field, the importance of formal process descriptions is well documented, primarily through the PDMA best practice studies carried out at regular intervals (Griffin, 1997; Barczak et al., 2009; Markham and Lee, 2013). These studies show that organisations that excel at new product development (measured by, among others factors, overall industry position; performance relative to internal goals; financial measurements such as percentage of sales arising from new products; amount of successful projects relative to unsuccessful projects; and development cycle time) are much more likely to have process descriptions in place than those who do not do as well based on the same measurements. However, over time, research has moved from describing new product development as a linear process that should be managed sequentially, to describing it as a recursive and sometimes even chaotic process, in need of a more flexible management approach (McCarthy et al., 2006). Depending on which of these approaches is adhered to, there are also different views on the use of process descriptions and other structured approaches.

There are a number of studies that show that the design of the process descriptions can differ significantly from case to case and that important and potentially outcome-influencing characteristics include level of formality, the use of sequential vs concurrent methods, level of structure, and strictness with regard to adherence and enforcement (Cunha and Gomes, 2003; Adams-Bigelow, 2006; McCarthy et al., 2006). The value of the process description for project outcome is also dependent on the context and nature of the specific new product development project (for example de Brentani 2001; MacCormack and Verganti 2003). How strictly these descriptions should be followed and enforced has also been debated. For example, Sethi and Iqbal (2008) argue that excessively rigid application of rules for new product development can prove to be counterproductive in various ways. Cooper et al. (2010), on the other hand, argue that the more disciplined the application, the better it is for the outcome of the development project. Studying new product development from a routines perspective, Becker and Zirpoli (2008) similarly argue that the "governance gap" observed when rules and procedures are not followed links to performance outcomes. Between those arguing for or against strict process descriptions, there are also many studies that argue that it is imperative to find a balance between rigidity and flexibility in both process design and execution (Tatikonda and Rosenthal, 2000; Dougherty, 2008).

Beyond the different types of design and execution, scholars have identified the need for a deeper understanding of how the process description is enacted in practice, showing that, for example, different types of sensemaking can lead to the process description being enacted differently to the original intention of its designer (Christiansen and Varnes, 2009). The role of process descriptions for the creativity necessary for developing something new is also debated. On the one hand, they create meaning and can therefore be seen as a source for stability and predictability in an otherwise complex environment (Akgun et al., 2006). The process descriptions can thus provide the type of heuristics described by Tversky and Kahneman (1974) that individuals will turn to when facing uncertainty. On the other hand, the rigidity and desire for stability, that is normally the result of focusing too much on minimising uncertainty, discourages inquiry and freedom and thereby negatively influences

creativity (Cummings, 1965). At the same time a manager can foster creativity by allowing for flexibility and autonomy, or quash it by constantly changing specifications or deadlines (Amabile, 1998).

The research discussed above has focused on empirical relationships between outcome variables such as financials, product success and development cycle time on the one hand, and the use and design of process descriptions on the other. I would argue, however, that there is little theorising on why these relationships emerge on a micro-level. In contrast, authors that advocate the complex adaptive systems view (rather than the linear or recursive/chaotic view) of new product development have a different approach to process descriptions that is closer to the theoretical foundations of routines theory. They argue that in a complex adaptive system, the organisation has to rely on the ability of its employees to self-organise (McCarthy et al., 2006), and that when such self-organisation is effective, it will in turn lead to the emergence of the type of organisational routines recognised from routines theory. These formal and informal routines will enable and facilitate the decision making abilities of the individuals participating in the system (McCarthy et al., 2006).

From an organisational routines perspective, self-organisation can be described as the result of performative actions by the individuals and the resulting ostensive patterns, whereas emergence is the development of new performances and patterns that are generated through the internal dynamics between ostensive and performative aspects of routines. This will, in turn, lead to new ways of self-organisation, and so on. According to McCarthy et al. (2006), these can then be transformed into artefacts or artefactual routine representations by the organisation at large, in an attempt to facilitate further and hopefully 'better' self-organisation and emergence. In such a case, the formal structures and processes imposed on a new product development project and its members by the organisation, have, as their main role, to allow individuals, the agents, to make qualified and well-informed decisions rather than to dictate their behaviour (McCarthy et al., 2006). However, this view also fails to acknowledge that the relationship between routine performances and process descriptions is more complex than just a question of supporting vs. coercive process descriptions and the system's ability to adapt to environmental contexts. Instead, adaption and

self-organisation in this case is a response to environmental variations, whereas variations emerging from within routine enactment itself are not accounted for.

2.8. Summary

The aim of this chapter was to review the literature on organisational routines and how artefactual representations such as process descriptions play a role in shaping their performances, and present literature from the field of new product development specifically related to process descriptions. While the research in both of these fields provide useful knowledge and assistance, in terms of frameworks and concepts related to organisational routines, artefacts, process descriptions and new product development as well as the relationship between them, I found that they didn't fully explain or describe the dynamic way in which the engineers at Global Tech related to the process descriptions they were applying in their daily work.

Research on new product development is dominated by predominantly normative or descriptive empirical studies with a focus on what companies do and should do. In this field, artefactual representations are process descriptions that are seen as something good, something that companies that succeed in new product development use more than others (for example Barczak et al., 2009). Although these studies show that the correlation between new product development success and the existence of process descriptions is positive, other studies have shown that this depends on how the process description is designed, whether the process description is flexible or rigid (Cunha and Gomes, 2003; Adams-Bigelow, 2006; McCarthy et al., 2006) and how strictly it is enforced (Sethi and Iqbal, 2008; Cooper et al., 2010). There are also studies that show that contextual factors moderate the importance and success of process descriptions in new product development (de Brentani, 2001; MacCormack and Verganti, 2003). These are, however, all factors that are exogenous to the enactment of the routine, and the relationship is rarely problematised further than that (Christiansen and Varnes, 2009, is a notable exception). These studies notice that there is a positive empirical relationship between the existence

of process descriptions and development project outcome; however, they do not investigate the underlying mechanisms.

As discussed above, within the field of organisational routines, process descriptions have been conceptualised, among other things, as artefactual representations of routines, that is, artefacts that are in different ways supposed to represent, describe or dictate how the routine is performed (D'Adderio, 2008, 2011). Yet, these artefacts are neither prescriptive rules that people follow blindly, nor are they descriptive stories of how 'things are done' (D'Adderio, 2008, 2011; Pentland and Feldman, 2008a). By looking at organisational routines as dynamic systems, consisting of both ostensive and performative aspects, this field has contributed to our understanding of why routines in general change and why they do not, as well as how artefacts in particular can enter and affect the whole or parts of that system (D'Adderio, 2008, 2011; Pentland and Feldman, 2008a).

There are, however, some notable limitations to these studies as they have focused on particular contexts, where the conditions might not be representative to, for example, the context the research of this thesis is set in.

Firstly, D'Adderio (2008,2011) shows that artefactual representations shape, and can be shaped by routine performances when they differ from what the artefactual routine representation originally prescribed. However, artefacts can be rigid structures (for example Latour, 1991), raising the question of what happens to routine performances when the material properties of the artefactual representation cannot be changed particularly easily. In the field of new product development, Christiansen and Varnes (2009) show that because of sense making on behalf of the actors, the actual new product development process can differ significantly from what the process description says. However, they neither empirically illustrate nor conceptualise the processes through which this occurs. Hence, while we know that artefactual representations of routines condition routine performances, in what ways and how this conditioning happens is in itself a topic that merits further research. This claim is supported also by Feldman et al. (2016) who call for more research specifically into the role of artefacts and materiality in routine dynamics.

Secondly, and related to the point above, Dittrich and Seidl (2018) show that the long-term goals of the routine evolve over time to adjust to the means at hand. However, as the artefactual representation can provide both goals and means, there is reason to believe that the routine would adapt to these as well. At the same time, the goals and means provided by the artefactual representation may or may not be aligned with those of the routine, opening up for tensions emerging between the artefactual representation and the routine it represents. Existing research points towards such situations by, for example, showing that people relate to and enact process descriptions in a wide array of different ways (Norman, 1991; Woods and Shattuck, 2000; Dekker, 2003; Morrison, 2006; Christiansen and Varnes, 2009; Desai, 2010), indicating that the relationship between the artefactual representation and the routine is not just about perceived appropriateness or willingness to comply. In the field of organisational routines, for example, Glaser (2017) shows how the performances involved in the *design* of the artefactual representation connect the representation to the routine. Such a connection between artefactual representation and routine performances through design, would be one way of aligning the means and goals of, on one hand, the routine and, on the other, its artefactual representation. However, Glaser (2017) studies an artefactual representation designed from scratch. As he points out, more research is needed on the type of artefactual representations that have been developed over time, being gradually changed by individuals or groups that are more or less familiar with the wider context of the routine, that is, the kind of artefactual representations operating in Global Tech. In such settings, characterised by multiple-actor involvement in the distributed and fragmented design of the artefactual representations evolving over long periods of time, the reflective design performances observed by Glaser might not have taken place. In those cases, how the performances and the artefactual representation of the routine are connected is far from clear, and different mutual interactions between artefact and routine performances may emerge as a result. In the absence of mindful and reflective design performances that ensure the continuous alignment of artefactual representation and routine, how the actors cope with the arising tensions is thus a question that warrants further research.

Thirdly, little is known about how the organisational routine and its representation and their relationship evolve over time. As mentioned above, Dittrich and Seidl (2018) show that emerging intentionality in routine enactment and the foregrounding of means over ends, can lead to the goals of the routine changing over time. Their study does not involve artefacts, but as these can be important providers of both means and ends in routine enactment there is reason to believe that the relationship between the representation and the performances of the routine would have implications for routine development, and consequently also for organisational stability and change. While the new product development literature has studied the relationship between design and use of process descriptions and outcomes in terms of, for example, financials, this literature has not unpacked the implications of the complex routine dynamics underpinning the relationship on the routine itself. It also hasn't studied the implications on organisational stability and change more generally: What happens to the organisational routine, its performances or the artefactual representation as a result of how it is enacted?

The aim of the present study is to explore the topic of artefactual routine representations in organisational routines, starting from the fairly broad research question of how artefactual representations of routines shape routine performances. The review of existing research has shown that while there are several studies on this and related topics that provide direction and suggestions, they consider the relationship between artefactual routine representations and routine performances in isolation, separated from the context in which they are set. With the present study I therefore intend to develop and extend existing frameworks to account for the tensions that arise between a rigid artefactual representation and dynamic routine performances in the complex environment in which a new product development routine is enacted within a large multinational organisation.

It has been shown that, from a new product development research perspective, there are under researched topics that warrant further attention. More specifically, these involve how process descriptions are enacted in practice, why this enactment occurs and what its implications are on how a new product development process is performed. From the

perspective of organisational routines research, while the understanding of the general dynamics of routine enactment is well established, the understanding of the role of artefactual representations in those dynamics is still underdeveloped. This is especially the case regarding the tensions between stable artefactual representations and the dynamic context in which they are enacted, as is the understanding of the implications of artefactual representations for organisational stability and change. Hence, further exploring the role of artefactual representations in routine performances will address these gaps and introduce a routines lens and perspective in the new product development literature as well as increase our knowledge on how organisational routines and their artefactual representations affect organisational stability and change.

Chapter 3

Methodology

This chapter introduces the empirical context in which the research is set as well as the methods used for data collection. It also introduces the ontological assumptions on which the research is based and the tools used in the analysis of the data. The resulting coding structure is presented at the end of the chapter.

3.1. Ontological approach

Originating from the practice perspective (Parmigiani and Howard-Grenville, 2011), the theory of internal dynamics of organisational routines relies on a relational ontology (Emirbayer, 1997), meaning that the world is conceived as consisting of processes and the unfolding relations between actors rather than static 'things' (ibid p. 281). As such, its main focus is on actions rather than actors (Pentland et al., 2012). These actions are situated, form temporal patterns and can be carried out by human and non-human actors alike (Feldman et al. , 2016).

The study of internal dynamics of organisational routines builds on the assumption that social phenomena are generative by nature, that is they continue to evolve and develop over time as they are performed (Feldman and Pentland, 2003; Pentland and Hærem, 2015; Feldman et al., 2016). Furthermore, routines, like many social phenomena, contain a duality of structure and agency (Giddens, 1984), which is made possible by the recursive relationship between their mutually constitutive performative and

ostensive aspects (Feldman and Pentland, 2003). As there are multiple actual and potential actions, as well as multiple possible connections and situations, variations in how the organisational routine is performed are likely to occur. This leads to routines being sources for flexibility and change. However, as the patterns created by the actions are, by definition, repetitive and recognizable, the routine can simultaneously provide stability (Feldman et al., 2016).

3.1.1. Assumptions on the material

Process descriptions have been conceptualised as artefactual representations of routines. They are a type of artefact that is introduced with the purpose to guide, direct or decide the actions of actants in particular situations (D'Adderio, 2008). As such, they can ontologically be considered one of many actants involved in the situated actions that form a routine (Feldman et al., 2016). However, the purpose of this study is to analyse how the process descriptions affect the enactment of the organisational routine and they are therefore analysed as separate from human actors (c.f. Leonardi and Barley, 2010).

As artefactual representations of routines (D'Adderio, 2008, 2011), process descriptions can take the shape of, for example, printed manuals, software systems or intranet sites. Sometimes this type of artefact is referred to as 'cognitive artefacts' (Norman, 1991) as they are "…those artificial devices that maintain, display, or operate upon information in order to serve a representational function and that affect human cognitive performance" (ibid p. 17). Artefactual representations are also semi-soft in that they do not physically force anyone to behave in one way or the other, nor does not complying with them necessarily lead to any sanctions. On the other hand, the ways of working described in artefactual representations are also not mere suggestions or recommendations, and therefore non-compliance can still come at a risk.

Looking at artefacts as inherently possessing certain material properties, without necessarily determining how the artefact is put into practice, is described by Leonardi and Barley (2008) who say that "in addition to studying social dynamics such as perception and interpretation, this means paying attention to what a technology lets users do, what it does not let

them do, and to the workarounds that they develop to address the latter" (p. 164). Or in other words, while users can decide how they use an artefact, artefacts still present real constrains and opportunities to how everyday work is carried out. D'Adderio (2011) argues along the same lines, stating that even though artefactual representations of routines can be theoretically bypassed, they are normally not. She argues that there are a few reasons for why artefactual representations of routines are followed. Artefactual representations are, for example, normally embodying certain shared assumptions and rules regarding 'how things are done here' already in their design, implying that actions described by the artefactual representation would normally be carried out that way anyway.

While there are therefore good arguments for why artefactual representations of routines are followed, there are also a few characteristics of artefactual representations that allow or encourage users to break them. Even though the design and use of an artefact can take place at different points in time or space, they must be studied together to fully understand how the artefact interacts with agency and the social world (Orlikowski, 1992; Leonardi and Barley, 2008). The artefact's design will, for example, reflect the intentions and logics of its designers and the context in which it has been created (D'Adderio, 2011). When these logics and intentions do not correspond to those of the users, artefactual rules can wittingly or unwittingly be broken.

The artefact therefore has aspects, such as its meaning and affordances, that are changed or formed as a result of how they are enacted and socially constructed (Orlikowski, 1992; Markus and Silver, 2008; D'Adderio, 2011). However, by acknowledging the material properties of the artefact, we can assume that some aspects of the artefact, such as its design, require too much time and effort to change for this to happen on a regular basis (Tyre and Orlikowski, 1994; D'Adderio, 2011). Nevertheless, "the fact that technologies resist does not mean that users are at the mercy of the technology, only that they must adapt their practices accordingly" (Leonardi and Barley, 2008, p. 164).

For this thesis, this means that 1) artefactual representations are 'real' things with material properties that exist independently of our constructions of them 2) artefactual representations shape, enable and

constrain routine performances, but they do not determine them, 3) the design of the artefactual representation does not just happen, but has been created by people based on their logics and intentions at that particular point in time, and 4) the material properties of the artefactual representation may not be that easily changed.

3.1.2. Methodological implications

Existing studies on process descriptions and new product development are commonly applying a performance optimising-focused approach (for example Barczak et al., 2009). These studies find that process descriptions are positively correlated with certain desirable outcomes of new product development, however, they also black-box the processes through which this positive correlation comes about. Applying a practice perspective allows us to unpack the black box to show how, why and in what way process descriptions affect how new product development is done. By focusing on the practices, we recognise the agency involved in shaping organisational reality (Feldman and Orlikowski, 2011). Instead of focusing on what process descriptions as isolated artefacts lead to in terms of performance, it is possible to study how people use and employ them in practices that subsequently create organisational outcomes. If instead the agentic capacity of the actors is ignored and focus is put on the structure provided by the process description, that is a focus on the artefactual representation itself as a thing with inherent and essential rather than enacted capabilities and properties, it cannot be fully understood why, or why not, certain processes provide certain outcomes and what can be done to achieve one outcome rather than another.

Conceptualising organisational routines as consisting of mutually constitutive and recursively related ostensive and performative aspects also allows for further methodological openings when a distinction can be made between how the process description as an artefactual representation of the routine affects the actions and the patterns of the routine respectively. Using a routines lens to study the relationship between the process description and routine performances implies that insights into how the process description affects the different aspects of routines can be generated. With these insights, an understanding can be gained of how

artefactual routine representations such as process descriptions can be involved in enabling or preventing organisational change or stability.

The unit of observation in this case are the actions relating to the two artefactual routine representations that are the focus of this study, and that are carried out, mainly, within a specific product development project in Global Tech; the Rocky project. This approach implies that it is of less importance whether the actions take place at an individual, team or organisational level. What is important are the patterns and understandings that occur, regardless of where the underlying actions took place or which sociomaterial assemblages were involved in creating them (Feldman et al., 2016). This is consistent with previous studies on organisational routines such as Feldman (2000), Lazaric and Denis (2005), and Danner-Schröder and Geiger (2016), to name a few. In the current study, the observed actions are manifested through speech events, covering both what the actants say in relation to the process descriptions as well as what they say they do.

To study how these actions come about, a qualitative research approach is required that allows for a detailed description of the actions carried out in the enactment of an organisational routine (Glaser and Strauss, 1967; Strauss and Corbin, 1998; Gioia et al., 2013). Close in-situ observation allows for such detailed descriptions of actions as well as identification of the emerging patterns.

3.2. Research context

This study was carried out over the course of 2.5 years within a new product development unit in Global Tech, a large technology infrastructure provider. Global Tech develops and produces equipment and services for a global market. The organisation structure is complex, with development, production and sales sites across the world. Like most things in a corporation of Global Tech's size, new product development is also complex and each development project includes multiple functions within the new product development department itself. These are in turn highly dependent on other departments within the organisation. To add to the complexity, the operations of both the new product development

department and any related functions are spread across many different sites, in different countries and continents, making coordination and communication key for project success.

The empirical context of Global Tech is that of complex systemic capital goods; a type of product that differs from, for example, fast moving capital goods in a variety of ways (Nightingale, 2000). The products and their development process are characterised by a high level of user involvement as well as heavily regulated markets. Products also contain embedded software, thereby complicating the development process further. Due to the high interdependency between components, systems and subsystems, short and effective feedback loops are imperative. Therefore, complex systemic capital goods require more communication to avoid costly rework (Nightingale, 2000).

Such conditions put increased pressure on the product development process in a company like Global Tech. Accordingly, the process description in this type of context is an important tool in reducing uncertainty and ambiguity (Cyert and March, 1963). However, the higher level of uncertainty and unpredictability also leads to more instances in which the process description might fail to provide required guidance (Reynaud, 2005).

3.2.1. Lean transformation

When I first entered Global Tech, they were in the early stages of transforming from a more traditional product development process to one guided by the principles of the Lean-philosophy of management. Since the term 'Lean production' was first introduced (by Krafcik, 1988), extensive research has been carried out within the field of lean as a management philosophy. At the core of the lean philosophy is the difference between resource and customer focus. A resource focused organisation will aim to achieve the highest possible resource utilisation, that is, using its available resources to their maximum capacity, whereas a customer-focused organisation will aim to achieve highest possible flow efficiency, that is, add the most possible value to the unit passing through the organisation at any given point in time. The unit in this case can be, for example, a product, a document or a customer (Modig and Åhlström, 2012). Whereas a resource

focus mainly measures the 'downtime' of the resources in the organisation, flow efficiency measures the 'downtime' of the unit, and, in the end, the customer. The intention is not to entirely ignore the idea of a resource efficient organisation, but rather to combine flow and resource utilisation, thereby improving the overall efficiency of the entity. By combining the three core principles of maximising value, minimising waste (defined as non-value adding activities) and continuous improvement (that is, being lean is not a state, it's an ongoing process in a learning organisation), this can be achieved.

When applying lean thinking to an organisation it is important to look at the processes within the entity from the perspective of the flow unit, ensuring that the unit passes through the organisation and the individual processes on its way as smoothly as possible. In the case of Lean Product Development (LPD), the flow unit is the product under development. Wasteful activities in this case can be excessive reporting requirements, long decision processes or unproductive meetings.

Lean product development can be defined generally as strategic management of the development process through visions and objectives, rather than detailed specifications (Karlsson and Åhlström, 1996). Translated into practice, this means that, for example, process descriptions should focus on the goal rather than listing all the steps that should be taken to get there. The immediate issue in combining Lean and product development is the lack of standardisation and predictability. Successful innovation/new product development is based on knowledge and a combination of creativity and management (Freeman, 1982). As creativity and knowledge are highly variable and unpredictable, this poses a problem from a Lean point of view. The application of lean principles to an environment that is characterised by high variation, unpredictability and uncertainty, as within product development can at first seem contradictory (c.f. Browning and Sanders, 2012).

However, when adjusted for the context, lean product development has shown to be highly successful in many places (Hines et al., 2006; Radeka and Sutton, 2007; Martinez León and Farris, 2011; Browning and Sanders, 2012). The birthplace of all things lean, Toyota, is, for example, well known around the world for its production system, as well as its highly efficient

development organisation. Not only do their cars excel with regard to quality; the company is also famous for its short development cycles (Liker and Morgan, 2006) and the characteristics of the Toyota development system have been well identified in literature (c.f. Liker and Morgan, 2006; Sobek et al., 1998; Sobek et al., 1999; Ward et al., 1995).

According to existing literature on the Toyota development system, there are a few main characteristics that make it so efficient. For example, the development engineers are organised mainly in functional groups that are assigned to cross functional teams for a specific project. The work of the team is led by a Chief Engineer who is responsible for the development and technical integration of the various components involved at all times. This ensures that functional expertise can be kept and developed, even though each project is cross functional.

Another key component is the use of set-based concurrent engineering (SBCE) meaning that the development team works on several feasible design solutions at the same time. As the work moves on, less than optimal solutions are discarded and the set is narrowed down until one final solution remains. This way of working ensures that, at any point in time, the remaining solutions are achievable for all departments involved. Hence, the design process will always be able to move forwards instead of iterating back and forth as will most likely be the case when only one alternative is processed (For a more detailed description of SBCE, please see, for example, Ward et al. (1995) and Sobek et al. (1999)). Similar to the production system, the development system at Toyota has been developed over a long period of time to suit the specific needs and characteristics of the particular company. Therefore, what works for Toyota, might not work for another company.

Global Tech followed the recommended guidelines when 'going lean'. They put up whiteboards that would facilitate visualisation and information exchange. They appointed a chief engineer for each project and made the project teams more cross functional. More importantly, for the context of this thesis, some people were put on the task of investigating the process descriptions dictating how product development work should be carried out in Global Tech. These groups and/or individual members of staff were given the job to investigate how the current process descriptions could be

made to fit into the 'new', lean organisation. This meant that the processes were, at least for some people, brought to the surface for mapping, questioning and change.

3.2.2. The Rocky new product development project

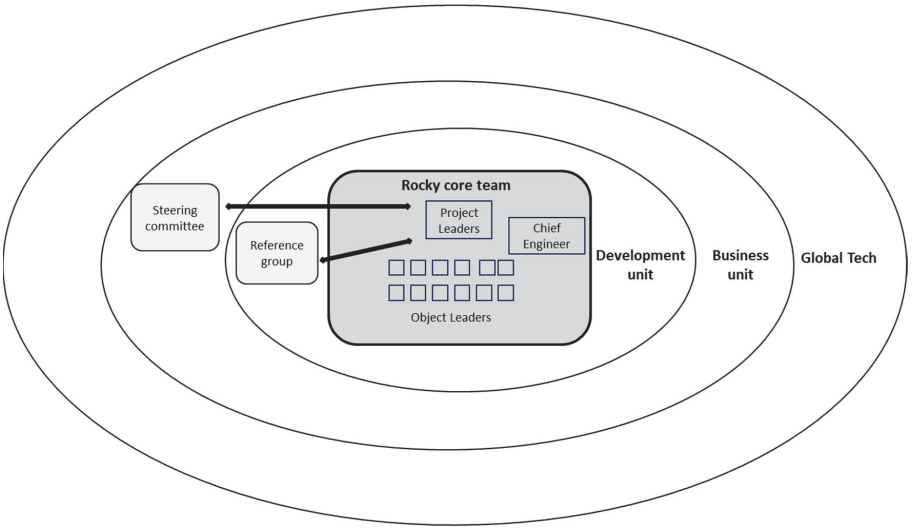
The data for this study mainly consists of observations of the work carried out within the Rocky development project. The execution phase of the Rocky project started in early 2015 with the aim of developing a new generation platform product. By Global Tech standards, the product specification given to the project team was considered to be a major technological step compared to the rather incremental product variation projects that were common in the organisation.

The unit of study has been the core team of the project as well as its interactions and interfaces with the surrounding environment. The team mainly consisted of two to three project leaders, one chief engineer, and object leaders representing the twelve sub-parts of the project, even though team composition changed slightly over time. Of the object leaders, seven focused on the development of the different components that together constitute the end product, and five worked with surrounding functions such as purchasing, production and requirements handling. As each of these parts had one or two representatives in the core team, the team could at times consist of as many as 22 people. The team was smaller in the beginning and increased in size over time as the scope of the development project was extended to include the development of more product variants.

To support the project 'from above', a reference group consisting of line managers from the different functions within the development unit was formed. The reference group met with project leaders and the chief engineer on a weekly basis. These meetings were also included in our study as they show the interaction of the Rocky project with the next hierarchical level. Decisions regarding staffing were taken in this forum along with recommendations for gating decisions on the wider business unit level. The actual gating decisions were however taken by a steering committee consisting of the heads of the business unit, based on presentations by the project leader(s). We participated also in one of these steering committee meetings. For a visualisation of the structure in which the Rocky project

and its core team was operating, please see Figure 1 as well as Table 1 and Table 2 for a description of the different roles and types of meetings attended.

Figure 1. Empirical environment - Rocky within Global Tech



3.2.3. The process descriptions

New product development in Global Tech is carried out according to a wide array of processes and subprocesses. These govern how the development process should progress, which requirements should be fulfilled, and which mandatory gates the project must pass through on its journey towards a finished, sellable product. These process descriptions, or artefactual routine representations, are physically manifested in process descriptions on the intranet as well as in the many information-systems that control, structure and enable the product development projects in Global Tech. The core team of a development project in Global Tech will thus have to relate to several artefactual routine representations at different levels and at different points in time.

Table 1. Roles in the Rocky project team

Role	*Description*	*#*
Project Leaders (PM)	Overall responsibility for the project, the budget and time plan. Responsible for presenting the status of the project in connection with gating decisions.	Two people at the start of the project, three towards the end
Chief Engineer (CE)	Very knowledgeable about the technology of the project. Has overall responsibility for connecting all technical areas of the development project.	One person
Object Leaders (OL)	Responsible for the different sub-areas of the project. Seven of these areas are technical, related to each of the subcomponents of the product under development. Two areas relate to requirement handling, one relates to documentation handling and system updates, one production and one purchasing.	Each sub-area has one or two object leaders. Two areas are located in a different city and/or country to the rest of the team.
Core team	The project leaders, object leaders and chief engineer of the project.	15-20 people
Reference group	Consists of the relevant line managers connected to the development project. This group acts as support and advisors to project leaders. As they are the responsible managers for different areas of the project, they are also the ones handling the project's staffing requirements. Recommends gating decisions to the business unit steering group	20+ people invited to the meetings. However, in reality the group consists of a core of 10-15 people that are expected to participate.
Steering Group	Consists of the business unit heads. Manages the overall development portfolio of the business unit. Takes gating decisions following a presentation by the project leaders and a recommendation from the relevant reference group.	20+ people invited.

Table 2. Types of meetings

Meeting	*Description*	*Participants*
Stand-up meeting	Twice-weekly morning meetings involving the project core team. The meeting lasts 20 minutes and takes place in front of the project white board. The object leaders briefly mention and discuss their tasks and issues for the coming two weeks. Main purpose is to highlight dependencies between areas and assign tasks accordingly.	Core team
Core team meeting	Weekly one-hour meeting involving the core team of the project. Here discussion is allowed to go deeper than in the stand-up meetings. This meeting also deals with overall project issues related to time plan, overall project status and resource allocation.	Core team
Problem report meeting	Meeting in which all open problem reports are discussed. Should involve the entire core team but, in reality, attendance is low. Technical problems are not discussed, only the reports they resulted in. Problem reports are assigned to individuals and a due date for the task to be solved by is set.	Core team + representatives for the problem report handling function
Integration event	Took place eight times during the course of the project at dispersed intervals. Involves more representatives from each area as well as some auxiliary areas. The integration event lasts four-five hours during which time all areas present their current status, open issues and dependencies.	Core team + others
Reference group meeting	Weekly meeting between project leaders and the reference group. Project leaders present current status and open issues. The reference group advices on how project leaders should proceed, and if they can assist by 'pulling strings' and solving staffing issues. Recommends gating decisions to the business unit steering group. Project specific.	Project leaders, chief engineer and line managers for the involved areas.
Steering group meeting	Meets on a regular basis to deal with overall portfolio issues and decisions for the business unit. Relates to the overall business unit rather than the specific project. Takes gating decisions according to NPD Decisions Directive.	Business unit heads + presenting project leaders

Two of these, NPD Operations Directive and NPD Decision Directive, are particularly salient for the ongoing work in the project. These two are formal instructions for the sequence in which products are and should be developed, which stages the product development projects should go through, and what the requirements and tasks for each stage are. NPD Operations Directive dictates the everyday operations of the new product development project team, whereas NPD Decision Directive concerns gating decisions taken on a business unit level (see Figure 1). The instructions demand adherence to the directives through the extensive use of gates and status points that allow the project to proceed, or not. If you work in a product development project at Global Tech, these are the rules you are instructed and expected to follow.

The process descriptions have a strong focus on status codes reflecting the project's progress, documents and checklists. The directives are written in such a way that output is defined as documents; project status corresponds to document review status; and problems are considered unsolved until the corresponding document has been updated. To an outsider it is striking how much of new product development is centred around documents at Global Tech. Internally there is some awareness of this as well. When one member of staff was put on the task of mapping how the new product development process was supposed to flow according to the NPD Operations and NPD Decision Directives she exclaimed: "Apparently, we don't develop products in this department, we develop documents!"

NPD Operations Directive

NPD Operations Directive (see Figure 2a and 2b) directs the activities carried out on a day-to-day level in the development departments. It splits the new product development process into five parts that new product development projects move through sequentially. When completing one of these sub-processes, the product is said to pass a Status Point (SP1, SP2 etc) and is given a specific design status code (DS1, DS2 etc.) depending on which sub-process has been completed.

The NPD Operations Directive applies to the final product, as well as to the different parts of it, so that component X could have passed SP1 and component Y SP2. Depending on which version of the product / component the status point relates to, the codes are expressed as SP5A, SP5B etc. To be able to measure and identify if a certain SP has been reached, revision statuses of product documents are used as proxies for product status. All documents and their revision status are summarised in a special master document, from now on referred to as the X1A, which is also one of the key outputs of the process according to NPD Operations Directive. The purpose of this document according to its formal description is:

> It is the key and entry document for a product. It gives an overview of the product documents and makes it easier to get a concise picture of these documents for various product revision states. It also minimises the risk of handling wrong document revision state for a document related to a certain product revision state.

The definition of the final design code given when the product is ready for release is:

> Design is verified and documentation complete. All documents (all product information) have been reviewed, approved, registered and released and are now available.

NPD Decisions Directive

NPD Decisions Directive (see Figure 3) describes the formal gating process used by business unit management to make informed go/no-go decisions at set points during a development project. The explicit purpose of the process is

> …to provide a common language and framework for development decisions to facilitate cross-organisational collaboration. The [process] supports the requirement area concept in the development unit where we take decisions on complete [products], covering [all parts of the final product], from opportunity analysis to general availability.

Figure 2a. NPD Operations Directive

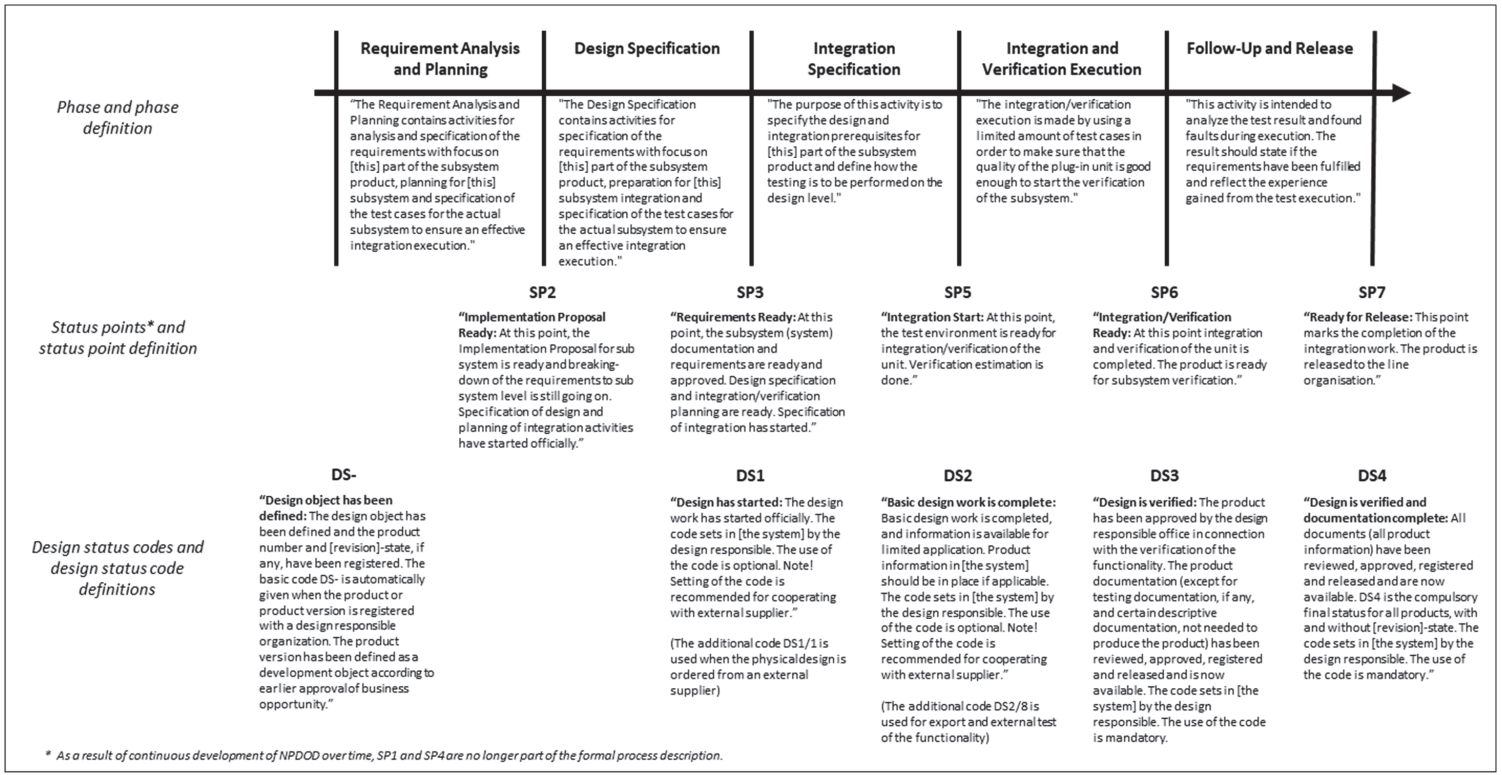
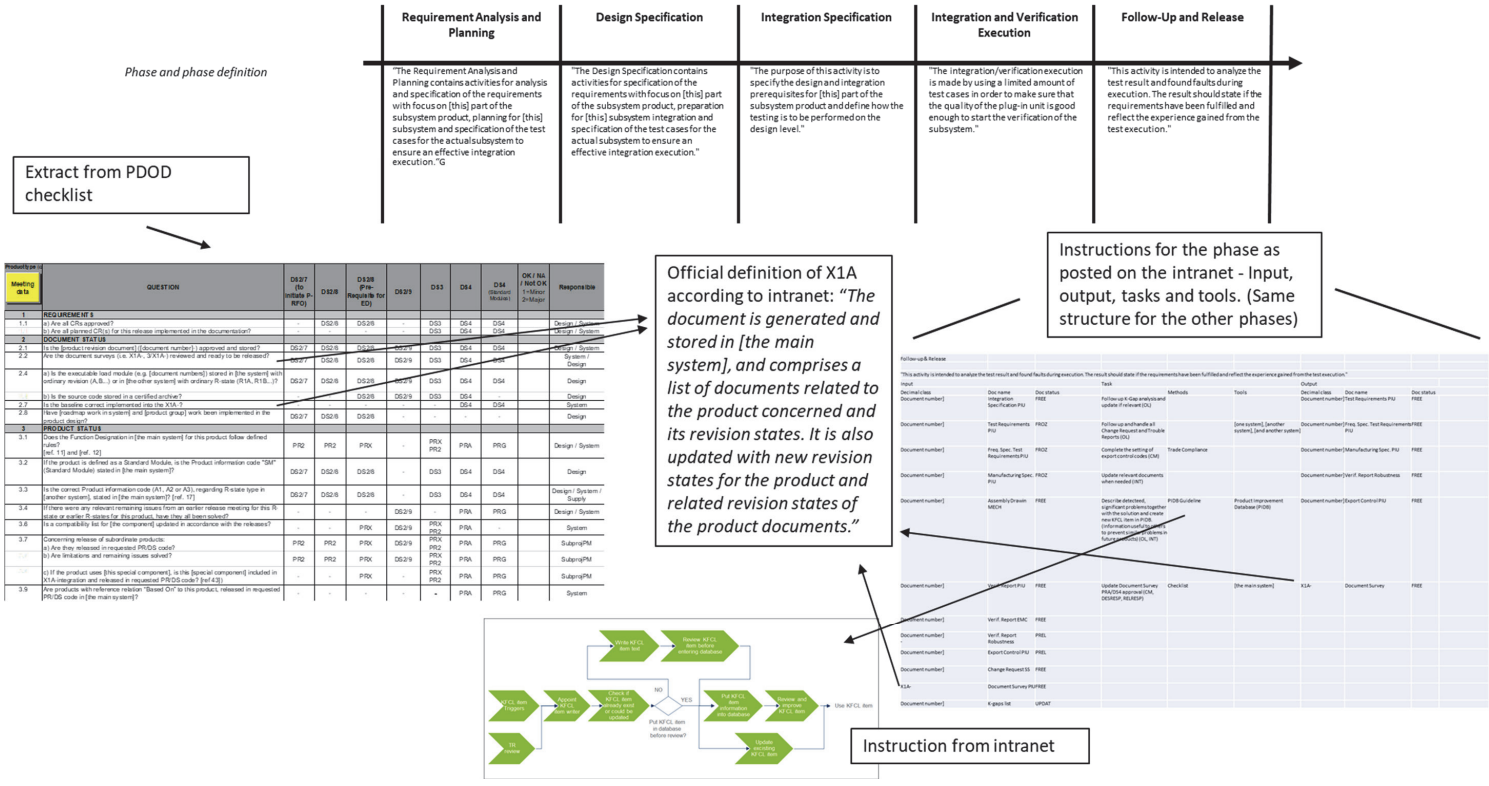


Figure 2b. NPD Operations Directive, continued (for full-size figures, please see the Appendix)

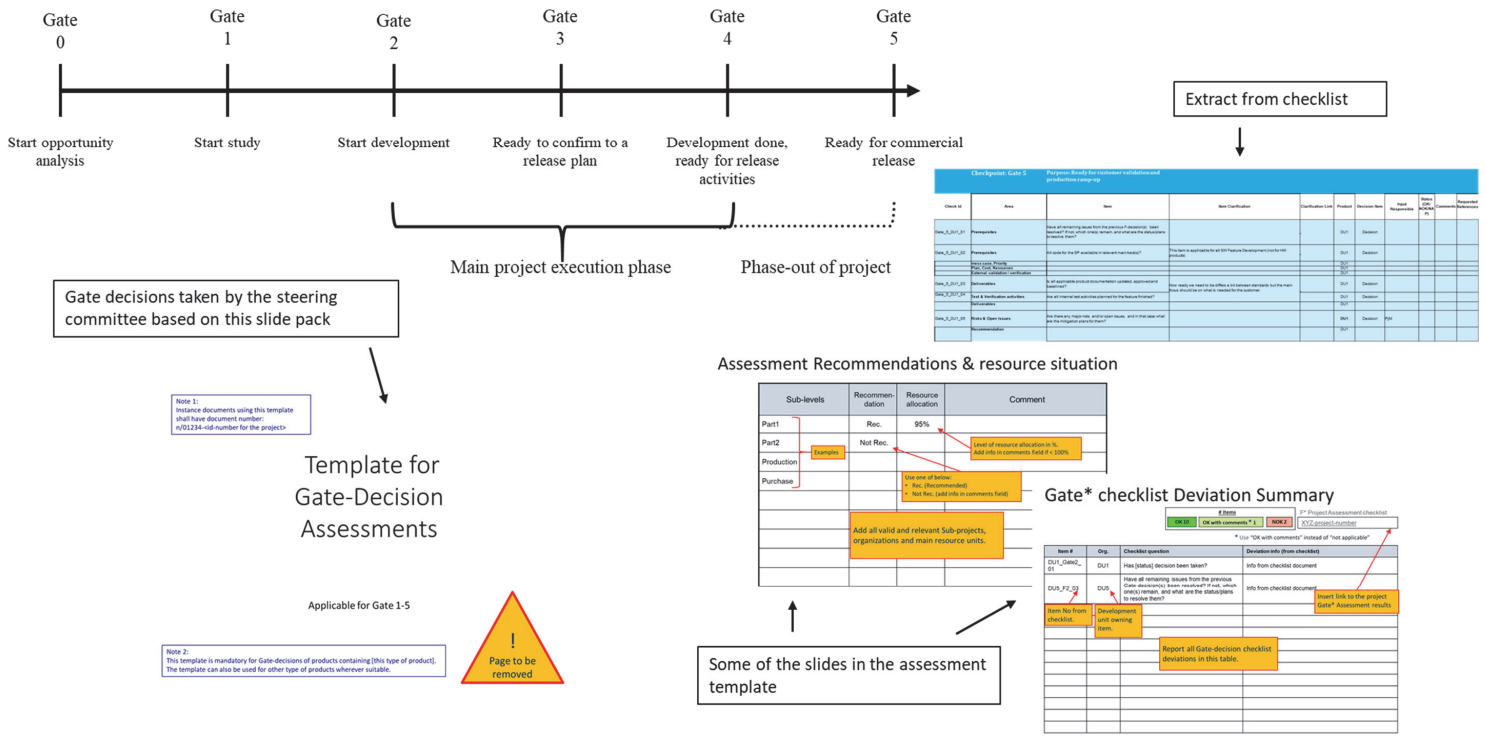


Decisions according to this process are taken in large steering committee meetings in which the project manager(s) of a development project present the project status to business unit management. Formally, the decision taken by this group should be based on, for example, open knowledge gaps, perceived risk and expected return of the project. In reality, the development unit reference group (see Figure 1) will make a recommendation of whether to let the project pass the gate or not and the business unit steering committee rarely goes against this recommendation.

As mentioned above, NPD Decisions Directive covers the complete development process from opportunity analysis to release of the product for general availability. Hence, the execution part of the development project is only a part of the process covered by the directive. The temporal distance between the gates varies from project to project. In a typical project there is a significant period of time between Gate 2 and 3 and less of a distance between Gate 3 and 4. The main part of the project team will leave the project around Gate 4 and the rest will be phased out between Gate 4 and 5.

NPD Decisions Directive is a tool through which the business unit controls and manages its overall portfolio of new product development projects. As such it is a high-level process that the project team members will not have to directly relate to on a day-to-day basis the same way they do with NPD Operations Directive. The project managers inform the rest of the team when the next gate is approaching, and they will all engage in checklist clean-up activities accordingly. After a gating decision has been taken, the rest of the team is again informed by the project managers as part of the weekly core team meeting.

Figure 3. NPD Decisions Directive (for full-size figures, please see the Appendix)



3.3. Research design

Research started off with empirical observations and puzzles to which there was not a satisfactory explanation in existing theory. When carrying out inductive research like this, grounded theory provides a useful framework for how to relate to the data (Glaser and Strauss, 1967). As grounded theory regards all statements about events in the area of study as data, it is highly suitable for exploratory research where data collection can be deliberately wide and where the data is allowed to set the agenda for further data collection rather than any preconceived theoretical ideas. This leads to an iterative process where the researcher can move between data collection and theory and back to data collection as the work proceeds. When achieving the right balance between theory and data, the researcher can thus allow him- or herself to be informed by existing theory without letting it overshadow or drive the data in any way. As such, the grounded theory approach is useful when developing new, or extending old, theory rather than testing prior hypotheses (Glaser and Strauss, 1967; Strauss and Corbin, 1998; Gioia et al., 2013).

Grounded theory can be successfully applied to social units of any size. In this case the social unit consists mainly of the team in the Rocky new product development project at Global Tech. This qualitative research methodology assumes that the researcher is "… a highly sensitised and systematic agent…" (Glaser and Strauss, 1967. p.251) who has the ability to use personal insights and draw conclusions through structured comparative analysis. The approach is especially suitable for the analysis of how people make sense of complex situations (Suddaby, 2006) and translate them into purposeful action. It is also suitable for the analysis of process data when, as in this case, the aim is to analyse "… a more micro level to explore the interpretations and emotions of different individuals or groups living through the same processes" (Langley, 1999, p. 700).

Since the concept of grounded theory was originally introduced in the 1960's (Glaser and Strauss, 1967), innumerable articles and books have been written on the subject spelling out how grounded theory should, and should not, be used as a methodological tool. I have primarily used one of

these papers, Gioia et al. (2013), as guidance in my data collection and analysis.

3.3.1. Data collection

The data collection for this thesis consisted of two stages, both carried out within a new product development department at Global Tech (please see Figure 1, for an overview of the structure of Global Tech). The first stage, the pre-study, started in 2013 when I first entered Global Tech and focused on getting to know the organisation as well as their particular issues and challenges. The second stage, the main study, started in early 2015 and evolved around the specific Rocky development project and their routine performances. The two stages overlapped slightly in terms of time and scope. However, whereas the search during the first stage was intentionally wide and spanned the whole development unit and the issues surrounding the overall lean change initiative, the second stage focused on one development project within the development unit and the daily interactions within that project rather than the overall organisational change process.

During the first stage, data was collected through participation in workshops and other events related to the change effort, as well as interviews and informal chats with key members of the organisation. The meetings were either audio recorded or reported with extensive notes or both, depending on the character of the specific meeting. The second stage consisted mainly of observations from the Rocky team meetings which were also audio recorded and reported with notes. (Table 2 provides a detailed account of the types of meetings in which I participated, and Table 3 shows how the specific meeting types were recorded.) During this stage, interviews were used mainly to clarify or verify observations from the meetings. To ensure that the interviews would reflect the voice of the informant rather than my own (Gioia et al., 2013), all interviews were very loosely structured, departing from either questions arising from my own observations of a specific phenomenon or from the interviewees experiences with a specific context or situation. To be able to concentrate on the person I was talking to, I took very few notes during the interviews. Instead they have been recorded and transcribed verbatim.

Table 3. Data collection

ROCKY		
Type	*Documentation*	*Amount*
Interviews	Audio recording, notes	4 x 1-2 hrs
Core team meetings	Audio recording, notes	21 x 1 hr
Reference group	Audio recording, notes	9 x 1 hr
Stand-up meetings	Notes	26 x 20-30 mins
Steering group	Audio recording, notes	1 x 1hr
Project leader shadowing	Audio recording, notes	80 hrs
Integration events	Audio recording, notes	5 x half day - full day events

NON-ROCKY		
Type	*Documentation*	*Amount*
Interviews	Audio recording	9
NPD Decisions Directive	Audio recording, notes	20 x 1.5-2 hrs meetings
General change initiative	Audio recording, notes	14 half day – full day events
Other	Audio recording, notes	12 x 1-1.5 hr meetings

INTERNAL DOCUMENTS		
Type	*Subject*	*Source*
Formal process description with attachments	NPD Decisions Directive	Intranet, design group
Formal process description with attachments	NPD Operations Directive	Intranet
Survey results	NPD Decisions Directive	Design group
Workshop presentations	Change initiative	Intranet, change drivers

Pre-study - Problem identification

With the initial aim of investigating an organisation transitioning to the principles of lean product development, my focus, at the outset of the data collection process, was to familiarise myself with Global Tech and their ways of working. The observations made during this stage eventually formed the empirical puzzle that subsequently lead to the three research questions presented in previous chapters. During the early stages of the research process, data collection was exploratory, and I allowed myself to go where the observations took me rather than to be driven by specific tentative research questions. While the focal point and context at this early point in time was lean transformation, as my understanding of the organisation increased and the observations answered some questions as well as raised new ones, the forms of data collection evolved over time and can best be described in three parts as below.

Drivers and inhibitors of change (2013-2015)

The focus of the study at this point was to identify the ways in which the development unit changed, or didn't change, as part of the lean transformation, and the impact it had on the quality of the product development process. During the initial phase, data collection consisted of regular catch up interviews and informal chats with the change driver of the business unit as well as other key people involved in or around the project. During this part I also regularly participated in the launch of 100-day change programs as well as their 30, 60 and 100 day follow-ups as well as many workshops and meetings related to the lean transformation initiative at large. These activities mainly served to contribute to my own understanding of Global Tech as a company. Nonetheless, while participating in these activities, I also noticed organisational issues such as a strong perception among the staff that 'things don't change easily around here', doubt in the commitment of management to change from a resource

focus to a lean flow focus, and a large perceived distance between new product development and customers. The complexity of the organization, and the issues this brought with it, became apparent, and initiatives that would at first glance look straightforward became complicated when they got entangled in the structure of the organisation and its existing processes.

New product development in Global Tech (2014-2015)

To get a deeper understanding of where the organisational issues identified in the first part emerged from, I shifted focus towards the new product development process itself. During this period several interviews with project leaders of recently finalised projects were carried out. Some of these projects had been considered a success and some a failure (even though they had all managed to develop a new product in the end). The reason for the failures seemed to be a general underestimation of how complex the projects actually were. There was a high resource utilisation involved in the projects and when issues appeared, there were not enough resources in place to deal with them. This resulted in lengthy reworks and taskforce type operations which would also affect all other currently ongoing projects. Overoptimistic planning by both project leaders and department managers was identified as an overall issue at this stage. Work was also carried out on the process descriptions directing new product development operations. Those involved in this work claimed that the processes were important for determining how new product development was carried out in the organisation. However, others claimed that "nobody follows the process anyway" or that "the others follow this process, but I don't".

Process descriptions (2015-2017)

At this point I was introduced to the process descriptions used to describe and direct how new products are developed in the organisation. Data collection consisted mainly of participant observations from the weekly two-hour meetings within the group that was responsible for the development and deployment of the NPD Decisions Directive. When I first entered the group, they focused on developing a survey that would evaluate the first year of implementation of NPD Decisions Directive. The results of the survey, that were aggregated, analysed and presented to

management, showed that the understanding amont the users of the purpose of the model and knowledge of how the Directive worked was lower than expected.

After the report with the survey findings was published, a larger group got together for a workshop with the aim of initiating work to rectify the issues that had surfaced. The results of this workshop were not, however, followed up on. Nonetheless, the team that had developed NPD Decisions Directive continued their work. Focus had by now moved from developing the survey and analysing the results, to actually improving the directive. The way this was to be done was to go through the checklists for the various decision points in the directive in order to reformulate, add to, or remove items. Even if all members of this team (which had by now increased in size to include representatives from other functions related to the new product development process), agreed that the enactment of the model was too checklist focused, the team was only talking about which items should be in the checklist and how these should be formulated. The discussions quite often turned to what the decision points *actually* stood for and what that meant in practice. Agreement on this was never quite reached; yet, somehow the checklists were developed, approved and changed as a result of these discussions. At some points the group didn't even agree on whether the model described products or projects. By the end of 2016, two of the founding members of the team (one of them the chair of the meetings) left the organisation and went into early retirement. Following that, the group disintegrated and responsibility for the development and continuous improvement of the directive was temporarily put on hold.

Even though I entered the group to assist them with the survey, I quickly turned my focus to the issues surrounding the design and implementation of the process description as an artefact in the organisation. The initial survey provided insights into how the process description was perceived in the organization. Participating in the group meetings provided insights into the designers' intentions with the process description, as well as how they moved from the intentions to the final design of the NPD Decisions Directive. A key observation from this setting concerned the relationship between the intentions, design and enactment of the process description.

When I later got introduced to the lower level process, NPD Operations Directive, I saw that the relationship was different. NPD Decisions Directive was, according to the survey and the members of the group, mostly enacted in line with its design, while neither design nor enactment seemed to reflect the intention behind it. The view of the group was that the actors also frequently interpreted the intention of NPD Decisions Directive differently to what was explicitly stated in the designer's brief. Nonetheless, even though this misalignment had been identified, the design didn't change accordingly.

NPD Operations Directive showed a different type of misalignment. In this case, the design didn't reflect the intentions, while the actors to some degree followed both design and intentions. However, sometimes the tensions between design and intentions became too strong and the actors had to choose which one to adhere to. Sometimes they went with the intentions and sometimes they went with the design, and it was not evident why they chose one over the other. Again, the design didn't adjust significantly, so the actors had to keep on releasing these tensions by dynamically relating to the process descriptions and seamlessly transitioning between following and breaking it.

As part of my efforts to understand the organisation and the new product development process, I had been introduced to the Rocky project already in 2015 to closely study how a product development project in Global Tech was carried out. However, triggered by the observations described above, and in light of the previously identified gaps in existing research, the second part of the research process was initiated. This constituted a more systematic analysis of the practices observed within the frame of the Rocky project, specifically into the process descriptions and their role in shaping the actions and emerging patterns.

Main study

Rocky (2015-2017)

I entered the Rocky project when the execution phase had just been initiated in February 2015 and followed it until the project reached a product release decision in autumn of 2017. During this time, three focused data generation efforts were performed, even though the project was

loosely followed in between these. The first of these efforts consisted of a total of five months spent at the beginning of the project attending stand-up morning meetings twice a week, project core team meetings once a week as well as two large integration events (the total amount of meetings attended is listed in Table 3). Thorough notes were taken and the meetings were recorded. After this initial period, regular contact was maintained with the project through attendance at integration events every 2-3 months as well as attendance of the regular team meetings about once a month.

A second major round of data collection was undertaken for four months, between February and May 2016, focusing on following core team meetings and integration events. The final data collection period started in February 2017 and lasted until the Rocky project wound down, in autumn 2017. During this time, data collection was intensified to also include the weekly one-hour reference group meeting with project leaders and relevant line managers. I also spent two weeks on separate occasions shadowing one of the project leaders, joining him to all his meetings and listening in on most of his conversations. These one-week sessions provided full insight into the daily activities of the Rocky project team especially as the project leaders and team members were very generous with their time and allowed for follow up questions and gathering of additional contextual information after each meeting. As before, extensive note-taking was combined with audio recordings.

In those contexts where I was not already known to those present, I or one of the project leaders would normally introduce me as a "researcher from the Stockholm School of Economics", even though one of the project leaders normally referred to me as "the Fly" (on the wall). In general, my presence in the meetings was barely noticed and there is no reason to believe that the participants in any way changed their actions due to me being there, even though this cannot be entirely ruled out. In the beginning quite a lot of fun was being made of my fairly fast and incessant typing, even though, eventually, they got used to that too. One of the project leaders even said when I had been away that "I can't concentrate in the meetings when I don't hear your typing". Hence, I was very much treated as a team member and was invited along to lunch and coffee as well as allowed to participate in the small talk and gossip around the office.

Over time I got to know the team members quite well and could also notice such things as irregular behaviour or changed energy levels between types of meetings. These observations and other personal reflections were registered in my own meeting notes, clearly marked with 'my thoughts'. This meant that I could also follow the development of my own thoughts and the questions they led to over time.

To supplement the observational data, a total of twelve semi-structured interviews were carried out with project team members as well as other staff involved in new product development in Global Tech. These provided additional insight into and understanding of the context that the Rocky project was operating in.

Data collected beyond Rocky (2015-2017)

However, given the inductive and exploratory nature of the research, I also allowed myself to pursue lines of inquiry that were not strictly Rocky-related. As mentioned earlier, this meant that I followed the group responsible for developing and deploying one of the process descriptions during 14 months. After having been approached to help the group with the design of a survey, I participated in the weekly meetings of the cross functional team created for the development and implementation of an updated version of the process description NPD Decisions Directive. Over the 14 months I followed this group, they distributed the survey (156 respondents within the department) evaluating the use and understanding of the updated decision process a year after its initial launch.

The data from these meetings were mainly collected by extensive note taking. However, when the discussion became too intense for me to keep up with or when the issues became too technical or specific for me to fully understand, I would also audio record to be able to analyse afterwards. I have also had full access to the survey results and the subsequent report as well as all checklists and other documentation related to both the NPD Decisions Directive and the NPD Operations Directive. This allowed me to get insights into the designer's thoughts and intentions behind the material properties of the process descriptions, thus providing a different perspective and better contextual understanding.

Following a standard meeting within the frame of Rocky, I also got involved in a separate process-focused discussion on the management of problem reports which gave me rich data on a subprocess to NPD Operations Directive. This data has also been included in the study.

3.3.2. Data analysis

Following the principles of grounded theory (Glaser and Strauss, 1967; Strauss and Corbin, 1998) and the Gioia-methodology (Gioia et al., 2013), the analysis of the collected data focused on the informants and what they did, said and said they did in the context of new product development and the following of NPD Operations Directive and NPD Decisions Directive. The analysis was done in NVivo and the first step was to code everything that was directly or indirectly related to the enactment of the artefact, the process description, in accordance with Glaser and Strauss, (1967). This included instances such as the team directly referring to NPD Operations Directive or NPD Decisions Directive and also when they referred to artefactual requirements or their derivatives such as product status codes, document statuses or deadlines. This coding also covered events in which the artefactual representation was enacted even though it or its related attributes were not explicitly discussed.

A second round of coding was then performed where the coded data was labelled according to the type of action it expressed or referred to. This round corresponded to what Strauss and Corbin (1998) call open coding in that it coded passages of speech or interaction with the question "what is the major idea brought out in this [passage]?" in mind (p. 120). The labels therefore often took the form of abbreviated quotes such as "easier to talk about if we have a problem report", or "all the documents have to be in order so that there are no stoppers", even though they could also be descriptive such as "project manager doesn't believe in plan". Many of the coded snippets of data would also bring with them an attached memo that covered my own thoughts and reflections around the particular passage (c.f. Glaser and Strauss, 1967; Strauss and Corbin, 1998). This round generated more than 120 unique codes.

Following the guidelines from Gioia et al. (2013), axial coding was then applied to "…begin the process of reassembling data that was fractured

during open coding…" (Strauss and Corbin, 1998; page 124). These codes were assessed along dimensions such as which part/parts of the process description they referred to (status codes, document review status, the process description as a whole), whether they referred to breaking or following the requirements of the process description and whether the passage implied tensions between the process description and what the team members thought of as efficient product development, to mention a few. After this process, the 120+ codes were grouped into 35 empirical observations that were subsequently aggregated into 16 first order concepts.

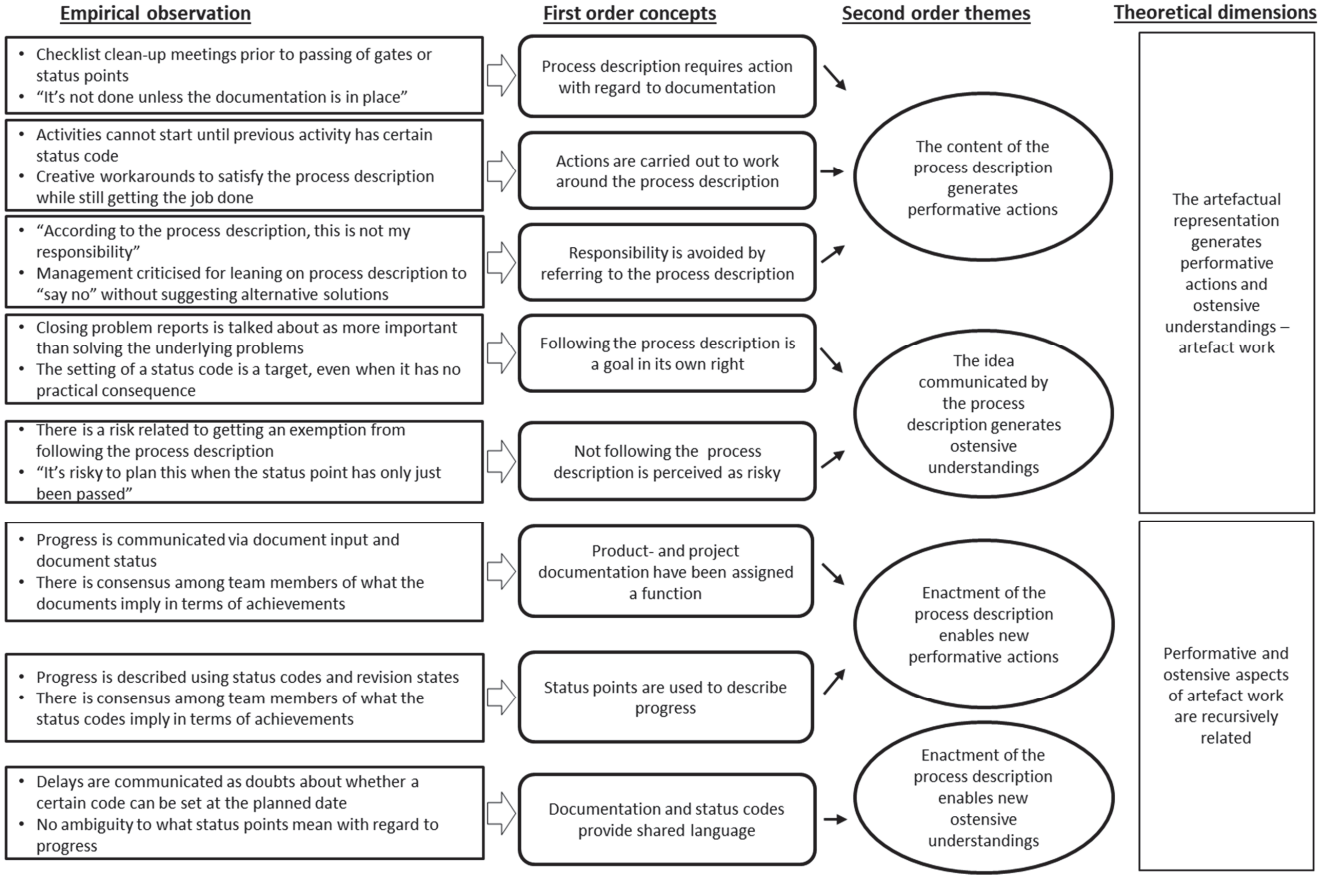
Throughout the coding process the research questions were also developed and refined. While I started out with the general question of "How do artefactual representations shape routine performances?", as the data collection and analysis progressed, more questions arose. An example of this process was when I first saw that the actors seemed to perform artefact work and task work in separate routines. This observation led to the question "why does this happen?". The answer was that "it seemed to be a way of coping with tensions between artefactual representation and task requirements" which then led to the development of research question 2, "How are tensions between dynamic routines and stable artefactual representations coped with?".

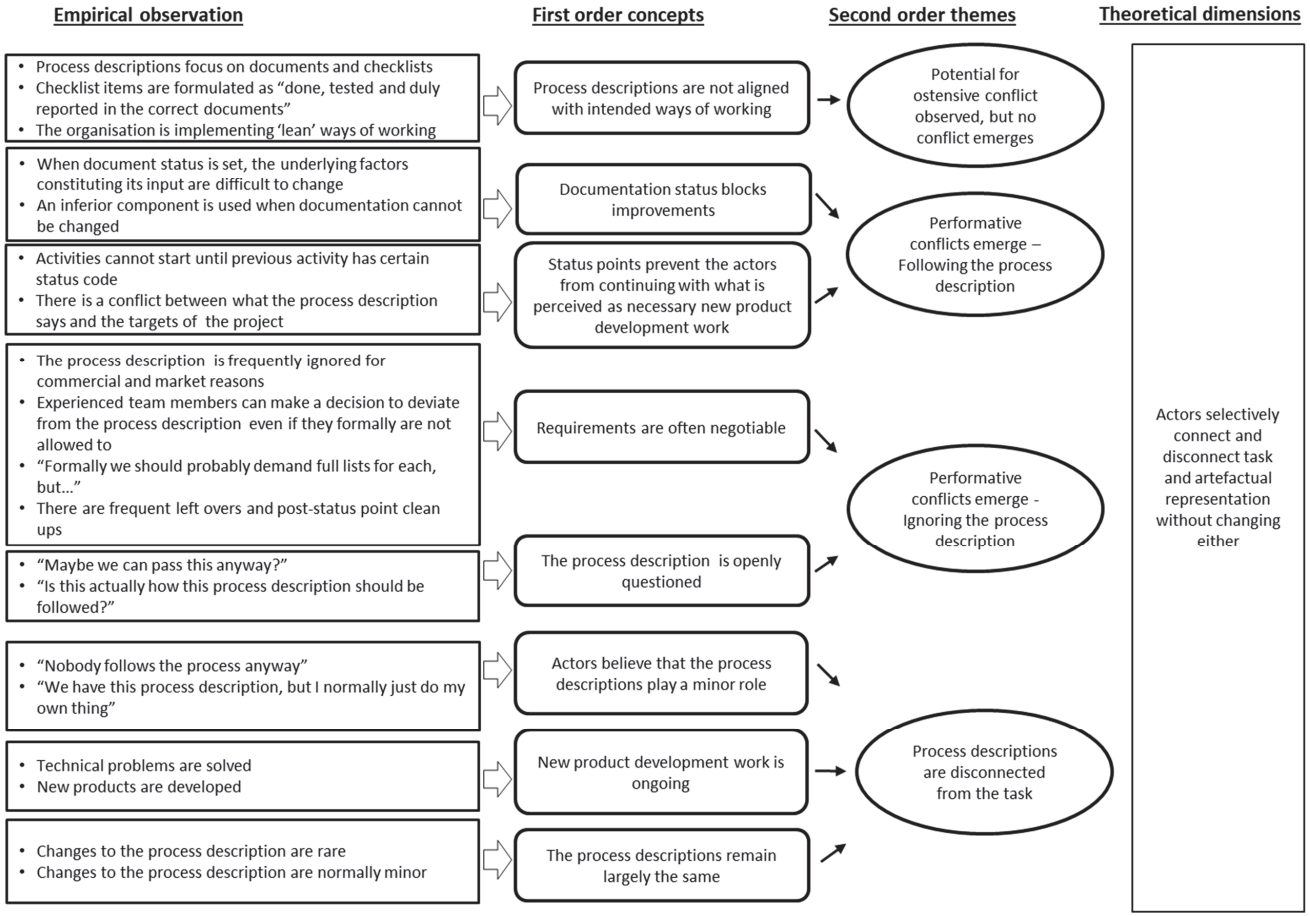
When analysing the first order concepts asking the question "What is going on here" (Gioia et al., 2013) at the next, more theoretical, level of abstraction a set of eight second order themes were identified. These were still of a largely empirical nature, yet reflected my interpretation as a researcher. For example, "the idea communicated by the process description generates ostensive understandings", "potential for ostensive conflict observed, but no conflict emerges", and "process descriptions are disconnected from the task". The process through which second order themes have been reached along with examples of the underlying data are described in more detail in Chapter 5.

At this stage of the analysis I applied the lens of organisational routines theory. When analysing these themes through the lens of routines theory, I identified a pattern that subsequently developed into the theoretical dimensions showing the ways in which the artefactual representation of the

routine, played a direct or indirect role in routine dynamics. How these theoretical dimensions emerged and how they developed into the proposed model is described in detail in Chapter 5 and 6. The first order concepts, second order themes and theoretical dimensions were organised in a coding structure in accordance with Gioia et al. (2013). (Please see Figure 4 for the resulting coding structure.)

Figure 4. Coding structure




Empirical observation
First order concepts
Second order themes
Theoretical dimensions
• Process descriptions focus on documents and checklists
• Checklist items are formulated as "done, tested and duly reported in the correct documents"
• The organisation is implementing 'lean' ways of working
Process descriptions are not aligned with intended ways of working
Potential for ostensive conflict observed, but no conflict emerges
• When document status is set, the underlying factors constituting its input are difficult to change
• An inferior component is used when documentation cannot be changed
Documentation status blocks improvements
Performative conflicts emerge – Following the process description
• Activities cannot start until previous activity has certain status code
• There is a conflict between what the process description says and the targets of the project
Status points prevent the actors from continuing with what is perceived as necessary new product development work
• The process description is frequently ignored for commercial and market reasons
• Experienced team members can make a decision to deviate from the process description even if they formally are not allowed to
• "Formally we should probably demand full lists for each, but…"
• There are frequent left overs and post-status point clean ups
Requirements are often negotiable
Performative conflicts emerge - Ignoring the process description
• "Maybe we can pass this anyway?"
• "Is this actually how this process description should be followed?"
The process description is openly questioned
• "Nobody follows the process anyway"
• "We have this process description, but I normally just do my own thing"
Actors believe that the process descriptions play a minor role
• Technical problems are solved
• New products are developed
New product development work is ongoing
Process descriptions are disconnected from the task
• Changes to the process description are rare
• Changes to the process description are normally minor
The process descriptions remain largely the same
Actors selectively connect and disconnect task and artefactual representation without changing either

Chapter 4

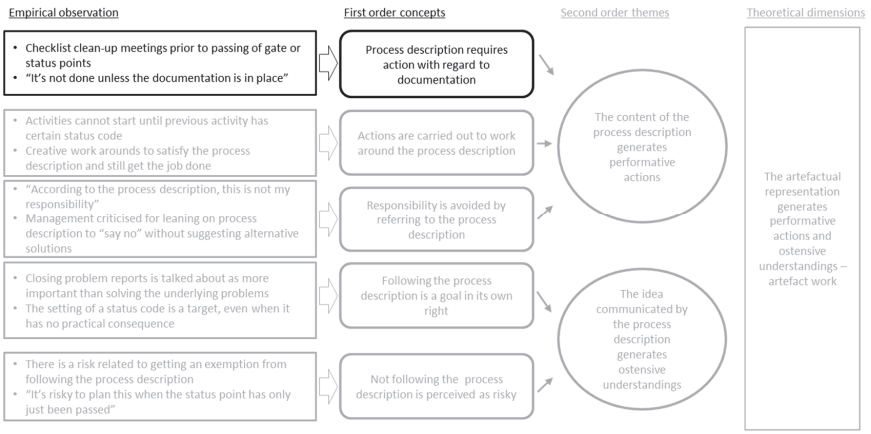
Observations – First order concepts

When observing the work in the Rocky project, I noticed that the members of the new product development projects in Global Tech relate to the process description, that is the NPD Decision and NPD Operations directives, and the documents and checklists that they say are to be produced, in a variety of ways. While the projects were typically successful in developing new generations of products, albeit not always on schedule, I also observed that the requirements of the process descriptions were sometimes in conflict with the goals of the actual product development project. Members of the product development projects had to relate to the requirements of the process description, the artefactual representation of the routine (completing documents), as well as the original intention of the routine (developing good products) simultaneously. Furthermore, they had to do so when these were both aligned and when they were not. Hence, the process description could, in this case, simultaneously affect routine performances in several different ways. When systematically analysing the data, a few main empirical concepts related to this enactment of the artefactual representation, were identified. This chapter is structured thematically and presents narratives or extracts from conversations to illustrate these empirical concepts. As a reminder for the reader, the parts of the coding structure relating to each concept have been included as an introduction to each section.

This chapter describes the findings in terms that are close to the empirical setting (in accordance with recommendations for research

informed by the principles of grounded theory, for example Gioia et al., 2013) I will use the term 'process description' rather than 'artefactual representation' for the remainder of the chapter.

4.1. Process description requires action with regard to documentation



The most visible effects of the process description's involvement in the new product development process at Global Tech are those performances that are carried out to comply with what the process description demands. These can be seen in performative, everyday actions, such as, fulfilling requirements on paperwork, following a specific work sequence, or inputting information in the appropriate software-system. Such actions are often carried out by the project team members in parallel with development activities. At Global Tech there are functions represented in the core team that only work with document handling and revision. In addition to these dedicated functional teams, development engineers spend time filling in checklists and completing reports at the same time as they develop new products. The simultaneous pursuit of development work and compliance with the process description can be seen in almost all interaction within the Rocky team. In the weekly core team meetings, for example, the engineers

tell their colleagues about recent development progress, or issues, as well as how this has been recorded. In one meeting, one of the engineers reported that "the overall status is ok, but there are some delays with regard to documentation", thereby combining development status and document status within the same sentence. In other cases the inclusion of both might not be in the same sentence, yet still within the same reporting event.

However, on some occasions the work that is required by the process description is allowed to foreground development work to the point that objects such as checklists and product documentation become deliverables in their own right, separate from the underlying product the team is developing. One particularly poignant example of such activities directly driven by the requirements of the process description is the checklist clean-up meetings held in preparation for an upcoming release decision meeting. These clean-up meetings, involving the entire core team, are held with the sole purpose of going through the checklist to make sure that all boxes have been ticked before the team formally asks for a release decision or other type of approval to be made. Below is an extract from one of these meetings where the project manager, Norman, goes through a part of the check list that happens to be related to object leader Caroline:

> Norman: So, question 4.3… "For [this requirement], has [the appropriate body] been notified?"
>
> Caroline: No, Not OK.
>
> Norman: Hmm, so Not OK.
>
> Caroline: Well, you're supposed to test this and send the report off. Rick thought he had sent the report already for the previous version, but then I asked if he had really checked that and he was like "oops", so no…
>
> Norman: But do we really need this for initial release approval?
>
> Caroline: We can usually get around it if we say that we have the test results and that they look good, but we just haven't got the report yet.

Norman: Ok. So next then: "For [this component], has the report been signed?"

Caroline: Well, yeah, we don't have the papers in place, but we just have the test results and then we start. For us this is paperwork that we take care of after the test. So Not OK 1 (not a stopper)

Norman: Next question… "For Japan?"

Caroline: Not applicable.

Norman: "Is [the file] for [the component] updated and released in X1A?"

Caroline: No, not yet.

Norman: So that is something that you will do then…? The same question but for North America…?

Caroline: Not applicable.

Norman (to himself): Next is not applicable…

Caroline (in the background, to herself): Next is not applicable, next is Not OK…

Norman: Hmm, this is always Not OK

Caroline: The next one is also Not OK.

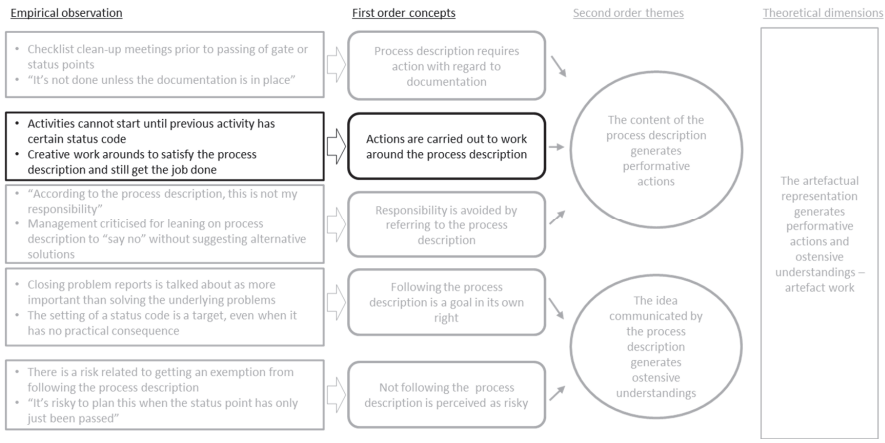
Norman: And here is the same question again…

Caroline: That question is for another release code.

Norman: Oh, yeah, I can see that now. We should sort this checklist so that we only see the items applicable to this release code. I will do that for the next meeting.

This conversation is typical for these meetings and focuses on completing the requirements listed in the process description. The checklists consist of two parts where the first covers purely document related questions and the second product related questions. Document related questions are of the type "has the [document number] been completed and approved". However, even the questions described as product related involve documents and are formulated as "has [the task] been completed, verified and duly reported in the corresponding documents". Hence, project deliverables not only consist of sellable products but also the documents and checklists that should be produced and communicated throughout their development. Performative actions must therefore be taken not only to fulfil product requirements, but also to make sure that all requirements on documentation are fulfilled in accordance with the process description.

4.2. Actions carried out to work around the process description



Usually such actions can be carried out in parallel; however, there were also occasions when the team had to come up with creative solutions to work

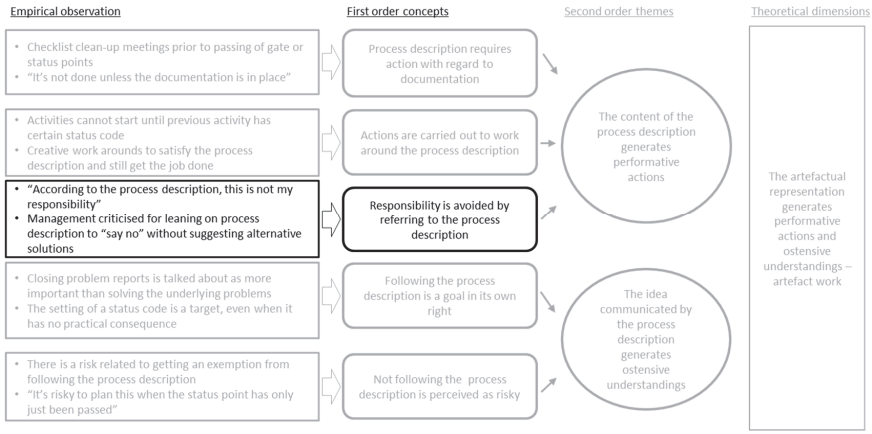
around, rather than meet, the requirements of the process description. These situations were perceived as creating extra work for the team, using up time and resources that they felt could have been better spent elsewhere. A typical example of this type of tedious workaround was when material couldn't be shipped from one site to another due to missing paperwork. Instead, a member of staff personally delivered the material from one part of Sweden to another.

In that particular situation the members managed to successfully work around the requirement of the process description so that they received the material without the formal paperwork being in place, even though it meant that the team had to spend additional resources in transporting it. In other situations, the team spent time and resources finding a work around, while in the end still had to settle with a partial solution. Line manager Graham describes a situation in which the 'solution' consisted of an adjustment in the process description itself that solved the identified issue while at the same time created another:

> Graham: Well, regarding this problem with [the software]… [The software] has been seen as a component among many other components. The problem then has been that [production] need a frozen specification to be able to order material and prepare the plant and they need that specification fairly early on. But [the software] can't be frozen that long in advance so we have come up with different creative solutions to 'cheat' and get around this. Finally, someone realised that this wasn't very clever, so they removed [the software] from the component list and put it in the X1A instead as a "related product". But then we started discussing that, well, "how should we deal with this in the next phase then?". And then we came up with something and added that to the process description. … But what happened then is that we saw this as an opportunity to cheat even more, so we stopped talking to each other and just referred to the process description and kept on feeding new [software]. So the guys in production, who have to set up their testing equipment with the right [software], don't stand a chance of keeping up as they are not getting the right information on time. So then we created a checklist for this as well.

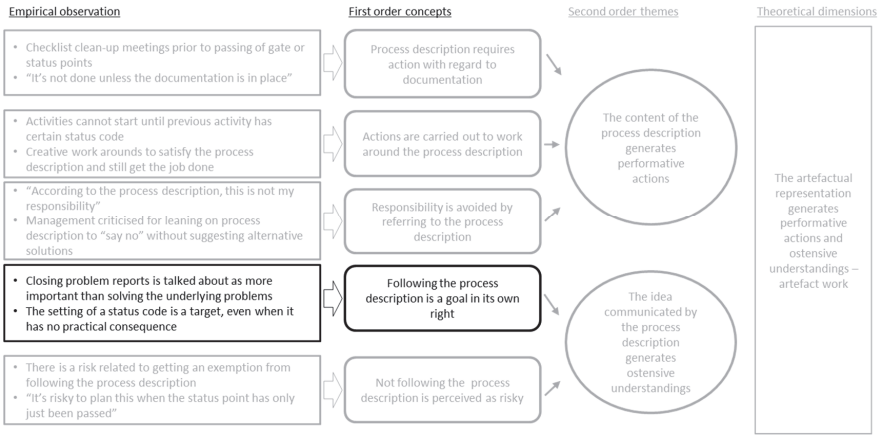
In this case, what worked as a solution for the development engineers, created problems for the production facilities and just moved the need to perform additional work from one team to another.

4.3. Responsibility is avoided by referring to the process description



The quote in the section above also touches on another issue that was frequently observed. The process description could result in additional work regarding documentation and could also be used by team members to avoid or postpone work. In the situation described by Graham, while the process description was used as an excuse to stop communicating, it also allowed the development engineers more flexibility. However, the frequent software changes caused problems for the production facilities, problems that the development engineers, with the support of the process description, were not made accountable for. In team meetings I also observed comments such as "according to NPD Operations Directive, my team can't start [the activity] until the [other team] has completed their part" or "formally, that is not the responsibility of my team". These indicate that the process description can also be enrolled in order to postpone, or completely avoid, work that the team members are unwilling to perform.

4.4. Following the process description is a goal in its own right



The material properties of the process description and its design are also observed to enable and constrain team members' way of understanding and relating to their work in everyday conversations. In the examples mentioned in section 4.1 the actors perform actions that are only performed in order to satisfy the requirements of the process description, thus indicating that documents have emerged as stand-alone deliverables for the team, in parallel with new products. Along the same lines the general *goal* of routine performances has been extended to not only include the development of a new product, but also the completion of checklists, creation of documents and compliance with demands of the process description. As with the deliverables, process compliance is commonly referred to as a goal in its own right, separate from the goal of developing a new product at a certain standard within a certain time schedule.

This is reflected especially in the area of problem report-handling, where the process description stipulates that a project cannot have any significant (A-class) problem reports open at the time of release. The problem reports are managed through a dedicated software system, and the

problem report-list is the main topic of the weekly "problem report-meeting" in which the entire project team is supposed to participate together with representatives from the problem report-handling function. In this meeting the problem report-handling reps go through the list of all open problem reports in the system and assign them to the relevant engineer, noting the date by when the problem report is assumed to be resolved. The underlying technical problem or its potential solution are not discussed.

The following episode is a translated extract from one of these meetings in which Jane and Jim, two interns from the problem report-handling function, and one development engineer, Tom, discuss what to do with a problem report that seems to be particularly tricky to handle:

> Tom: Well, it says in the decision (from last week's meeting) that it should be assigned to Will and that the problem report should be cloned also to product variant B.
>
> Jane: Oh yeah, that's because it couldn't be cloned to B. I have been asking around and well… So I made a copy of the problem report and assigned the copy to Will. 'Cause that's what we agreed on in the last meeting… So we'll assign the copy to Will and keep the original here so that we can clone it to B, but there is no product number for B so we can't clone the problem report to that variant.
>
> Jim: What does it mean that there is no product number?
>
> Jane: Yeah well, then there's nothing we can put the problem report on…
>
> Jim: Ok. So there's a product but no product number?
>
> Jane: Well, there is a product number for variant A for this problem report, but there is no number for B so the problem report is currently only for A. The problem report has been copied and assigned to Will, but it's just that… well, this just seems to have got stuck… So, shall I just assign this (the problem report for product variant A) to Will and drop B then?

Tom: Well, we must find the product number for it. Hank (Jane and Jim's boss) should know about it. There must be a product number somewhere and if there isn't, Hank will have to get one.

Jane: I spoke to Hank about it, but he referred me to Chris who then said I should speak to someone else…

Jim: Ok, but what's the current status then?

Jane: Well, the current status is that we should just clone the problem report to A and assign it to Will, but the clone from B can't be assigned because it doesn't exist since B doesn't have a product number.

Jim: So what should we do with this problem report then?

Jane: Well, we still have to clone it to B and then assign it to Will… We've just got stuck right here…

Jim: Keep investigating!

Tom: Well, we will have to bring this one (the problem report) up again next week then.

Jane: Yeah, I'll just copy it for now then and move it to next week.

Jim: Sure. I've noted that it's ongoing then.

Jane: Great! Let's move on to the next item (problem report) then.

From the above example we can see that a breakdown in the problem report-handling process is not necessarily related to the lack of solutions to a technical problem; instead it rather relates to a lack of solutions to the problem of what to do with the problem report in the system. The sole purpose of this meeting series is to go through the list of problem reports to close and update existing problem reports and to assign new ones to the correct responsible team. This meeting does not discuss the actual problem that generated the report in the first place. Those issues are instead

discussed in the weekly core team meeting or in the twice weekly stand up morning meetings.

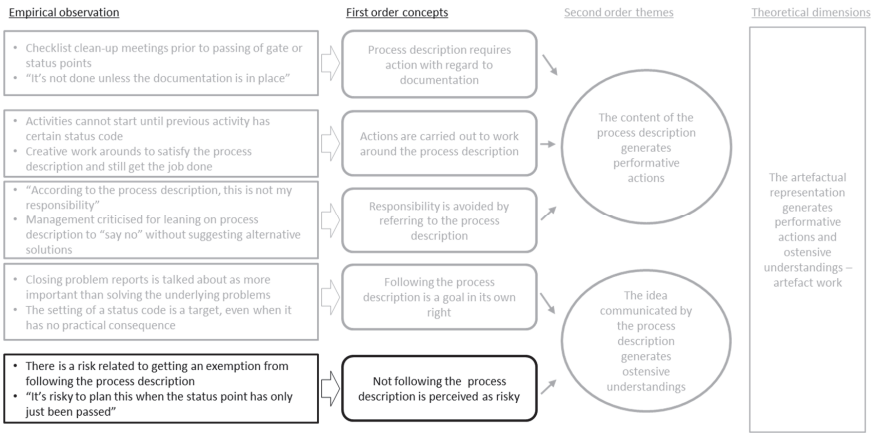
After attending one of the problem report-meetings, I was a bit puzzled by this and decided to probe project manager Ken for the rationale behind decoupling a problem report from a technical problem. The following is an extract from that conversation:

> Researcher: What is the actual purpose of the problem report-meetings?
>
> Ken: Well, all problems must be registered in a problem report that is subsequently filed and allocated to the right person. <Then a long monologue on how bad the problem report-meetings are when a lot of people are absent and the possible reasons for why some people don't prioritise these meetings> So I don't know, maybe we have to really force people to come to these meetings, because when we are approaching release we can't have, let's say 50 problem reports waiting to be closed. In those situations you really need to focus on the problem reports towards the end of the project and have maybe two problem report-meetings a week instead of one.
>
> Researcher (who is on a mission to understand where the actual technical problems enter the picture): So how come you don't discuss these in the core team meeting at the same time as you are discussing the technical problems then?
>
> Ken: Well, of course one could imagine a scenario where you can quickly go through the problem reports at the beginning of the meeting and then continue with the rest. I mean that would put the focus on the open problem reports.
>
> Researcher (still on a mission): Maybe then they would be treated as real practical problems?
>
> Ken: Yes, that's right. Because, I mean, a problem report doesn't just disappear. It just grows older and older and just like a cheese it will start smelling after a while. So, sure, dealing with the problem reports in the core team meeting could be a solution. But if there are too many problem reports then you will end up with two-hour core team meetings and that will never work! (Laughs)

From the above conversation we can see that PM Ken finds it hard to make the connection between the problem report (which is discussed in the problem report-meeting) and the technical problem that led to the creation of the problem report in the first place (which is discussed in the core-team meeting). Even when the researcher asks a clearly leading question pointing him towards the alternative of simultaneously discussing problem reports and actual problems, he insists on only talking about problem reports.

Hence, when Ken relates to this part of the process description, the closing of the problem report is referred to as the main purpose of the activity and has been decoupled from the activity of solving underlying problems.

4.5. Not following the process description is perceived as risky



This way of following the process description for the sake of the process description itself can also be seen in the perceived risks attached to non-compliance. In the case of the problem reports mentioned in the previous section, project manager Ken refers to the risks of not closing problem reports rather than the risk of not solving the technical problem. The same

way of talking about the process description related to risks can be seen also in other instances expressed as for example

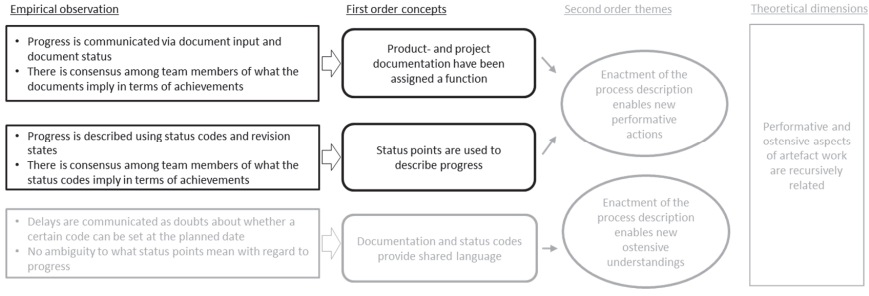
> it's a risky decision to take when this status point has just been passed

or

> are you prepared to take the risk involved in planning that before SP3 has been reached?

As these status points are formulated in terms of requirements with regard to documentation rather than product (see Figure 2a and 2b) we see that, just as with the open problem reports, the sense of risk in these cases relates to compliance with the process description rather than the development of the new product.

4.6. Product- and project documentation have been assigned a function and status points are used to describe progress



The first order concepts "product and project documentation have been given a function" and "status points are used to describe progress" are discussed simultaneously as they are both reflections of the same phenomena. The enactment of the process description has, at length,

provided documentation and status points with functional affordances and constrains beyond those suggested by its mere material properties or discursive content. This is reflected in how documentation and status points are used to communicate both issues and progress. In the weekly project core team meetings, one object leader, for example, describes the status of his particular area as:

> We will deliver SP5A tomorrow for [this component]. And on Monday we have SP5B on the build. So the idea is to get all SP5 documents ready for that. The status is good, the work on the documents is ongoing and the bill of materials is updated.

The production facilities mention the following issue:

> The build was actually planned for tomorrow, but then I heard the bill of materials has been changed today. That is too late, and it requires a preform that we don't have here. So I don't know if we should postpone the build or if we should build with the preform that we have?

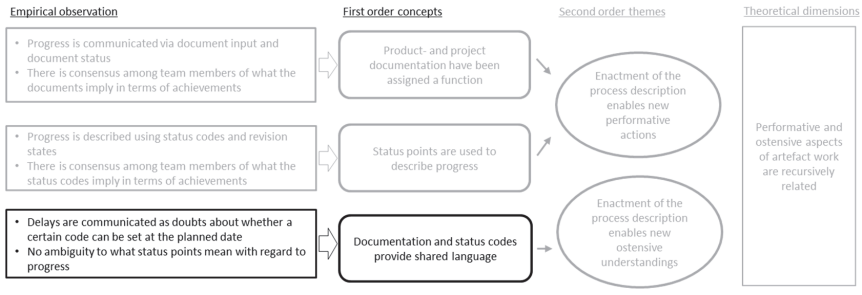
The project leader clarifies that a new component can be used in the following way:

> It shouldn't be a problem and I think you should be able to use that. It will be put in the X1A very soon.

From the above examples we can see that documents and document status are used to describe product related issues, while, at the same time, they can also become an issue in their own right. We also see that status codes are set depending on the revision status of certain documents and that a common definition of successful task completion is that the relevant documents have been updated and frozen.

Hence, product and project documentation are being put into performative use as ways of communicating project status as well as for raising issues related to practical development work.

4.7. Documentation and status codes provide shared language



As the previous section showed, documentation, status points and design codes are enrolled in performative action at Global Tech. The milestones are used as ways of communicating both issues and progress as well as being targets in their own right. The shared understanding relating to what these status points imply is reflected in the language of the project team members when discussing project progress. Casual phrases such as

> We hope to set [this code] by next week

or

> The checklist is completed so [this part] is done now

are common, indicating that the artefactual representation's measurement of progress is also used to measure progress in practice.

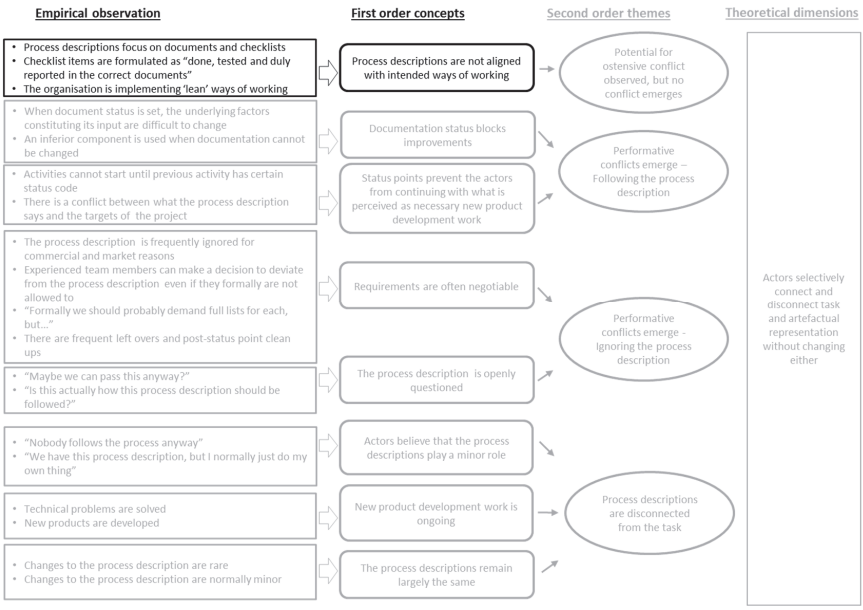
The use of status codes and document status as a way of measuring success is not demanded by the process description itself; instead it is a consequence of how it is put to use by the project team. The extensive use of documentation and status codes has thus facilitated consensus-forming among those involved, concerning, for example, what a certain status code or document means in terms of achievements. This consensus in turn provides the project team members with a common language for

communicating both progress and problems. Team members can therefore say :

> I have [this status code] on [this part of the product] and the documents are [in this revision state]

and everyone around the table knows what that means in terms of what has been done and what is still left to do before a complete product can be delivered.

4.8. Process descriptions are not aligned with intended ways of working

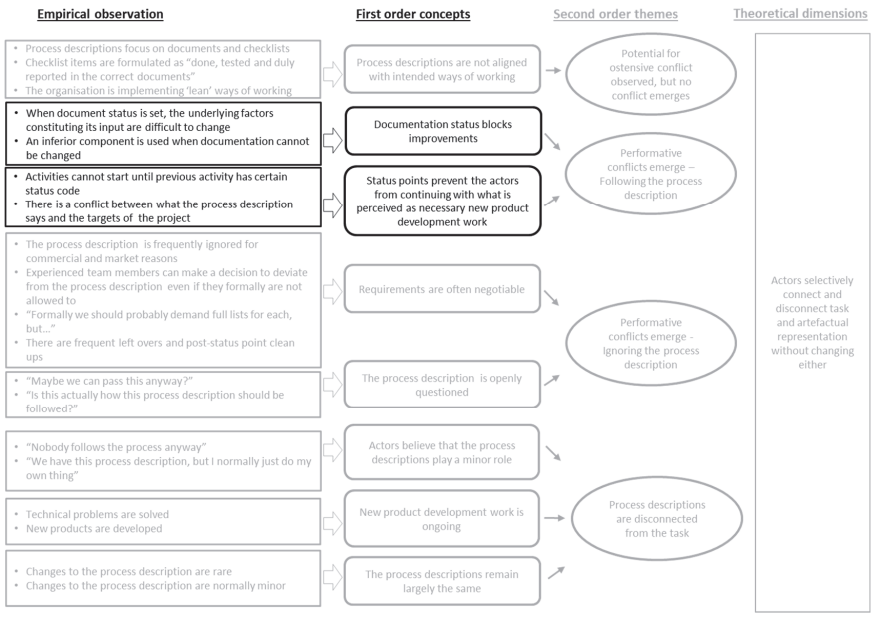


As described in Chapter 3, Global Tech was, at the time of this study, going through a transformation project by implementing the principles of lean management. A more extensive description of what these principles imply

can be found in that chapter, however, a key feature of lean is a focus on flow efficiency measured from the perspective of the customer. The process descriptions that have been the subject of this study however define and measure progress in terms of documentation. There is therefore an apparent misalignment between what is in focus in the process description and what is supposed to be in focus in a product development project according to the espoused organisational culture.

During the course of the study, I discussed this misalignment at different occasions with three people working with change in the business unit, yet it was never mentioned or explicitly acknowledged by anyone in the Rocky team.

4.9. Documentation status blocks improvements and status points prevent the actors from continuing with what is perceived as necessary new product development work



The first order concepts "documentation status blocks improvements" and "status points prevent the actors from continuing with what is perceived as necessary development work" are both examples of when the process description hinders development work in such a way that it cannot be worked around. They are therefore presented jointly in this section.

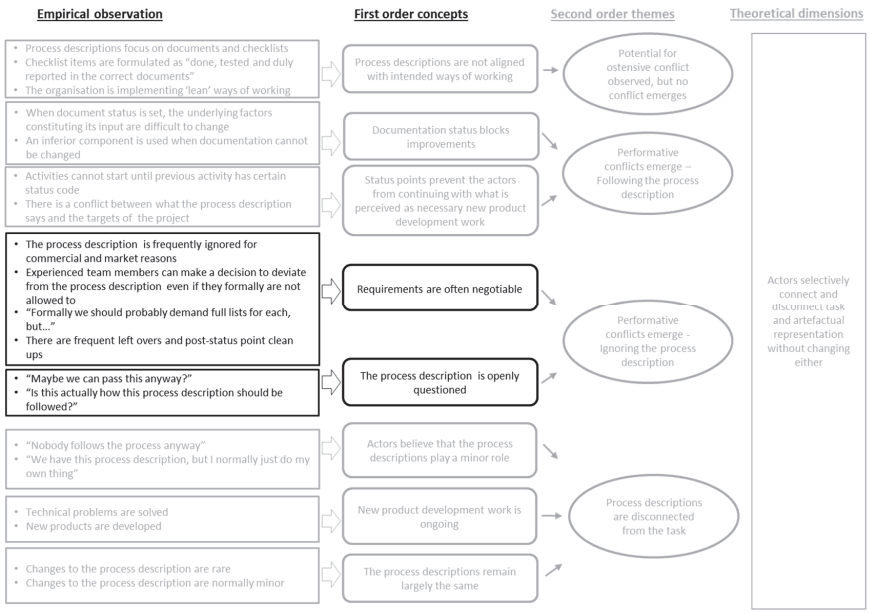
Once a document status is set at Global Tech, it can be very difficult to change the content. Since all changes to the product must be recorded in the corresponding documents, the product cannot be changed if the documents are not changeable. This restricts the range of possible actions that can be taken by the project team. Such restrictions in turn lead to situations where the project team must settle with solutions that are perceived as less than optimal from a new product development task perspective. We also observe that the process description's use of status codes can result in the same type of conflict between the requirements of the process description and what is perceived as required practical action. As mentioned in section 4.2, such conflicts can sometimes be diffused through creative workarounds. Even though such workarounds create extra work, they can temporarily resolve the emerging tensions. However, such solutions are not always available as the following example shows:

> Lucy (object leader): We are starting to go into the checklist for DS2/8 in more detail now and we realised that [this component] only has preliminary approval in [this system]. I don't know if this is some kind of stopper for [this product]. It isn't checked in [other system] so it might not be a stopper, but I'm not sure. The component has DS3 but this hasn't been approved in [this system]. I don't know if this is a problem or not.
>
> Norman (the project leader): Can't you just approve it in [this system] then?
>
> Lucy: No, it must be approved by the component engineer and I think they are waiting for some kind of approval from the vendor side.

This is a recurring scenario. In another instance, certain tests were put on hold until a particular status code had been set. In another case, a new, improved version of a component could not be included in the first release of the product since production verification tests of the component had

not been performed at the new production site, even though all tests had been performed and passed, but for some reason not reported at the previous site. In this case, the project leaders had to accept an inferior component in the product due to a formality. The statement "if we don't follow the process, we will have chaos" is also frequently heard, further indicating that process description following is considered important

4.10. Requirements are often negotiable and the process description is openly questioned



While the section above points towards those instances when the process description is treated as 'the law', the following section discusses those instances when it is not. These have been coded under the first order concepts "requirements are often negotiable" and "the process description is openly questioned". In these situations, the project team members break from what is required by the process description to take what they perceive

as necessary actions for product development progress. This is particularly apparent when things become urgent as was the case when one of the Rocky project leaders asked the reference group to recommend a pass of Gate 3 according to NPD Decisions Directive:

> Project leader Nigel has presented the first slides of the standard Gate 3-presentation, covering open checklist items, unresolved technical issues and an updated time plan. He starts off by briefly presenting the new release plan, informing the reference group that expected release has been postponed by two months. He moves on according to the standard Gate 3-slide show, quickly presenting the status of the checklist, open technical issues and technical risks. He then stops when he gets to the slide labelled 'project risks'.
>
> Nigel: When we noticed we wouldn't make it in time for the original release date, we went through our time plan so that the release date has been postponed by two months. Now however, the higher priority for [the other product], which I only found out about this morning, will have consequences also for [my product]. There are some resources that I will not have access to that I planned for. For example, the chief engineer, John.
>
> Line manager Steve: Poor John will be busy…
>
> Line manager Pat: So what you're saying is that you don't believe in this plan?
>
> Nigel: No. According to my plan I will share John 50/50 with [the other product]. Now it has been agreed that I will have John 30%, which according to John is not enough to reach the planned release date. And besides, I don't think I will get John at all given the new circumstances.
>
> Line manager Nick: Then you will be late, unless you are really lucky…
>
> Desperate laughter spreads around the table. The line managers then enter into a long discussion on whether there are other resources that Nigel could use. They conclude that John is probably the best shot anyway.
>
> Steve: So what is the project manager's recommendation then?

> Nigel: I recommend you pass this even if I don't believe in the plan. I think that is the only option at this stage. If I must change the plan now to take the new circumstances into account, that will take another two weeks. And given that vacation time is coming up…
>
> The line managers enter into a discussion on the details of the time plan.
>
> Pat tries to straighten things out: So, what you are saying is that you have a time plan, but that you are not confident that you will have the resources you need to fulfil it? But you think that we should go anyway, but that it is a risky decision?
>
> Nigel nods.
>
> Pat: Well, I think we should go for it then, but with the knowledge that it is high risk.
>
> The other line managers agree and the recommendation to pass Gate 3 is given.

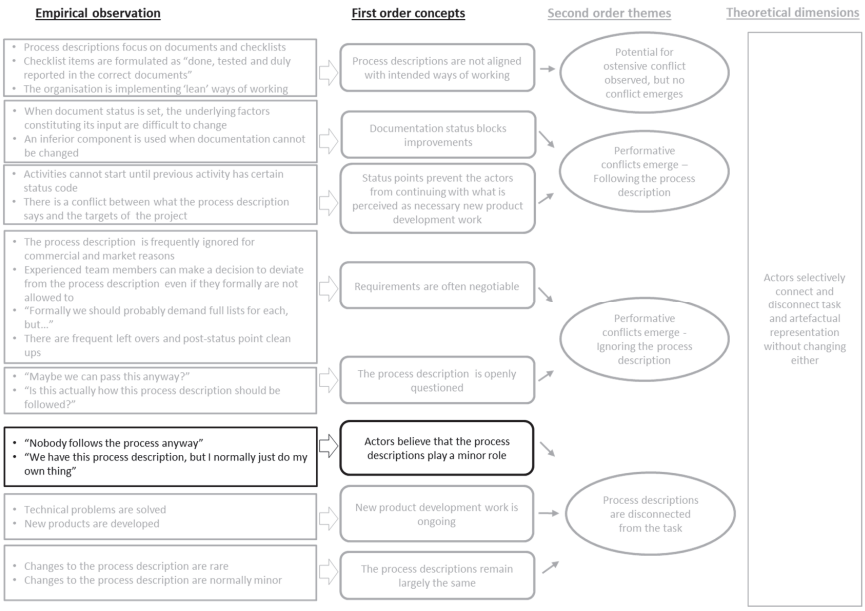
In these cases of urgency, most requirements become negotiable and flexibility in relation to the process description increases considerably, especially among the more experienced team members. In an interview at a later point, line manager Graham tries to explain:

> Researcher: So how do you know which process requirements you can break and which you can't?
>
> Graham: Well, there are two types of requirements. Regulatory requirements and Global Tech internal requirements. You can't break the regulatory requirements. But Global Tech requirements are always negotiable… (laughs)

When the perceived commercial risk of delaying the product is considered high, getting the product out to the customer seems more urgent than ticking all the required boxes. Such direct rule breaking seems to be quite effortless and often occurs without being preceded by internal discussions among the actors. This indicates that the completion of new product

development work can be perceived as more important than meeting process description requirements. It thus demonstrates that the goal of the new product development routine (to develop a new product) can also restrict the ability of the process description to dictate action. Hence, in times of conflict between formal requirements and new product development progress, actors draw on their own perception of whether new product development or process description should take priority in the particular situation.

4.11. Actors believe that the process descriptions play a minor role



In contrast with what the study shows, in several conversations and interviews, members of the organisation claimed that "nobody follows the process anyway", even though the observations show that they clearly do,

at least to some extent. Hence, the actors believe that the process description plays a minor role in how they perform their job.

The team I followed was constituted mainly by skilled development engineers, working to develop a new product. It is therefore no great surprise that when team members refer to their job, they mainly mention the type of activities that I have coded as product development work (please see section 4.12 below) rather than artefact work. They refer to it as consisting of such things as setting up verification equipment, building prototypes or developing a specific component. When asked about how the process description enters their day to day work, some gave the rather sweeping and generalising answer that "nobody follows it anyway", while there were also those that provided a more developed answer. An example of this comes from line manager Graham who says that all Global Tech internal requirements are negotiable as mentioned above, and who also provides the following quote (abbreviated and translated from Swedish):

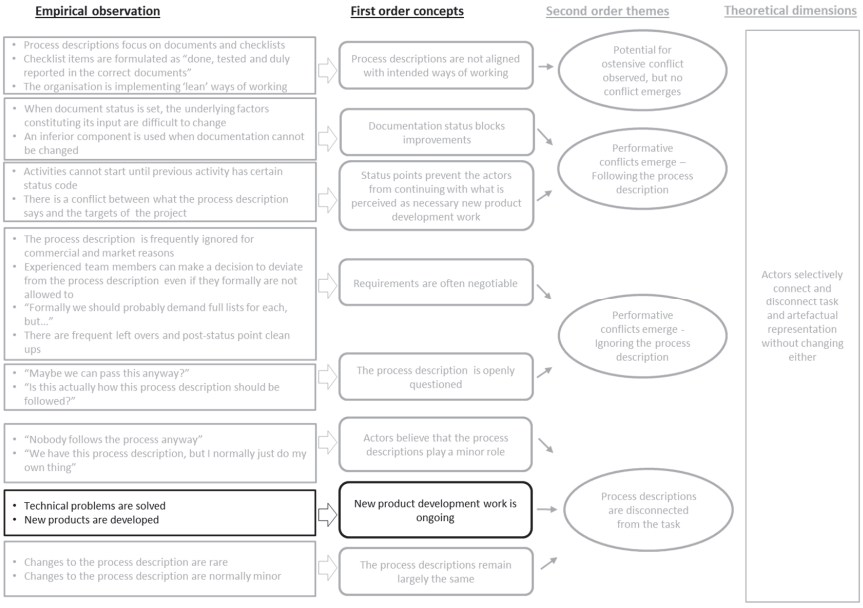
> Sure, I can just say no and point towards the process description, but then I wouldn't be adding much value.

Later in the interview Graham also says that:

> I think that we are probably quite process heavy on the surface, but the whole point with having a process description is that you should know what you are deviating from. Just because you have a process description doesn't mean you have to follow it to the letter, but rather that you should know where you are lacking and where the deviations are.

Hence the actors can foreground new product development work over compliance with the process description not just in concrete actions in specific situations, but also when reflecting on and referring to how the process description guides their performances in general.

4.12. New product development work is ongoing

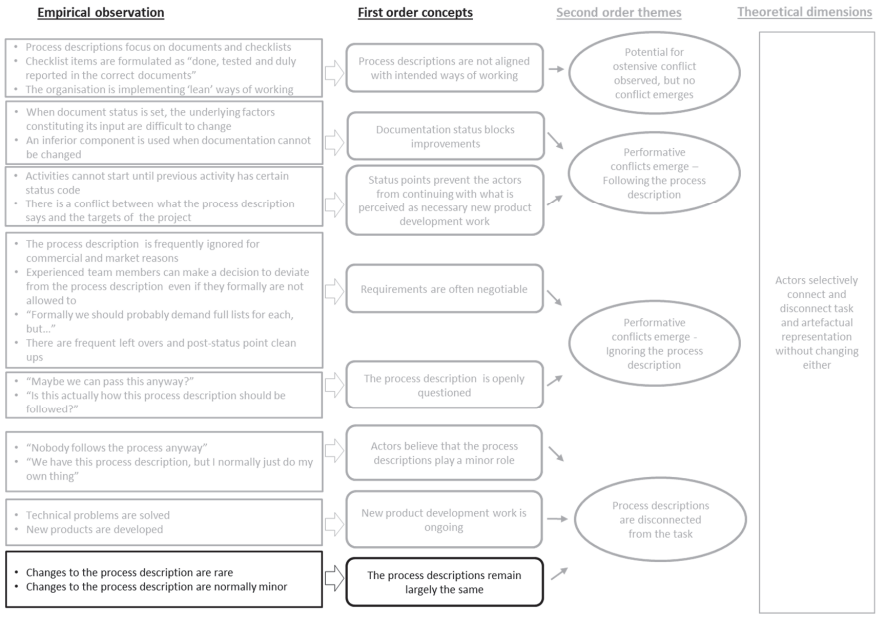


When the development engineers claim that "nobody follows the process" they are, of course, right in the sense that actual development work takes place together with the activities triggered by the process description. These activities have been coded as "product development" in the analysis and are defined as those activities that relate to the development of the product rather than compliance with the process description. Examples of such activities are both small, such as mentions of technical problems that have been solved or communication of successful verification of new technology, as well as large, such as entire meetings between the project leader and specific engineers discussing how a particular technical issue should be solved.

These activities can be carried out without any mention of the process description, such as some of the problem-solving meetings, but can also be carried out together with the process description, as in the example

mentioned earlier in the chapter when the problem was solved (product development work) and reported in the correct documentation (process work). At the end of the day it is important to stress that the Rocky project did develop a new product that was produced and sold.

4.13. The process descriptions remain largely the same



The process descriptions at Global Tech are not completely rigid and unchangeable, which is reflected in the quote by Graham in section 4.2. However, as is also reflected in the quote by Graham in section 4.2, the changes are normally minor and mainly involve adding, removing or rephrasing single checklist items or redefining, for example, definitions of design status codes. Even the revision of the NPD Decisions Directive, that was internally considered major, related to what should and what shouldn't be included in the checklists at each decision gate and how the

checklist questions should be formulated. The team I observed frequently discussed larger issues such as what was actually the meaning of a particular decision point, or how the gating meetings could be changed to better reflect the intentions of the directive. Most of these discussions ended up with the team realising that they could not agree on what the underlying issue might be, and in the end the particular issue would be dropped and no action would be taken.

After the team working with NPD Decisions Directive received the results from a survey distributed to 271 randomly selected users of the directive, several improvement points were identified. A large group of managers from the business unit were invited to a workshop where these findings were discussed. A plan was then developed for how these improvements should be prioritised, when they should be carried out and by whom. When the team disbanded less than a year later, most of these points had not been dealt with.

The revision history for the design status codes in NPD Operations Directive shows a similar pattern. From April 2009 until November 2016, there are a total of 42 entries in the revision sheet for the status code checklists. Most of these relate to technicalities of the actual spreadsheet describing the requirements for each code, such as the introduction of new sorting filters or the inclusions of hidden columns with explanations for the checklist questions. Changes to definitions of design status or the order in which items should be checked are rare.

That the process descriptions are rarely subject to major changes is described also in interviews. For example, Barry, the person officially responsible for NPD Operations Directive, describes how the software tool used is sometimes a blocker for changes to the process descriptions. He also says that even though a group of users meet on a regular basis to discuss changes to NPD Operations Directive, they normally discuss updates that have been proposed as a result of the development teams experiencing that checklist points are missing or unclear. However, despite the group's best efforts to take a wider perspective on the whole process, due to "everyone working with their own area, you end up in silos" (in the words of Barry himself) and changes on a system level do not take place.

Mabel, who is working with change management on a business unit level, plays with the idea of scrapping the whole checklist and rebuilding it from scratch. She describes an experiment the business unit ran related to product requirements and draws parallels to the process requirements of NPD Operations Directive and NPD Decisions Directive (abbreviated and translated from Swedish).

> We noticed that the requirements list for our products just got longer and longer. We saw issues in the field and then we thought that this must be improved in the next product and subsequently added that requirement. And if you continue like that, at some point the requirements list will be infinitely long.

Hence, changes to the process descriptions are incremental and relate to adding or expanding checklist items rather than changing the actual process.

4.14. Summary

These findings suggest that on one hand the process descriptions influence what people do and how they relate to what they do. Not only have the process descriptions at Global Tech created a need for new performances, such as checklist clean up meetings, but they have also provided the team members with understandings and a language they can use to describe progress and project status. There are also instances when the actors follow what is stated in the process descriptions rather than what they perceive as necessary product development work. Hence the process descriptions clearly influence how the new product development routine is performed.

Simultanously, the actors frequently state that the process descriptions play a smaller role than they actually do. The actors distance their work from the process descriptions by stressing how flexibly they can be enacted and how little they are followed. The findings also show examples of such cases when the actors break with the process description in favour of pursuing development work. Hence, the actors themselves claim that the process descriptions do not influence their work significantly.

To briefly sum up the observations described in this chapter; the process descriptions studied here seem to affect the new product development routine at Global Tech in many ways. Firstly, people downplay the role of the process descriptions even though they affect what people do, how they talk about what they do as well as their idea of what the purpose of their work is. Secondly, the process descriptions can create conflicts when what is formally required goes against what is perceived as necessary development work. In the findings we see examples of both when the actors chose to go with the requirements of the process description as well as the opposite, when the actors chose to ignore the process description in favour of, for example, delivering a product on time. These observations suggest that there are open conflicts between the requirements of the process descriptions and what is perceived as necessary product development work. They also suggest that there are hidden tensions between how they describe the role of the process descriptions in routine performances and how the process descriptions are enacted in practice.

Lastly, interestingly enough, the process descriptions are not significantly updated or changed. This suggests that even though they are frequently ignored and simultaneously frequently in the way of what is considered efficient development work, there is no sense of urgency about changing them.

Chapter 5

Second order themes and theoretical dimensions – Performing task and artefact work

While the previous chapter described the first order concepts and the data they were derived from, this chapter shows how these can be aggregated into second order themes and theoretical dimensions. The chapter is organised according to the theoretical dimensions. Each dimension is discussed by first explaining how the first order concepts were aggregated into the second order themes. This is followed by the development of the theoretical dimension in question with the support of existing research.

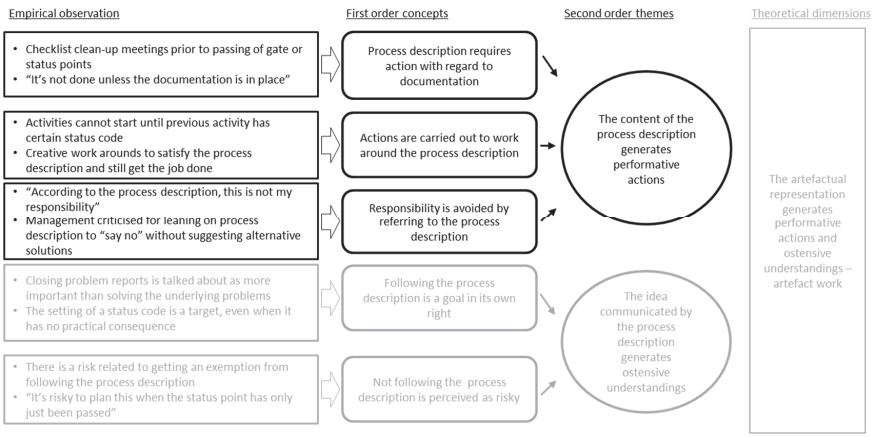
To discuss the ways in which the artefactual representation shapes routine performances I will apply the framework and vocabulary used by D'Adderio (2008, 2011). According to this framework (based on Callon, 1998), the artefactual representation *frames* routine performances so that they converge with the representation. However, due to the inevitable unpredictability of the surrounding context, the framing is subject to *overflow* that results in routine performances diverging from those described by the artefactual representation. The overflow in this context relates to all those situations and circumstances in which the frame provided by the artefactual representation is, for some reason, considered inadequate (Callon, 1998; D'Adderio, 2008, 2011).

The first half of the chapter presents the theoretical dimensions that show four distinct ways in which artefactual representations frame routine performances in the absence of overflow (cf. Callon, 1998; D'Adderio, 2008, 2011). These have been observed when there is no conflict (no overflow) between what is allowed or demanded by the situational conditions and the artefactual representation. The chapter then moves on to discuss the theoretical dimensions related to those situations when there is such a conflict (overflow). Again, 'process description' is used to talk about the data and the case, whereas 'artefactual representation' is used when raising the discussion to a more abstract and theoretical level.

5.1. The artefactual representation generates performative actions and ostensive understandings – artefact work

The following section describes those actions and understandings emerging as a result of the design and content of the process description.

5.1.1. The content of the process description generates performative actions



Unsurprisingly, the process descriptions with their checklists, status points and gating decisions require certain actions to be taken while preventing others. The actions required by the process descriptions can be clearly connected to the activities that would normally be considered part of new product development, but they can also be seemingly disconnected. The pre-release checklist clean-up meeting mentioned in the previous chapter is an example of when the process description creates a need for actions that are not directly connected to the development of the new product. Just the name of the meeting, "checklist clean up", suggests that this meeting is not focusing on the product, but rather on the satisfaction of the process description.

When observing the performances undertaken in the meeting, we see that these are indeed only related to documents, reporting requirements and review status. Even though the participants in the meeting do not seem as engaged in this meeting as they are in more product related discussions, the validity or usefulness of the meeting is not openly questioned (in my field notes I made the comment during one of these meetings that "I have spent so much time with these people and they are really good and capable engineers, but in this meeting they act like different people. Energy levels are sooooo low"). The checklists in this case do exactly 'what it says on the tin', that is, provide a checklist that the team can use to make sure that all the correct documentation is in place. However, the completion of the checklist itself is also required by the process description. The performances of the clean-up meeting are carried out as a result of what is written in the process description and not as part of, rather in addition to, the task of developing new products.

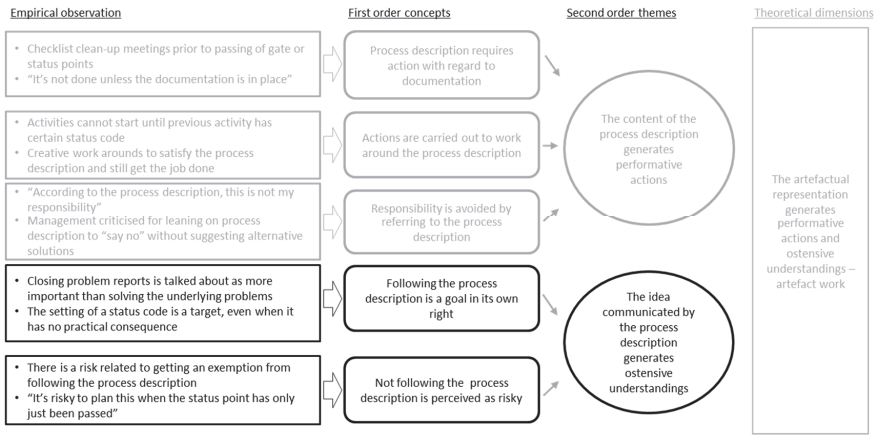
The process description could also lead to the emergence of new performances when tensions between what the process description required and what was perceived as necessary product development work were resolved using work arounds. In such cases, team members spent time and effort on performances that only constituted a detour from what would otherwise have been a more direct course of action. Again, these performances, even though they could be related to the task of developing a new product, were carried out because the process description

constrained the actions that would otherwise have been performed to complete the task.

The artefactual representation could also be used to postpone or avoid performances all together. Hence, team members were involved in performances carried out on top of development tasks, while at the same time, work that should have been carried out could end up being late or even completely omitted when the process description afforded responsibility to be pushed around.

These findings indicate two types of actions that are performed as a result of the requirements, affordances and constraints provided by the material properties and discursive content of the artefactual representation. Firstly, the artefactual representation generates activities that would otherwise not have been performed. Directly derived from how the artefactual representation is designed and manifested in checklists and documentation requirements, checklist- and documentation-driven activities are carried out in parallel with development work. In addition to this parallel artefact work, the design of the process description can result in activities that are only performed in order to work around, rather than meet, the requirements put forward by the process description. Secondly, the process description can also be used by individual team members to avoid performative action by pushing responsibility on to someone else. This means that, in a worst-case scenario, activities that would, and should, be undertaken in a development project, may not be completed at all.

5.1.2. The idea communicated by the process description generates ostensive understandings

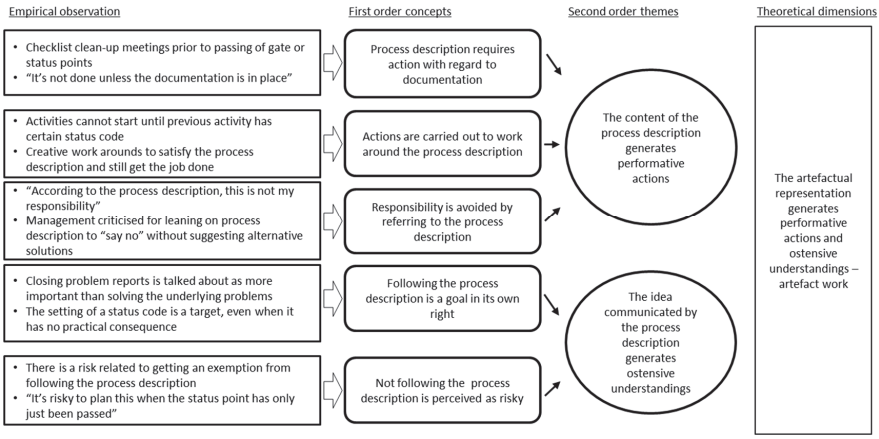


While the material properties and discursive content of the artefactual representation can afford or require certain actions and constrain others, the abstract idea that has intentionally or unintentionally, been designed into the representation (DeSanctis and Poole, 1994; Markus and Silver, 2008; D'Adderio, 2011), also affects how the routine is performed. As can be seen from the observations in the previous chapter, NPD Operations and NPD Decisions directives didn't just directly change or add to the actions carried out by the team members. The checklist clean-up meeting, for example, shows that fulfilling process description requirements has become part of the understanding of what product development entails. The artefactual representation's effects on how people understand the purpose of their actions is observed as forming part of the ongoing daily interactions between the actors throughout the project. By, for example, treating documents as deliverables the actors indicate that these objects, which have been created as a result of what the process description requires, have been assigned with value that contributes towards the overall purpose of the project. The same reasoning goes for those situations in which certain status points are considered important targets to be achieved by a certain date, or when a sense of risk is expressed in relation to not

following the requirements of the process description. An important outcome of a development project is not just that a new product has been developed and tested, but also that everything has been "duly reported and document status updated" as described in NPD Operations Directive. The goal of the product development process at Global Tech is both to develop a new product and to make sure that all documentation is produced and the process description followed.

Hence, the artefactual representation of the new product development routine at Global Tech has directly affected the actors' understanding of the routine, its purpose and its targets. These are all signs of the artefactual representation creating ostensive patterns and understandings that are not derived from the task of developing new products, but rather from the demands of the process description. The product development process in Global Tech thus generates a pattern that develops a new product and also a pattern reflecting the requirements of the process description.

5.1.3. Developing the theoretical dimension "the artefactual representation generates performative actions and ostensive understandings – artefact work"



These second order themes thus illustrate that artefactual representations of routines can directly affect both the performative and the ostensive aspect

of routines. The material properties of the artefactual representation can demand certain actions to be performed while constraining others. These actions would not have been performed the same way, if at all, had it not been for the existence of the representation. At the same time the artefactual representation brings an idea, whether explicitly or not, that affects how the routine is ostensively understood. This idea can also be more or less aligned with what would otherwise be considered the idea of new product development.

There is a difference between the actions and understandings related to the artefactual representation and those related to product development work. To facilitate the discussion going forward I would therefore like to introduce the concepts of 'task work' and 'artefact work'. These are based on the overall observation that while the Rocky project team was clearly developing a new product, carrying out typical product development tasks such as assembling prototypes or testing new parts or writing new software code, they were also engaging in performances aimed at satisfying the requirements of the process description, the artefactual representation. As mentioned earlier, not only did the team include members who were only working with document handling or other activities performed with the purpose of ensuring compliance with the requirements of the process description. The development engineers also spent significant amounts of time relating to or acting upon what was demanded by the process description without this work necessarily being connected to the development of the new product. For the sake of simplicity I will refer to this type of work as 'artefact work' as it normally involves artefacts such as documents, and is also aimed at satisfying the requirements demanded by a specific type of artefact, that is an artefactual routine representation. 'Task work' on the other hand are those activities that would normally be connected with new product development, such as solving technical problems, building prototypes, and testing and verification of parts and products.

The NPD Operations and NPD Decisions directives asked for a large array of documentation and reporting activities to be carried out during the course of a Global Tech new product development project. When allowed by the contextual conditions these activities could be carried out more or

less simultaneously with the activities related to the task without demanding much extra time or effort. The Rocky team members could, for example, carry out tasks such as verifying new parts (task work) and continue to log the findings in the appropriate systems or documents (artefact work). In such situations, artefact work was an integrated part of task work that didn't require special attention and the additional time spent would be insignificant.

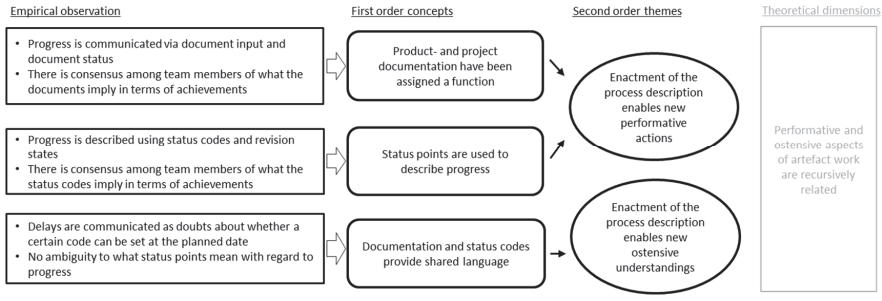
However, there are also many instances in which the connection between task work and artefact work is not as easily identifiable. In such cases team members would be engaging in pure artefact work that could demand significant amounts of time and/or effort that didn't seem to be directly connected with the development of the final product. The degree of connection between artefact work and task work lies on a sliding scale. Artefact work was performed at varying degrees by all team members, independent of function or project phase. The checklist clean-up meeting, for example, is not as clearly linked to task, even though it could still be argued that the checklist items represent new product development tasks therefore indicating some connection. The problem report-handling though has seemingly lost the connection to the task entirely; so much so that the management of problem reports is discussed in one meeting (artefact work) and the technical problems they report are discussed in another meeting (task work).

It is worth emphasising that this analysis is not looking into whether the artefact work adds value to the overall new product development project or not. It is easy to imagine situations in which such artefact work would be beneficial to the overall project by providing tools for organisation, knowledge sharing, management control etc. In practice, task work and artefact work can therefore be hard to separate. Nonetheless, the analytical distinction between task work and artefact work provides a way of talking about artefactual representations and the routines they represent. This is used in the analysis going forward.

5.2. Performative and ostensive aspects of artefact work are recursively related

In addition to the direct effects of artefactual involvement described in the previous section, a series of indirect effects on both performative actions and ostensive patterns was noted. The ticking of checklists or passing of status points were demanded by the artefactual representation and these demands were also reflected in the idea conveyed by the artefactual representation and consequently the understanding of the whole routine. While these performative and ostensive effects were direct reflections of what the design of the artefactual representation demanded, there were also other traces of the representation that emerged from how it was performatively enacted rather than from what its design required.

5.2.1. Enactment of the process description enables new performative actions and enactment of the process description enables new ostensive understandings

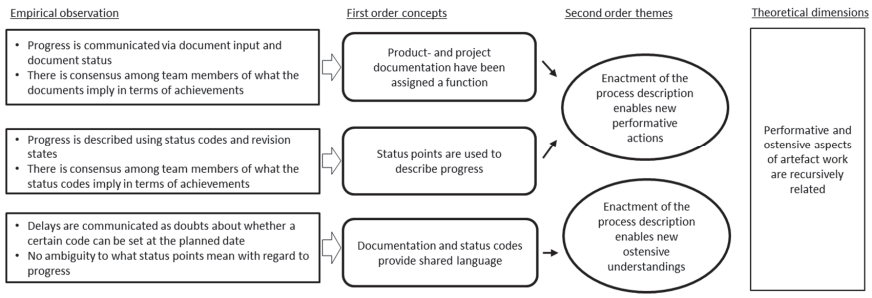


In section 4.6 the actors provide an example of how the language used by the process description is used to facilitate communication between the team members. The progress reported there is expressed as a series of status points and document updates. For those of us not deeply involved in the product development process at Global Tech, the extract is gibberish and makes very little sense. However, within the organisation, years of working with the NPD Operations Directive has led to this type of

language derived from the wordings of the process description being a perfectly sensible way of efficiently communicating progress. The artefactual representation, the NPD Operations Directive in this case, is not requiring the use of status points as means of communicating progress; these performances are allowed by the ongoing and repeated use of the status points in the daily practices. The understanding created by that ongoing and repeated use means that everyone instantly knows what the different codes imply and, as a result, a language for making sense of the task emerges. This implies that affordances are provided not just by the material properties of the artefactual representation itself, but also by its enactment. In other words, new uses for the artefactual representation are created as a result of how repeated enactment of the artefactual representation leads to increasingly shared understandings.

The same reasoning can be applied to the extensive use of document numbers and review status to communicate around both progress and issues. Documents are therefore deliverables to be produced, while at the same time being performatively put to use in the interaction between the team members. In the example in section 4.6 "status is good" means that "the work on the documents is ongoing" which indicates that document completion is an important part of overall status. However, it is also an example of when document review status, "the bill of materials is updated", is used to describe progress, that is, the new or improved components and materials have been incorporated into the next build. Again, the repeated use of these documents and their review status has created an understanding and language that facilitates team interaction, even if the team members are not familiar with the wordings in NPD Operations Directive itself. Hence, these are not actions that emerge directly or only from the design of the artefactual representation; it is rather the performance and regular enactment of the representation that has created an understanding that in turn allows for new types of performances that create new patterns etc.

5.2.2. Developing the theoretical dimension "performative and ostensive aspects of artefact work are recursively related"



These findings indicate a recursiveness and generativity in artefact work similar to that of performative and ostensive aspects of organisational routines (for example Feldman and Pentland, 2003). Hence, not only will the artefactual representation create ostensive and performative aspects that are different from those of the underlying task, which the artefactual representation is supposed to represent and control. These aspects also have the ability to generate new performances and patterns through an ongoing cycle of enabling and constraining on one side and creating and re-creating on the other.

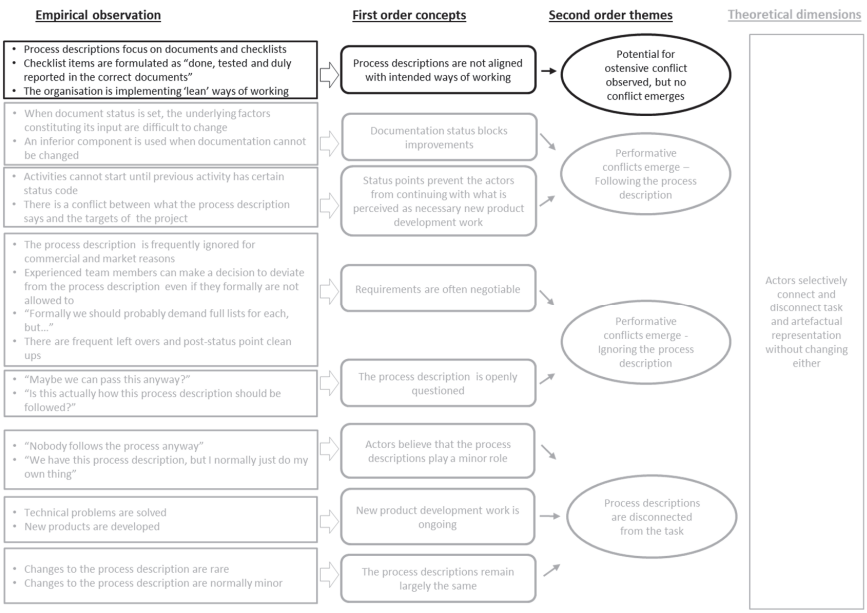
The following of artefactual representations does, in itself, show routine-like characteristics with performative and ostensive aspects that are not necessarily connected to those of the task. The recursive relationship between these aspects implies that the affordances related to the artefactual representation do not just emerge as a result of its material properties and discursive content. Affordances are also emerging as a result of the ongoing enactment of the artefactual representation. The shared understandings that such ongoing enactment creates implies that the representation can also be indirectly used as a means of communicating between the actors. The artefactual representation is thus creating artefact work, while at the same time it is also affecting task work by providing the actors with a way of talking about task progress and issues. This supports earlier findings by, for example, D'Adderio (2008, 2011) who shows that artefacts, especially

artefactual representations of routines, play an important role in routine enactment, and that they are part of the ongoing shaping and re-shaping of performances and patterns.

5.3. Actors selectively connect and disconnect task and artefactual representation without changing either

When the actors are exposed to situations where the actions demanded by the process description are not allowed by the context or vice versa, they must choose whether to follow the process description or do as required by the task. This section shows how these situations of conflict can manifest themselves on both the performative and the ostensive sides of organisational routines

5.3.1. Potential for ostensive conflict observed, but no conflict emerges



An observation made early in the research process was that, whether the artefactual representation could be enacted simultaneously with the task or not, the heavy focus on documents, check lists and status points stood in stark contrast to the principles of lean. Yet, lean is allegedly guiding the organisation's ways of working. This thesis is not about lean, however, the difference between what that management philosophy preaches and what could be seen in the process descriptions still provides an important backdrop for how the process descriptions were enacted at Global Tech. The lean principles are described in more detail in section 3.2.1; in short, lean is based on a focus on flow rather than resources, as well as putting value to the customer at the heart of the operations (Modig and Åhlström, 2012). Both NPD Decisions Directive and NPD Operations Directive focused on documents and checklists and the product under development was referred to only in terms of product documentation. The value to the customer was not referred to at all.

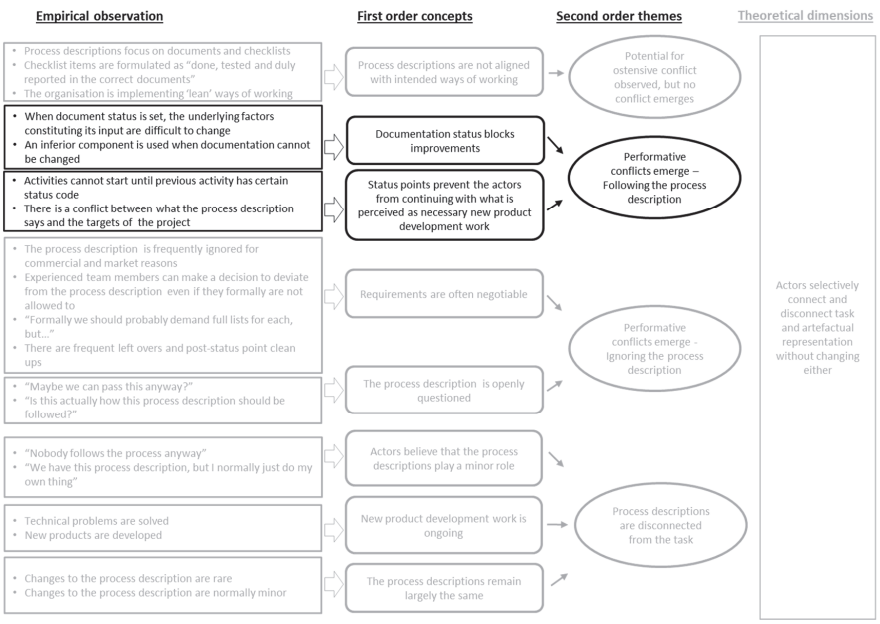
The difference between the principles of a lean product development process and those of the abstract idea of the artefactual representation give rise to contradicting demands on the ostensive understanding of the routine. Fitting the desired pattern of task work into the framing of ostensive understandings, reflected in the artefactual representation, would not be possible. For example, while the artefactual representation suggests that a new product development project has been successfully completed when "design is verified and documentation completed" (as stated in NPD Operations Directive, Figure 2a and 2b), the lean philosophy stresses the importance of product and customer focus and argues that documentation and reporting should be kept to a minimum (Modig and Åhlström, 2012). Progress should, in the lean world, be measured through the eyes of the customer to encourage the actors involved to think 'customer' and 'flow' rather than 'document review status' and 'checklist completion' which are the measurements of progress according to the artefactual representations.

What is most interesting here is not so much the observation that such a misalignment existed, but that the actors did not seem to react to the ostensive conflict it implied. The expectation would be that the contradiction and incommensurate demands between the process description and the work process the organisation was striving for, would

be a source of conflict experienced by the actors (D'Adderio and Pollock, 2014). Yet, this potential conflict rarely materialised or surfaced. Instead, the actors tried to satisfy both the expected lean pattern of the new product development routine as well as the document-focused pattern emerging from the enactment of the artefactual representation.

Even though the ostensive patterns of task work and artefact work would in theory be incompatible if compared, the conflict between them is barely mentioned by the actors in the present study. Instead, they perform the actions required to reproduce the patterns of both artefact work and task work separately. When the situational conditions and material properties of the process description allow for performances that reproduce both simultaneously, the otherwise incommensurate patterns can co-exist harmoniously. Team members solve problems at the same time as processing checklists, status reporting reflects project progress, and documents are delivered along with finished products.

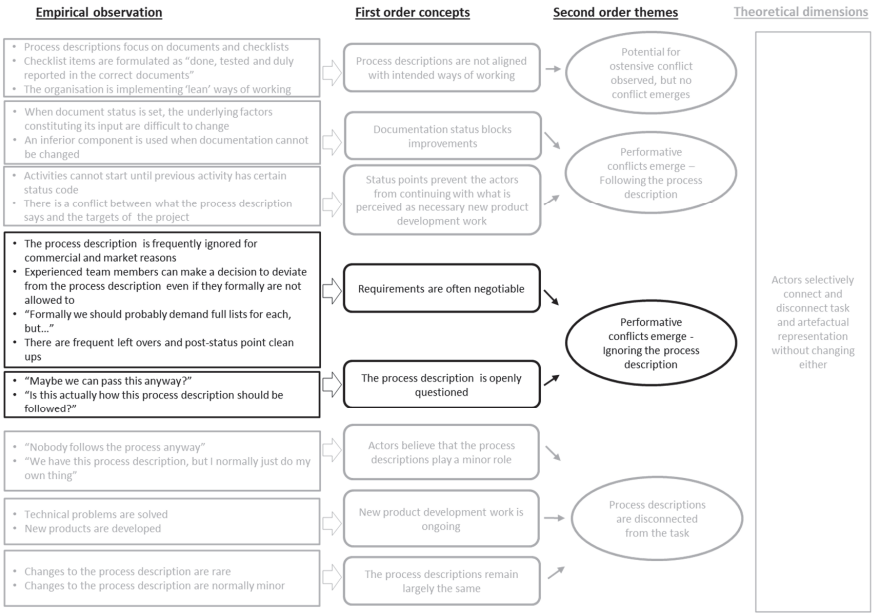
5.3.2. Performative conflicts emerge – Following the process description



When incommensurate demands are put on the performative side of routine performances, however, conflict is unavoidable. In these cases the performances required to fulfil a new product development task are not allowed by the artefactual representation or vice versa. Hence, by carrying out task work, the suffessful completion of artefact work would be directly prevented, or vice versa. In the data there are several examples of actors choosing to follow the requirements of the process description rather than proceed with development work. In those cases, the process description is treated as a law that cannot be broken, regardless of the implications of following it. This can be seen, for example, in the document review status that can constitute a stopper for improvements to the product or the status code set in the system that prevents the verification team from performing certain tests. When the process description is treated as immutable and non-negotiable it can lead to situations where development work is put on hold for the sake of process compliance.

When considering the routine from the perspective of the task, through the enabling and constraining properties of the ostensive aspect, performativity should reflect the ostensive idea of task work. However, when, for example, document review status means that products cannot be improved as described in section 4.9, the artefactual representation intervenes so that performative actions are guided by process description requirements rather than expectations on ostensive patterns. The dynamics of the ostensive and performative aspects of task work can therefore be moderated by the artefactual representation.

5.3.3. Performative conflicts emerge – Ignoring the process description



In the data we also see many examples of the process description being ignored. Instead of being treated as a non-negotiable set of rules that are allowed to determine performative actions, the process description is seen as negotiable suggestions that can be followed or violated at the discretion and will of the actors. The most blatant examples are those when the reference group, and later also the steering group, decide to let the project pass a gate even though all requirements have not been fulfilled. In that particular case, rule breaking was prompted by a sense of urgency regarding satisfaction of customer needs. It was also preceded by conscious deliberations of what to do. There are also other, more subtle examples of when the process description is not followed. These can be seen when the team members refer to other teams not acting in accordance with what is perceived as prescribed by the process description. The teams that have done the actual rule-breaking in this case have not been part of the study

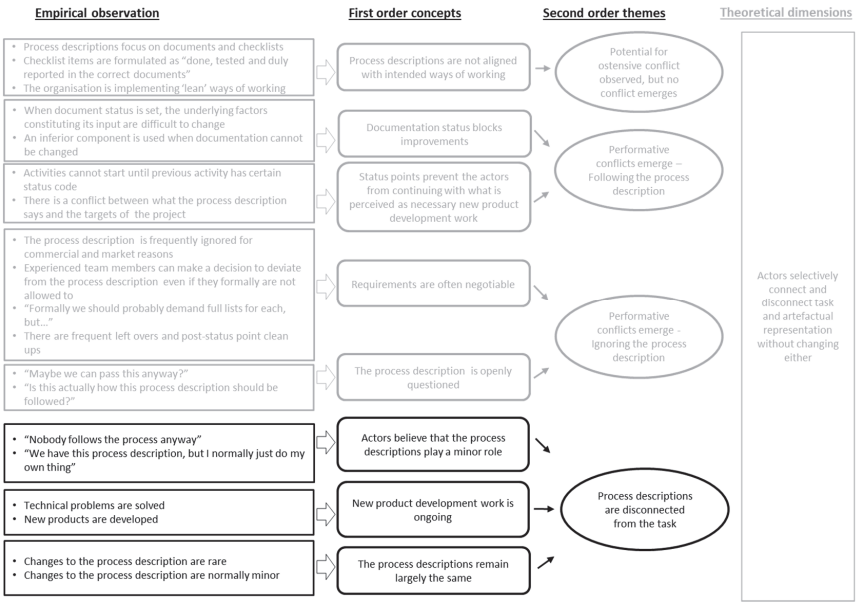
and, therefore, I do not know whether the non-compliance was deliberate or not, but their actions have observed repercussions for Rocky.

The Rocky-team members refer to the non-compliant teams both as "doing their own thing" and "not knowing what they're doing", indicating that 'the others' can both deliberately and unwittingly ignore the process description. Most interestingly, it is not so much whether they do or do not, but rather the fact that the members of Rocky open up for both scenarios. In other words, rules are quite easily broken (doing their own thing) and there is a certain degree of ambiguity connected to how the process description should be interpreted (not knowing what they're doing) and that rule-breaking in that case can be unintentional.

The process description is also openly questioned, both regarding whether it should be followed or not, and how it should be interpreted and applied. The interview with line manager Graham, described in sections 4.10 and 4.11, suggests that not only can the process description be ignored; a degree of flexibility in its enactment is even required. Explanations of the type "of course we have to deliver to the customer" are used to justify this type of behaviour. The statement "nobody follows the process anyway" shows that not following is considered perfectly normal and that the process description should rather be seen as a guide and indication of what is an expected action at any point in time. Hence, in these circumstances the process description has limited influence over how the routine is performed. The idea of what product development is 'really' about (developing new products) is allowed to take precedence so that the ostensive aspect of the task moderates the artefactual representation's ability to steer performances (cf. Essén, 2008).

Just as the ostensive aspect's ability to constrain and enable action is moderated by the artefactual representation, so can the artefactual representation's ability to dictate action be moderated by the ostensive aspect of the task. The representation's requirements on performativity can thus be either ignored, in favour of the reproduction of ostensive pattern of task work, or enforced, in favour of the reproduction of the pattern of artefact work.

5.3.4. Process descriptions are disconnected from the task



When only looking at the artefactual representations of routines at Global Tech, an outsider might get the idea that the most important aspect of development work consists of producing the correct documentation. At the same time, product development work is also ongoing. Products are developed, tested, produced and sold, and engineers talk about their work in terms of task work. They also frequently say that the process description does not materially affect how they carry out their job. Additionally, as the previous section showed, the process description is often ignored in favour of what is considered necessary task work. Hence, in parallel with the work aimed at satisfying the requirements of the process description, there is also a large amount of task work being performed.

With the common statement "nobody follows the process anyway", one could also be led to believe that the artefactual routine representations are just dead pieces of paper that do not have any influence over what people 'actually' do. However, the data in this study show that even though

the artefactual representation is not always followed, it quite often is. And even when it is not directly present, it is still an integral part of how the new product development routine is performed by affecting how product development work is talked about and measured, and by giving rise to actions and action patterns that would otherwise not have been observed.

By describing only the requirements on documentation instead of tasks, the artefactual representation is considered a poor description of the new product development routine. The idea communicated by the actors is that if you were to follow the artefactual representation by the letter, you would not be performing your job as a development engineer. On one hand the artefactual representations are therefore considered as a set of irrelevant, outdated, non-binding rules that can easily be broken. On the other, we observe situations in which the artefactual representations are considered 'the law', and that it must be complied with, even when this means putting development work on hold. The actors can also provide rational explanations for both of these, seemingly contradictive, stands by referring to the ostensive aspect of either task or artefact work. The common belief that "nobody follows the process" is therefore more an indication of how integral task work is and how the actors see their work, rather than an objective observation on whether the process description is followed or not.

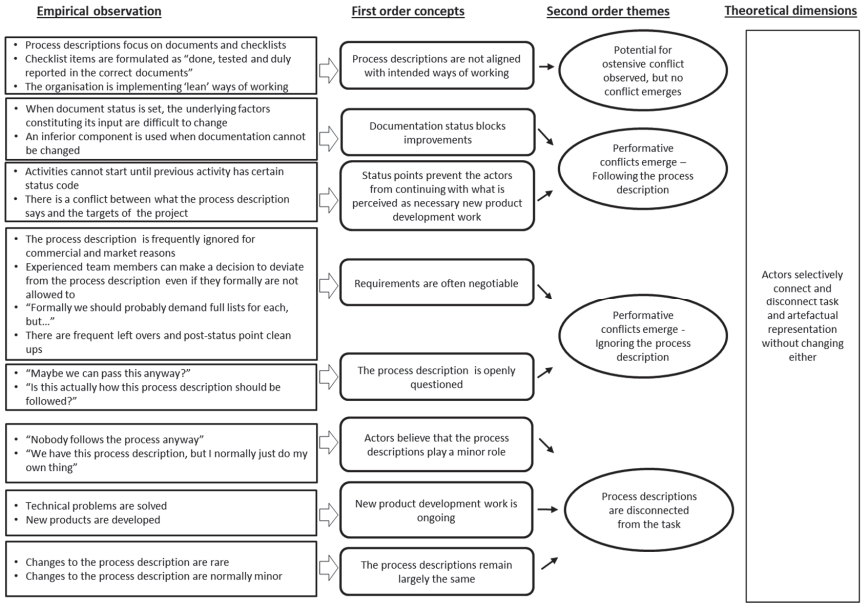
At the same time, as shown in section 4.13, the process descriptions in Global Tech remain stable, even though they are frequently broken, get in the way of development work, are not aligned with the espoused organisational values or are frequently talked about as mere suggestions. This is interesting for several reasons. Firstly, the performative and ostensive conflicts discussed in the sections above are the result of the dynamic and unpredictable contextual conditions that are inevitably affecting the relationship between a routine and its representation (Callon, 1998; D'Adderio, 2008). However, adjusting the artefactual representation to better reflect the conditions would be one way of, at least temporarily, avoiding such conflicts.

Secondly, even though the artefactual representation in the present study cannot be instantly changed by the users, changing its material properties or discursive content is quite easy from a technical point of view.

From an organisational stance it would, however, be a larger issue. Just the mere size and complexity of the organisation means that if something is changed in the process description in one place, the consequences for operations elsewhere in the organisation can be difficult to predict. The result is that the changes made are mainly incremental and rather additions of new checklist items than any structural alterations to the process description or its meaning. Even the specially appointed team working with the NPD Decisions Directive did not manage to change the substance of the process description or the ways in which it was enacted.

Hence, even though there are several factors that signal a need for change on one hand, and technical and organisational possibilities of performing the change on the other, the process descriptions at Global Tech are allowed to remain stable. The actors also follow the process descriptions, even though they claim they do not, at the same time as they perform the task of developing new products. The actors are disconnecting artefact work from task work so that following the process description is not related to performing the task. This allows them to both follow the process description and maintain their task related identity, without having to change the artefactual routine representations.

5.3.5. Developing the theoretical dimension "actors selectively connect and disconnect task and artefactual representation without changing either".



While the potential ostensive conflict described above can be managed by disconnecting artefact work from task work, thereby avoiding a comparison that would prove them to be incompatible, performative conflicts must be managed differently. As the artefactual representation is a representation of the task, task work and artefact work are still connected as two parts of the same organisational routine. When the contextual circumstances put the actors in a situation where the actions required by the process description are incompatible with what is perceived as necessary product development work, the option of completing both artefact work and task work is not available. Instead the actors have to choose which of the requirements to follow and which to break, and the performative conflict in that case cannot be avoided.

In the words of routines theory, this implies that the performative aspect of the routine is enabled and constrained not only by its ostensive aspect but also by the demands emerging from other factors in the context, in this case the artefactual representation. This means that the artefact that is supposedly a representation of the routine also plays an active role in moderating the internal dynamics of the routine it represents. However, the artefactual representation's ability to require, afford and constrain actions is also moderated by the ostensive aspect of the task. Nevertheless, whether the actions required by the context for the completion of the task are constrained by the artefactual representation or not, the actors still have to relate to both artefact work and task work in one way or another. In the data we see that in these situations the actors sometimes decide to side with the process description and sometimes with the task. The choice of which to follow and which to break is done by calling on the ostensive aspect of either task work – "of course we have to deliver to the customer" - or artefact work – "if we don't follow the process we will have chaos". By referring to the ostensive aspect of either task work or artefact work, the actors are implicitly ignoring and temporarily disconnecting the other. When the performative conflict has been dealt with, the actors can re-connect the previously ignored ostensive and go back to following both.

In addition to this dynamic and flexible way of relating to both task and artefactual representation, different types of stability are also observed. The task of developing new products remains firmly at the centre of what the actors perceive as the purpose of their work, and it is seen as stable and unaffected by the influence of the artefactual representation. At the same time, as shown in the previous chapters, the artefactual representation influences how the new product development routine is performed at all levels. It affects how certain jobs are prioritised over others, how the actors refer to what they do, and leads to specific performances only aimed towards compliance with the artefactual representation. Nevertheless, the actors clearly manage to develop new products and what is expected in terms of development performances and the patterns they generate remain the same. Despite the substantial influence of the artefactual representation on routine performances, the task is allowed to both retain its legitimacy and stability.

The findings also show that, even though the actors do not think the artefactual representation is an accurate representation of the product development routine and is frequently ignored, it is rarely changed or updated. The legitimacy and stability of the artefactual representation is therefore also retained, despite the dynamic and selective way in which the actors relate to it. Hence, even though the idea and pattern of the task on one hand and the artefactual representation on the other moderate each other's ability for the guiding, referring and accounting of performances, they are in themselves seemingly unaffected by each other (cf. Feldman and Pentland, 2003).

Separation of task and artefact therefore means that when performing task work, the artefactual representation can be put aside. Conversely, when performing artefact work, the task can be ignored if it gets in the way of compliance with formal requirements. The actors can therefore perform the task without having to consider the simultaneous enactment of the artefactual representation and vice versa. The recursively related performative and ostensive aspects emerging from artefact work have then been disconnected from those of task work. The ostensive conflicts described in section 5.3.1 can be avoided as the separation of the artefact work pattern from the task work pattern means that they can both be reproduced through their respective performances. At the same time, the performative conflicts are also dealt with by separating artefact work from task work so that when foregrounding task work, the expected task pattern is called upon, and conversely, when foregrounding artefact work, the expected artefact pattern is activated. By keeping the ignored pattern out of sight, its legitimacy is not questioned. The dynamic and seemingly effortless way in which the actors switch between artefact work and task work, thus facilitates rather than prevents the upholding of legitimacy and subsequent stability in both the artefactual representation as well as the routine it represents.

The actors can connect the task with the artefactual representation when possible, disconnect them when not, and then re-connect again as if nothing has happened. In practice this means that on one hand, the artefactual representation can maintain its stabilising powers even after it has been ignored, thereby reducing perceived uncertainty by not constantly

fiddling with the artefactual representation. On the other hand, it also means that tensions and conflicts can be swept under the carpet thereby reducing the organisations ability to identify when there is a need for change.

Chapter 6

Towards a model of task routine and artefact routine

The previous chapter discussed the second order themes and how they led to the identification of the respective theoretical dimensions. This chapter starts by discussing these dimensions and their implications in the light of existing research. Based on this, the chapter then proceeds to show how the theoretical dimensions connect to each other to form a model used to describe how artefactual representations of routines are involved in shaping routine performance.

6.1. Artefactual representations of routines shaping ostensive and performative aspects

As shown in Chapter 5, the artefactual representation brings in new types of performative actions and ostensive patterns relating to how organisational routines are performed. The purpose of the process descriptions studied at Global Tech is to direct and guide the way in which the new product development routine is performed, - and it is hardly surprising that they manage to achieve this to a certain extent. That technology and artefacts are shaping organisational practices is well known within the field of technology studies (see for example D'Adderio, 2008; Leonardi and Barley, 2008; Feldman and Orlikowski, 2011). However, it is also well known that even though the artefact requires certain actions to be

carried out while disallowing others, actions are not determined by the design of the artefact per se (D'Adderio, 2008, 2011; Leonardi and Barley, 2008; Pentland and Feldman, 2008a). Markus and Silver (2008) argue that technical objects are 'real' things insofar that they have material properties that are not dependent on how the object is used or perceived. Nonetheless, the functions of the object are determined by how it is interpreted and used by those enacting it. The text in a checklist, for example, has the same material properties no matter how you interpret it, even though how it is interpreted can be much more important in determining the actions that are based on it.

In existing research there is an established view that technology and other artefacts consist of different aspects or dimensions, thus supporting the idea that the types of performances emerging from the enactment of the artefactual representation, artefact work, would consist of both concrete actions and abstract ideas and patterns. DeSanctis and Poole (1994) make a distinction between the spirit and the structural features of technology, whereas Rafaeli and Vilnai-Yavetz (2004) talk about the instrumentality, aesthetics and symbolism of artefacts. Both of these suggest that artefacts contain concrete materiality (structural features or instrumentality) as well as represent abstract ideas (spirit or symbolism and to some degree aesthetics). Yet, materiality does not necessarily imply something tangible. Materiality can also be defined as anything, - tangible objects or conceptual frames - that has material implications and constrains for cognition and actions (D'Adderio, 2011). Hence, even though the artefactual representations studied in this thesis are not always tangible (such as process descriptions on the intranet, checklists in decision materials, or presentation templates), they still have material properties that afford certain actions and not others.

Observing that artefacts are enacted in a specific context by specific actors, Markus and Silver (2008) extend the model proposed by DeSanctis and Poole (1994) with the relational concepts of functional affordances and symbolic expressions in addition to the concept of technical objects denoting the material properties. Cloutier and Langley (2013) further connect the artefact to the context in which it is created by arguing that artefacts reflect and represent the logics of their institutional context. Along

the same lines, Essén and Winterstorm (forthcoming) suggest a framework in which both social and material structure pre-date and shape human action where the social structure is represented by logics and the material by artefacts. Hence, just as routines consist of both concrete situated performances and abstract ideas, the artefactual representation also has both concrete material properties as well as an abstract idea that has, deliberately or not, been attached to it by its designers and users.

Even though the material properties of an object can be seen as 'real' and given, the functional properties are not. Hutchby (2001) borrows the concept of affordances from ecological psychology to show the relational and situational aspects of technology by arguing that "…affordances are functional and relational aspects which frame, while not determining, the possibilities for agentic action in relation to an object" (Hutchby, 2001, p. 444). Markus and Silver (2008) include the goals of the actors as a factor involved in the formation of the object's 'functional affordances' defined as "… a type of relationship between a technical object and a specified user (or user group) that identifies what the user may be able to do with the object, given the user's capabilities and goals. More formally, functional affordances are defined as the possibilities for goal-oriented action afforded to specified user groups by technical objects." (Markus and Silver, 2008, p. 622).

The abstract idea of an artefact, the spirit, was defined by DeSanctis and Poole (1994) as "…the general intent with regard to values and goals underlying a given set of structural features" (p. 126). While DeSanctis and Poole (1994) regarded spirit as a property of the artefact that was there regardless of intentions or perceptions, Markus and Silver (2008) acknowledged the relational aspects of technologies and other artefacts with the introduction of 'symbolic expressions', defined as "… a relational concept relative to a specific user group, not as properties of technical objects" (p. 623). Hence, the abstract side of artefacts has been conceptualised in different ways. In the present study I have however opted for the simpler 'idea' to describe the abstract dimension of artefactual representations that, intentionally or not, reflect the logics (Essén and Winterstorm, forthcoming; Cloutier and Langley, 2013) or spirit (DeSanctis and Poole, 1994) of its designers and users.

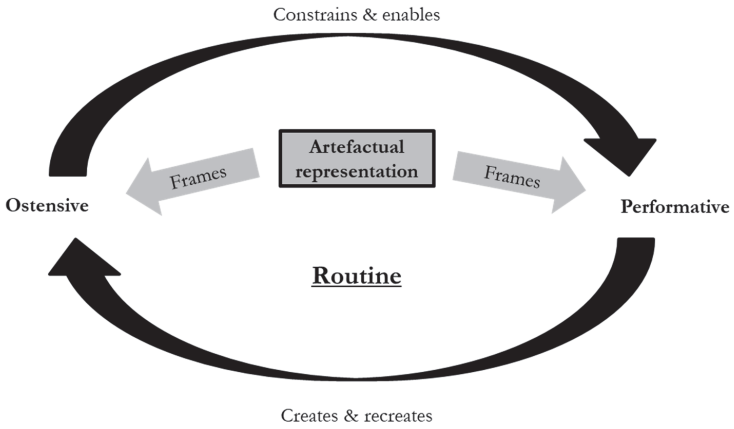
By acknowledging that the functional affordances and abstract ideas of artefacts, including artefactual representations of routines, are situated and relational, the direct effects of the artefactual representation on routine performances mentioned above can be discussed without having to assume that this will always happen. Instead, it can be concluded that the material properties (tangible and intangible) of the artefactual representation can frame the performative aspect of a routine by affording certain situated actions and not others. At the same time, the idea reflected in the artefactual representation provides a frame for how the routine can be ostensively understood.

The influential, yet non-deterministic, role of the material properties of the artefactual representation can be seen in section 4.1 and 4.2. Here the material properties of the process description afford certain performative actions (for example checklist clean-up meetings) while constraining others (for example shipping material from one site to another). These actions are indeed a result of the material properties of the process description, even though they do not necessarily state that this is exactly the way the actions are to be carried out in the specific context. The checklist clean-up meeting, for example, is not demanded by the process description; instead, the actors have themselves decided that this meeting is useful to ensure that compliance is achieved. The abstract idea of the process description is likewise not deterministic; it rather informs and guides the ostensive understanding of the routine and can also be drawn upon to justify or account for why this understanding has come about (for example when explaining why the problem report meeting is important).

Consequently, through their material properties and abstract ideas, artefactual representations of routines provide a frame that shapes both performative action and ostensive understandings. In the absence of overflow, the frame and performances converge and the frame is seen to 'fit' the routine it represents (Callon, 1998; D'Adderio, 2008). However, the artefactual representation frames actions and understandings relating to artefact work rather than the task of developing a new product. When the situational conditions allow for the performance of both artefact work and task work, that is when the frame provided by the representation does not prevent task work from being performed, the actors can take the

performative actions required by both task and artefactual representation, thereby allowing for the recreation of both ostensive patterns.

Figure 5. Framing of performative and ostensive aspects



Based on and developed from Feldman and Pentland (2003), Pentland and Feldman (2005) and D'Adderio (2008, 2011)

6.2. Formation of artefact routine and task routine

The previous chapter and section showed that artefactual representations of routine frame (Callon, 1998; D'Adderio, 2008, 2011) both performative and ostensive aspects of routines. This is done through the material properties and abstract idea of the artefactual representation respectively. The performances that are directly derived from the design of the artefactual representation, artefact work, can be more or less connected to the performances related to the new product development, task work. Indirectly, new performances are also enabled by the artefactual representation through its ongoing enactment and the understandings this

creates. Sometimes, the ostensive and performative aspects related to the artefactual representation are clearly linked with those of the task and can be recognised as two sides of the same coin. Had, for example, the checklists and other documents always been reflections of the task work performed, the connection would have been indisputable.

Artefact work is thus deeply entangled in, but not the same as, task work. Instead, artefact work has its own performative and ostensive aspects (Feldman and Pentland, 2003), that are performed in parallel with those of the task. These findings support previous findings by, for example, Turner and Rindova, (2012) and D'Adderio (2014), who point towards the emergence of multiple ostensives and/or performatives in routine enactment. They show that competing pressures for consistency and change originating from actors external to routine performances, such as customers or the surrounding organization, are sources of this multiplicity. To cope with the conflicting demands, the involved actors selectively enact one or the other ostensive and/or performative aspect. The results of the present study extend these findings by showing how routine performances cope with differences emerging from within the routine itself through its artefactual representation. The multiple ostensives emerge as a result of a difference between the idea of what a product development routine 'is about', on one hand, and the idea reflected in the artefactual representation, on the other. Hence, instead of taking part in the pattern generated by the task work, the artefactual representation sometimes generates its own ostensive pattern, different to that of the task. The multiple performative aspects, in turn, emerge as a result of the material properties of the artefactual representation requiring, affording and constraining actions that are different to those enabled and constrained by the situational context and ostensive aspect of the task.

However, not only does the design of the artefactual representation give rise to multiple ostensive and performative aspects, the way in which the artefactual representation is enacted also enables new performatives and ostensives to emerge. These actions and understandings are indirectly derived from the artefactual representation when the ongoing and continuous enactment of it has created common understandings that in turn allow for actions that would otherwise not have made sense. This

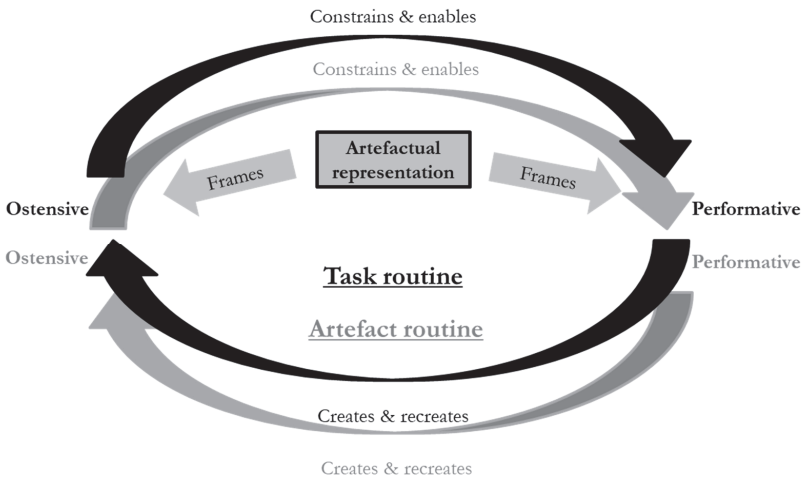
implies that the performative and ostensive aspects of artefact work are also recursively related so that the ostensive understandings and established patterns give rise to new actions that in turn create new patterns and so forth.

This implies that artefact work has performative and ostensive aspects that are separate from those of task work. That these aspects are recursively related indicate the formation of a separate artefact routine consisting of performative and ostensive aspects of artefact work, operating separately yet overlapping with that of the task. To clarify the way in which the two routines are different we can make a simplified comparison of their respective performative and ostensive aspects. In this case the underlying organisational routine, the task routine, is that of new product development. Its ostensive aspect can be approximated by the idea of 'this is how we develop new products' and the performative by, for example, testing new components and talking about potential solutions to technical problems. The ostensive aspect observed in the artefact routine can however be described as 'this is how we document and report how we develop new products'. Performativity of the artefact routine involves relating to checklist items, updating documents and preparing material for status code approvals. In this case we can see that although both the ostensive and the performative aspects of the task routine are closely related to those described in the artefactual representation (and of course the task performances often involve other artefacts too), they are clearly not the same. By performing the actions required by both the task and the artefactual representation, the actors are reproducing the patterns of both the task routine and the artefact routine.: technical problems are solved, and the solutions are duly reported through the correct document updates.

The recursively related ostensive and performative aspects of artefact work are hence different from the recursively related ostensive and performative aspects of task work. This indicates that the multiple ostensive and performative aspects that emerge as a response to the different demands from task and artefactual representation (c.f. Turner and Rindova, 2012; D'Adderio, 2014) form multiple routines that are, more or less, connected, yet distinct, parts of the same routine, the new product development routine in this case. Just as there is a difference between task

work and artefact work, there is also a difference between task routine and artefact routine, illustrated in Figure 6, based on the model introduced by Feldman and Pentland, (2003).

Figure 6. Performing task and artefact as different routines



Based on and developed from Feldman and Pentland (2003), Pentland and Feldman (2005) and D'Adderio (2008, 2011)

In the unlikely case that the artefactual representation's framing of routine performances is not subject to overflow (Callon, 1998), that is when there are no tensions or conflicts between artefact work and task work, the two routines can always stay connected. The actors can enact both routines in parallel by fluidly and dynamically drifting between them and the routines can co-exist harmoniously. The two ostensive patterns can also converge at times, for example, when the verification engineers are testing products and then logging the results in the appropriate documents and systems. In other cases, the distinctive patterns generated by task work and artefact work can be unconnected and performed separately even though they seemingly

relate to the same thing. When the actors treat documents and completed checklists as deliverables, for example, they are recreating the pattern of artefact work, whereas when they discuss technical issues, they are recreating the ostensive pattern expected by the task. In the present study, the disconnecting of artefact pattern and task pattern is the most visible in the handling of the problem reports. The extracts in section 4.4 are just some examples from a process that has generated a disconnect of the management of problem reports, on the one hand, from the solution of the problem that led to the report's creation, on the other. The connection between the problem and the problem reports has been weakened to the point where it is barely visible even to those involved in both. Here, the artefact pattern is reflected in one meeting series where the fulfilment of the requirements of the artefactual representation is discussed, whereas the task is reflected in a different meeting series in which the underlying task related problems are discussed. Hence, the performative actions of the task routine are not recreating the ostensive pattern of the artefact routine and vice versa. To the actors involved, these patterns are so distinct that merging them into one is not considered feasible and the performative actions they require must be carried out separately from one another.

6.3. Separating conflicting routines

Consequently, the material properties of the artefactual representation frame the performative aspects of routines, whereas the abstract ideas that are, deliberately or not, reflected in the design of the artefactual representation guide and inform the ostensive aspect. However, unsurprisingly, routine performances are also affected by overflow arising from the context in which they are enacted. Unpredictable, ambiguous or otherwise uncertain contextual conditions imply that the frame the representation provides is subject to overflow, resulting in divergence between representation and routine performances (D'Adderio, 2008).

The overflow can originate from all those connections that the routine, which is framed by the representation, has with its environment (Callon, 1998) and, as shown in section 5.3, the conflicts arising can be seen between both performative and ostensive aspects. Ostensive conflicts can

arise from a difference between the abstract ideas of the artefactual representation on one hand, and organisational culture or values on the other. Performative conflicts arise when the material properties (for example code in software or discursive content of a checklist) require actions that are incompatible with, for example, customer requirements, resource or restrictions, or material properties of the product under development. Whether the conflict takes place on the ostensive or performative side is, however, of great importance to how this affects the co-existence and simultaneous performances of the two routines. Ostensive conflicts can be largely avoided by doing more work, that is perform both the actions required for the recreation of the pattern of the artefact routine as well as the pattern of the task routine. Performative conflicts are, however, unavoidable as the actions required by one routine are constrained by the other. In those situations, the actors are forced to choose whether to perform artefact work or task work.

As described in section 5.3, the actors can choose to follow the process descriptions instead of performing the task. They can also choose to perform the task instead of following the process description. Hence, just as shown by D'Adderio (2008, 2011), the artefactual representation is not a law that everybody follows regardless of what, but it is also not a set of recommendations that 'nobody follows'. Instead, the actors in the present study show a dynamic way of connecting with and disconnecting from the artefactual representation, breaking it with as little effort as when they follow it. Most of the time, actors' choices of when to follow and when to break what the artefactual representation requires is integral to the ongoing flow of activities, quite undramatic, and typically not explicitly questioned. "Of course, we must deliver products to our clients" and "if we don't follow the correct order we will have chaos" are both typical explanations occurring in the data, even though they require the opposite actions in terms of following or breaking with the process description requirements. Hence, the intentions of the actors change depending on the available options and the assessments being made are tacit or automated. The negotiation between task routine fulfilment and following the artefactual representation seems as effortless as always, even though requirements of the artefactual representation have not been met, or problems in product

development have not been solved. The actors can thus drift in and out of reproduction of the artefact pattern, choosing to follow or violate the artefactual representation's requirements with equal ease. This effortless and seamless transition between following and breaking indicates a dynamic way of relating to the artefactual representation by experienced and knowledgeable actors.

In situations where the actors can no longer operate in both routines simultaneously, they must make a choice as to whether to perform the task or the artefact routine. To justify their choice, the actors are referring to the ostensive aspect of the respective routine. Following that reasoning, while the concept of "If we don't follow the correct order we will have chaos" is a valid justification for a rigid application of the artefactual representation according to the ostensive aspect of the artefact routine, it is maybe not as valid for task work. Conversely, justifying a breach of the requirements of the artefactual representation with "of course we have to deliver the product to the customer", makes perfect sense according to the ostensive aspect of the task routine, but is quite the opposite to that of the artefact routine.

When asked in interviews of how they know when to connect the artefactual representation and when to disconnect it, some of the actors respond that this comes with experience and that it is easier for more experienced actors to go against formal requirements than it is for those with less experience. On the other hand, the more experienced actors could also be more likely to engage in artefact entrenchment, that is, not questioning the process description and its requirements, as 'this is the way we have always done it around here'. Another explanation provided by an interviewee was that legal requirements cannot be ignored whereas essentially all internal requirements can.

While the above reasoning might partly explain why the artefactual representation can sometimes be ignored, it still fails to explain why it sometimes is not. If it were true that all internal requirements could be ignored, we would expect to see that happening whenever the artefactual representation got in the way of what is perceived as efficient or necessary development work. As shown in the earlier chapter, this is however not the case. This is interesting, especially in the light of the common statement

"nobody follows the process anyway", as it indicates that even though the actors do not think the artefactual representation is important, it still has significant influence over their actions.

The ability of the actors to break with the requirements of the artefactual representation shows that flexibility in performances is expected to adapt to the contextual needs, reflected also in the shared understanding that "nobody follows the process anyway". However, despite the sense of shared understanding there is a still a perceived need by the actors to coordinate their process-breaking through, for example, the talk observed in the reference group and steering group regarding the passing of a decision gate even though the formal requirements had not been met. The need for coordination of process-breaking is observed also by LeBaron et al. (2016) who continue by observing that confusion arises not so much when the artefactual representation is not followed, but rather when there are issues with intelligibility and ambiguity surrounding the artefact and/or the actions performed. Hence, non-compliance is the expected behaviour when the work, as described by the artefactual representation, does not comply with the expected pattern, and, conversely, breaking is frowned upon when the artefactual representation describes what is expected by the actors anyway.

Issues arise when the different actors expect different patterns so that, for example, one actor follows a requirement that somebody else expects to be broken and vice versa. When relationships are strong between the actors, routines normally become stronger too (Loch et al., 2013), implying that in a tight team, a sense of whether the artefact or the task routine is more salient should be shared, and knowing when to follow or when to break is mostly uncomplicated. When actors from different teams are involved, relationships can be expected to be weaker, implying that the idea of what constitutes the 'real' routine might not be shared. In that case, performing the task routine at the same time as enacting the artefactual representation through coordination between actors of different teams and departments to know when to follow the process description and when not to is a rather skilful and effortful accomplishment. However, as the data shows, there are also situations when this coordination is not as successful, further pointing towards the role of the individual actors' experience and

judgement in interpreting how and when process descriptions should be followed and when they should not. Hence, when they are inevitably having to ignore either the artefact or the task, we see that the actors are ignoring one or the other ostensive aspect quite effortlessly and without much deliberation. The actors are selectively and seamlessly connecting and disconnecting routines with as little effort as when they can perform both simultaneously.

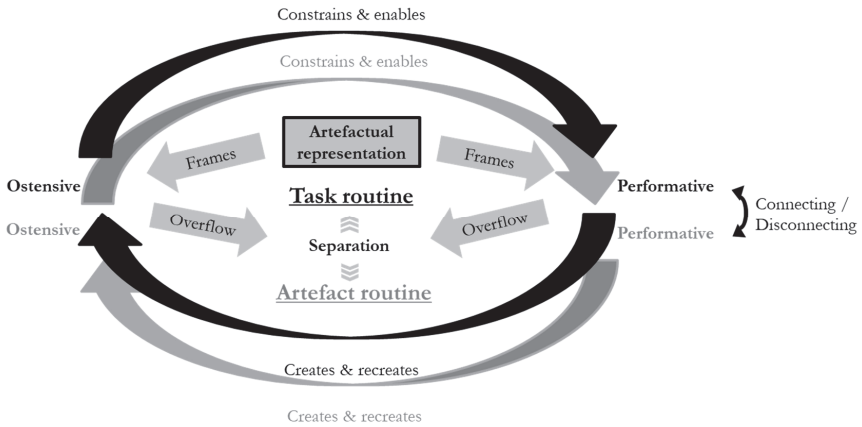
6.4. Stability in task and artefactual representation

When a representation is malleable, it can be reframed to accommodate the overflow, thus allowing for subsequent convergence of representation and performances (Callon, 1998; D'Adderio, 2008). Along the same lines, Leonardi (2011) argues that through imbrication, the interlocking of material and human agency in particular sequences, artefacts and humans together create, shape and change both artefacts and routines. According to Leonardi (2011), when the actors perceive the artefact as constraining their goals, they will attempt to change it and when they perceive it as affording the goals they will change how they perform the routine. Dittrich and Seidl (2018) also show that actors adjust their goals to adapt to the available means at hand when these are either enabling or constraining new performances. Volkoff et al. (2007) argue that when misalignments between the artefact and the ostensive aspect persist, either the ostensive aspect or the artefact should change. There is thus a large body of research suggesting that artefactual representation can change when the frame it provides no longer fits the routine it represents.

In the present study, however, the artefactual representation remains quite stable, despite frequent and substantial overflow. So what happens to the overflow when there is no reframing of neither task nor artefact work? The analysis in this thesis suggest that instead of reframing, the overflow leads to a separation of artefact work from task work, and subsequently also the separation of artefact routine from task routine. Building on the model suggested by Feldman and Pentland (2003) and the findings of

D'Adderio (2008, 2011, 2014), Figure 7 illustrates how separation of artefact routine and task routine accommodates for the overflow resulting from the incommensurate demands between the artefactual representation and the reality of the task without having to change or question the legitimacy of neither. Figure 7 shows how overflow leads to the separation of artefact routine and task routine and also that the overflow can be accommodated in the space between the routines that is created when they are separated from one another.

Figure 7. Overflow leads to separation of task routine and artefact routine



Based on and developed from Feldman and Pentland (2003), Pentland and Feldman (2005) and D'Adderio (2008, 2011)

As shown in section 5.3.1, the overflow on the ostensive side of the routines can, for example, be completely ignored. By disconnecting artefact routine from task routine, the actors can avoid the conflict that would arise if they were to try to incorporate the document-focused artefact pattern into the customer-focused pattern of the task routine. Instead, both patterns can be recreated by performing the actions they demand separately. By making a conceptual distinction between artefact routine and

task routine, we can thereby show how different abstract ideas as well as material constrains and affordances affect how routines are enacted. This also highlights that the ostensive aspects of the respective routines can be guided and informed by ideas, culture, management theories etc., that advocate very different, even incompatible or directly conflicting, values, intentions and ways of working, yet still co-exist harmoniously.

However, even though the potential conflict on the ostensive sides can be avoided when routines are performed separately, when the conflict takes place on the performative side it is not as easily solved. No matter how large the distance between the ostensive aspects of the routine, the performative aspects of the routines will always be related through the context in which the situated actions take place. When the context means that, for example, the actions required by the task are in direct violation of the requirements of the artefactual representation, recreation of the artefact pattern would not be possible if those actions required by the task are performed. Due to this connection between artefact routine and task routine on the performative side, performative conflicts cannot be avoided, but must be solved some other way.

Even in these cases when the conflict is unavoidable, separate artefact routine and task routine provide the actors with a solution. The actors can, in these situations, choose whether to perform the actions required by the task routine or those required by the artefact routine by referring to their respective ostensive aspects. By calling upon the ostensive aspect of, for example, the artefact routine –"if we don't follow the process we will have chaos"- the actors disconnect the task routine from their performances. By selectively performing only one of the routines, the other routine is temporarily put on hold. When again it is re-activated at a later stage, the actors can go back to performing both routines without having to question the legitimacy of the ostensive pattern of either. When the artefactual representation is only used to frame the artefact routine, the potential overflow that would occur if this frame was applied to the task routine has not happened and there is no need for reframing of either artefactual representation or task.

This dynamic way of relating to the artefactual representation supports existing research that shows that competing ostensive patterns arising

between routines (Spee et al., 2016) or within routines as a result of exogenous factors (D'Adderio, 2014) are coped with by selectively directing performances to one or the other pattern. The present study extends previous findings however by showing that the competing patterns do not necessarily have a source external to the routine. Instead, they can emerge from within the routine itself through its representation.

Chapter 7

Discussion – Separation of task routine and artefact routine viewed in the light of existing research

This study set out to explore how artefactual representations of routines, such as process descriptions, shape routine performances, especially in an environment that is inherently uncertain and unpredictable, while the artefactual representation is rather rigid and inflexible.

A review of existing research showed that at the core of routines theory is the realisation that routines are processes rather than things (Feldman et al., 2016) and that, through their mutually constitutive and recursively related ostensive and performative aspects, routines evolve and develop as they are performed (Feldman and Pentland, 2003). Within organisational routines theory, artefactual routine representations have been shown to influence how routines are performed, both affording and constraining routine performances (Leonardi and Barley, 2008), thus holding back or changing how the routine develops over time (Essén, 2008; D'Adderio, 2011; Leonardi, 2011; Danner-Schröder and Geiger, 2016).

The literature review also revealed three main points of concern. Firstly, it is recognised that artefactual representations form an integral part of organisational routines (D'Adderio, 2008, 2011); however, when they are put into practice, performances can differ significantly from those intended by their designers (D'Adderio, 2008, 2011; Pentland and Feldman, 2008a; Christiansen and Varnes, 2009). Such divergence can sometimes lead to the

artefactual representation being re-shaped to facilitate convergence in subsequent performances (D'Adderio, 2008). Sometimes the artefactual representation of the routine *can not* be changed though, indicating that either performances must be altered or the divergence between routine performances and representation will persist. How dynamic routines interact with a stable, rather than flexible, artefactual representation is a topic that has been largely left unexplored.

Secondly, Dittrich and Seidl (2018) show that as routines are continuously performed, intentions in routine performances emerge and evolve to adapt to, on one hand, the long term goal of the routine and, on the other, the means available at the specific point in time. As artefactual representations of routines can provide means by, for example, demanding that routine performances fulfil the requirements of the artefactual representation, and also come with the long-term goal of overall compliance, there is reason to believe that routine performances would also have to evolve and adapt in line with these. However, the means and goals of the artefactual representation might not be aligned with the means and goals of the routine. While Glaser (2017) shows that artefactual representations of routines are connected to routine performances through a series of mechanisms involved in the process of designing the representation, when artefactual representations emerge and develop organically over time instead of being designed from scratch, those mechanisms might not be present. Conversely, when routine performances evolve, while the artefactual representation does not, there is a clear risk that the artefactual representation will not adequately depict the routine it represents. In the absence of mindful and reflective ongoing design performances that ensure the continuous alignment of routine and representation, how actors cope with the tensions that may arise when the means and goals of the artefactual representation are not aligned with the means and goals of the routine, is thus a question that warrants further research.

Thirdly, we know from previous research that through the mutually constitutive, regenerative relationship between the routine's performative and ostensive aspects, even seemingly stable routines evolve over time, providing an important source of both organisational stability and change

(for example Feldman and Pentland, 2003; Becker et al., 2005; Feldman et al., 2016; Dittrich and Seidl, 2018). Again, the ongoing adaptation of routine performances to long term goals and the means at hand is an important aspect of how this evolution happens (Dittrich and Seidl, 2018). Given that artefactual representations would bring both means and goals, as per the discussion above, there is therefore reason to believe that artefactual representations would also affect how the routine and its intentions and goals evolve over time, especially when the means and goals of the artefactual representation remain rigid.

The findings presented in the previous chapters suggest that the actors enact the artefactual representation as a routine with recursively related ostensive and performative aspects, that are separate from those of the underlying task routine that the artefactual representation is supposed to represent. This artefact routine is therefore different from the task routine, even though task and artefact work are deeply intertwined and can be overlapping. The separation of task routine and artefact routine is the result of a stable artefact representing a dynamic routine. By selectively connecting and disconnecting task and artefact work the actors can fluidly and seamlessly transition between artefact routine and task routine without having to question the legitimacy of neither the artefactual representation nor the task. This implies that the artefactual representation can remain stable, even though it is frequently ignored or is allowed to get in the way of what is perceived as necessary task performances. This chapter discusses these findings in the light of existing research.

7.1. Separation of routines as a response to overflow

It is well established in existing research that artefactual routine representations matter for how routines are performed (D'Adderio, 2008, 2011; Essén, 2008; Pentland and Feldman, 2008a; Glaser, 2017). A basic, yet common, mistake is however to assume that the representation will be followed to the letter and that its design will be perfectly reflected in how the routine is performed. While such an assumption of technological

determinism is unnecessary (Leonardi and Barley, 2008), it has also been proven wrong by a number of studies from a variety of fields within business and organisation studies (for example Pentland and Feldman, 2008a; Christiansen and Varnes, 2009). Hence, focusing too much on the artefactual representation, neglecting how the routine is understood and enacted in practice, can lead to patterns of action that are significantly different from those intended (Pentland and Feldman, 2008a).

The present study supports earlier findings by showing that artefactual representations frame the performative aspect of routines (D'Adderio, 2008, 2011) and moderate the dynamics between the routine's performative and ostensive aspects (Essén, 2008). It also shows that artefactual representations can bring on the emergence of new ostensive understandings and ultimately the formation of a 'new' routine, centred on satisfying the requirements of the artefactual representation.

7.1.1. Rigid artefactual representations framing dynamic routines

Just as organisational routines consist of both performative and ostensive aspects, the artefactual representations of them also contain both concrete material properties and discursive content as well as more abstract ideas (DeSanctis and Poole, 1994; Rafaeli and Vilnai-Yavetz, 2004; Markus and Silver, 2008). The artefactual representation's framing of routine performances can therefore take on different shapes. On one hand the material properties and discursive content of the artefactual representation may afford certain actions and constrain others, while on the other the abstract idea or logic reflected in the artefactual representation will affect how the routine it represents is ostensively understood. The present study shows that the artefactual representation can frame routine performances (Callon, 1998; D'Adderio, 2008, 2011) in such a way that leads to the actors performing actions that they would not have performed, had it not been for the requirements of the artefactual representation, as well as to the formation of ostensive understandings focused on the satisfaction of the requirements of the representation.

As the artefactual representation and the routine do not exist in isolation, but are exposed to a world that is social and dynamic, rather than

mechanical and static, the frame provided by the representation will inevitably be subject to overflow (Callon, 1998; D'Adderio, 2008, 2011). The overflow in the case of the present study originates in, for example, the discursive content of the representation demanding actions that are not possible due to the context or that are not desirable from the perspective of efficient task execution. The result of the overflow is that the artefactual routine representation and routine performances diverge (D'Adderio, 2008, 2011). Or, in other words, the frame no longer fits the routine it is framing.

If the artefactual representation is malleable, such as described by D'Adderio (2008, 2011), it can be updated in accordance with its flexible and dynamic context, thereby re-aligning the artefactual representation with routine performances (Volkoff et al., 2007). However, when the artefactual representation does not lend itself to frequent updates, the misalignment will persist and the tensions between the artefactual representation and the routine it represents remains unresolved. When the overflow cannot go towards reframing of the artefactual representation, as observed by D'Adderio (2008, 2011), where does it go instead? The present study shows that instead of reframing, overflow can lead to the performances required by the artefactual representation and those required to satisfy the task diverging to the point where they can no longer be performed as the same routine. As a response, the actors perform an artefact routine dedicated to the satisfaction of the requirements of the artefactual representation, which is intertwined and overlapping with, yet clearly distinct from, the routine performing the task, in this case new product development.

The present study partly supports Leonardi (2011) who argues that technologies are flexible, not because of any inherent properties of the technology itself, but rather because of the dynamic context in which it is embedded and that "…when people work with both flexible routines and flexible technologies and wish to change their work practices, it seems they have a choice. Do they change the routine, or do they change the technology?" (page 163). In the case of this study, the organisation has expressed a wish to change their work practices and have also, to some extent, succeeded in doing so. However, as was shown in sections 4.13 and 5.3.4, even though the materiality of the artefactual representation is flexible in theory, organisational factors such as size and complexity makes

it rigid in practice. To accommodate the organisational intention of changing the work practices, without having to change the artefactual representation, the actors must change the routine. In this study, to allow for both the changed work practices as well as the unchanged artefactual representation, the actors adapted the routine to the point where the routine of following the artefactual representation is distinct from the routine of performing the task. When performed as separate routines, the artefactual representation is then allowed to only frame the artefact routine, thereby avoiding the issue of the overflow that would have occurred had the frame been applied to the task routine.

Berente et al. (2016) also argue that by dynamically adjusting the performative, ostensive and material aspects of the routine, misalignment between the artefactual representation and the ostensive aspect of the routine can persist without this necessarily causing problems for those involved. The misalignment in their case can even be beneficial to the implementation of the artefactual representation as it can function as a space in which conflicting demands can be negotiated. Volkoff et al. (2007) discuss the malleability of the artefact from a critical realist perspective, where they argue that the material artefact is enacted in cycles, implying that the artefact is not easily changed, even though it can be done. They show that when artefactual representations are enacted, they will either reproduce or elaborate the routine they represent and that when the ostensive aspect of the routine is in direct conflict with the material, either the material or the ostensive will be changed. The present study shows that when the actors can do neither, they can, instead, separate the artefactual representation from the ostensive aspect of the routine it represents, thereby avoiding the conflict altogether.

7.1.2. Multiple ostensives and performatives enacted as different routines

Artefactual representations are hence multidimensional in themselves, and their design can carry a variety of functions. Therefore, even though the design of the artefactual representation is by no means deterministic for the way in which the routine is performed (Pentland and Feldman, 2008a), the performances that go into designing the artefactual representation will be

important for shaping the connection between the routine and its material representation (Glaser, 2017). As a result, when matching, the material embodies the ostensive and shapes the performative (Berente et al., 2016). According to Pentland and Feldman (2008a), symbolically strong artefacts, that is artefacts that are subjected to interpretation by specific actors at specific points in time (Rafaeli and Vilnai-Yavetz, 2004), will "influence action to the extent that they are incorporated into the ostensive aspects of the routine" (Pentland and Feldman, 2008a, p. 242). However, based on the findings of the present study, I would argue that even if the artefactual representation does not necessarily have to be either embodied by, nor incorporated in the ostensive understanding of the routine it represents, it still shapes the performative. This results in other, more or less desirable, ostensives emerging. The idea of the artefactual representation also shapes how the routine and its purpose are ostensively understood, implying that when the idea conveyed by the design of the artefactual representation does not agree with the ostensive idea of the routine, performative action will be guided by multiple ostensives. These multiple ostensives may or may not be reconcilable with one another.

The emergence of multiple ostensive and/or performative aspects of routines have also been shown in previous studies (Turner and Rindova, 2012; D'Adderio, 2014). The present study extends those findings by showing that the performances carried out to satisfy the requirements of the artefactual representation leads to the emergence of new ostensive patterns and understandings that can in turn allow for new types of actions that create new patterns and understandings and so forth. The ostensive and performative aspects emerging from the enactment of the artefactual representation are also in themselves recursively related. This implies that enactment of the artefactual representation shows routine like properties that are similar to those of organisational routines in general. While previous studies have pointed towards the multiple ostensive and performative aspects within a routine, the present study shows that through their recursive relationship, the performative and ostensive aspects emerging from the enactment of the artefactual representation form a routine in themselves, carried out separately from the underlying task routine.

D'Adderio (2014) comes to a similar conclusion. She finds that conflicting goals in routine transfers leads to the formation of multiple sets of performative/ostensive aspects that are selectively performed depending on the combinations of communities and artefacts that are engaged. However, the findings in this thesis expand these conclusions by showing that selective performance of multiple ostensives and performatives can also be observed within the same set of actors and artefacts. Additionally, the emergence of multiple routines is not dependent on the existence of directly opposing goals; it can also take place when the goals of the artefactual representation and the task routine are different and not necessarily opposing, in other words, when the different routines are guided by different ideas, cultures, or values. In such cases, the material properties of the artefact do not necessarily enable the actions required by the task, even though they also do not necessarily constrain them. Convergence between the representation and the routine it represents is seemingly achieved by only considering artefact work while ignoring task work or vice versa. Consequently, when the artefactual representation is not aligned with the performative and ostensive aspects of the routine it is supposed to represent, the adaptation (Volkoff et al., 2007; D'Adderio, 2008; Berente et al., 2016) results in a drift that can eventually lead to, if not alignment and convergence, then at least reconciliation whereby the divergence is disguised as different, distinct routines instead of misaligned parts of the same routine.

Berente et al. (2016) connect their findings to differences in organisational level between those enacting the routine and those who have ordered the implementation of the material artefact. They argue that through the dynamic enactment of routines, inconsistencies between the material and everyday routine performances can be absorbed at a local level, thus allowing for reconciliation of contradicting goals at higher organisational levels. Berente et al. (2016) also mention the stability of the artefact as a reason for why misalignments occur in the first place, and that these misalignments can only be absorbed by the flexible adaptation of routine performances. In the case observed in the present study, I see traces of this occurring as well. However, the adaptation in routine performances leads to the emergence of an artefact routine instead of

reconciliation, and the misalignment between the ostensive aspect of the task and the artefactual representation is absorbed by adapting performances to both task and artefact routines separately. Berente et al. (2016) argue that the dual goals at the organisational level can thereby be achieved without putting an excessive burden at a local level. I would however propose a different interpretation, that the actors at the local level are taking on all the burden of reconciling the opposing goals by performing two routines at once. Hence the routine is adapted to the point that following the artefactual representation separates from the original routine, which in turn absorbs the misalignment between the artefactual representation and the idea of the task. This allows the actors at the local level to continue with their work while at the same time allowing the organisation to maintain a sense of control.

The artefact routine can sometimes be carried out simultaneously to the routine evolved for the completion of the underlying task. In those situations, task and artefact work are carried out in parallel. However, task routine and artefact routine can also be seemingly disconnected so that actors engage in artefact work and task work separately from one another. At the same time the findings have shown that when completion of the task is in direct violation with the requirements of the artefactual representation, actors can violate the requirements of the artefactual representation without the representation losing its legitimacy. Conversely, the artefactual representation is allowed to take precedence over what is considered efficient task work without neither artefact nor task routine being questioned or changed in the long run.

When the generativity observed in the enactment of the artefactual representation cannot be channelled towards changes in the representation itself it can set the performances and patterns created by it on a trajectory that brings them further away from those involved in the task of developing new products. Once separated, different performances create different patterns, which in turn will shape future performances and so forth. The mutually recursive aspects of performances and patterns will thus lead to separate generative systems forming for task work on one hand and artefact work on the other. The recursiveness in routines also implies that over time, they can drift further and further away from each other as

performances in each routine evolve in different directions. By separating task from artefactual representation, only considering them in isolation from one another, this drift can go unnoticed (Geiger and Schröder, 2014), thus preventing the artefactual representation from changing going forward. The separation of task and artefact work is thus not only a result of a rigid artefactual representation, it can also cement this rigidity further (cf. Konlechner et al., 2016).

Addressing the first of the issues mentioned in the introduction of this chapter, this study therefore shows that while routines are flexible (Howard-Grenville, 2005) and locally adapted (Berente et al., 2016) when the artefactual representation of the routine is inflexible and rigid, there is only so much flexibility in how the artefactual representation can be enacted before the tensions become too strong to be contained within the boundaries of the original routine. This can ultimately lead to the separation of artefact work and task work into two distinct routines.

7.2. Coping with conflicting demands

When artefactual representations attempt to frame performances in a context that is inherently unpredictable and uncertain, there are possibilities for tensions and conflicts to arise from several different aspects of routine performance. The artefactual representation of the routine demands fulfilment of artefactual requirements, such as completion of checklists, passing of design status points, etc. The new product development routine, however, demands that a sellable new product is developed in accordance with certain requirements on time, cost and quality. While these demands are not necessarily conflicting in themselves, the unpredictable nature of new product development work implies that situations arise in which the requirements of the artefactual representation and new product development are not compatible. While the previous section showed how the overflow resulted in the separation of artefact routine and task routine, this section will show how this separation can be both a source of and a way of coping with the conflicts and tensions that arise from the overflow.

7.2.1. Conflicting demands

While the artefactual representation in this case is stable and difficult to change, the task is dynamic and has to adapt to unpredictable and changing circumstances (Burns and Stalker, 1961; Browning et al., 2002; McCarthy et al., 2006). As shown by Woods and Shattuck (2000), in an uncertain environment it is impossible for an artefactual representation to predict all possible scenarios, which inevitably leaves some decisions to the judgement of the actors. This implies that, when the artefactual representation does not cover the situation at hand so that the material properties or discursive content of the representation neither affords, constrains or requires specific actions, the actors have to come up with a solution themselves based on previous routine performances (Reynaud, 2005). At other times, the material properties of the artefactual representation constrain certain actions that are perceived as necessary to continue with the task, thus giving rise to directly conflicting demands on how the actors should proceed.

Previous studies have discussed how conflicting demands on routine performances are balanced through multiple ostensives (Turner and Rindova, 2012; D'Adderio, 2014; Cohendet and Simon, 2016), and also how multiple ostensives in themselves can be a cause of conflict (Spee et al., 2016). Turner and Rindova (2012) show how the same routine can be subject to conflicting demands when different actors expect different patterns to emerge. In the context of a garbage collection routine they study how those performing the routine recreate a pattern of flexibility to satisfy the customers' expectation for consistency. Hence, in their study, the different ostensives are competing, yet mutually constitutive as the consistency required by one can free up the resources necessary to achieve the flexibility of the other. In addition, they also point towards the role of connections and artefacts in the recreation of both ostensive patterns. Whereas their study shows that the artefacts employed functioned as a tool for standardisation that can in turn facilitate flexibility, in the present study the artefactual representation does not play the role of a mediating tool; instead it is rather the root of the conflicting demands in the first place. This also means that the conflict observed emerges from within the routine itself rather than from exogenous pressures.

This is similar to the findings of Aroles and McLean (2016) who show that standards in organisations function as a tool for managing organisational issues, as well act as a source for such issues and concerns. The ability of the same group of actors to simultaneously maintain several ostensive patterns by selectively foregrounding one or the other is also shown by Spee et al. (2016) who point towards this behaviour when the conflict stems from incommensurate ostensive patterns of different, intersecting routines (rather than from within the same routine).

D'Adderio (2014) also points towards the emergence of multiple performative and ostensive aspects as a response to conflicting demands on routine performances. She studies how the competing goals of replication and innovation are managed in a routine transfer and shows that by separating the patterns and performances of replication from the patterns and performances of innovation, different combinations of communities and artefacts selectively foreground one ostensive pattern or the other, allowing the organisation to ultimately recreate both. Similarly to Turner and Rindova (2012), D'Adderio (2014) mentions artefacts as tools for switching between multiple ostensives and performatives. In her study, different combinations of artefacts and communities form the vessel through which the different ostensives and performatives can be enacted. The findings of this thesis thus extend the framework proposed by D'Adderio (2014) by showing that the conflicting demands can be the result of an artefact's involvement in routine performances as well as a tool for managing the conflict. The same combination of artefacts and actors can also successfully enact the different routines. In addition, this study also shows that not only do multiple ostensive and performatives emerge as a way of balancing conflicting demands, they are also mutually constitutive, recursively related parts that can form multiple regenerative routines operating in parallel.

When the artefactual representation frames both ostensive and performative aspects of routine performance, there are several potential sources of overflow that can, in turn, bring on different types of conflicts and tensions. The tensions between the competing goals, ideas, organisational values and strategies (to be lean in this case) and the highly bureaucratic process described by the artefactual representation are

conceptualised as ostensive conflicts. These tensions do not necessarily cause open conflict as long as the task can be carried out without jeopardising the fulfilment of the requirements of the artefactual representations. When the conflict takes place on the performative side of routines, it can however not be as easily ignored. When the performances required by the task are not allowed by the artefactual representation, or vice versa, the actors must choose whether to follow or break the requirements of either the task or the representation. The tensions between the ostensive ideas of the task and the artefactual representation can, however, be coped with by separating them from one another and enacting them in different routines. Depending on whether tensions arise on the ostensive or performative side of routine performances, the separation of task routine and artefact routine will provide different coping mechanisms.

7.2.2. Coping by separating

Salvato and Rerup (2018) show that actors with different goals avoid conflict between them by engaging in actions that fulfil one of the goals but do not relate to the other or perform tasks that fulfil both goals to avoid conflict all together. They also show that when these options are not available, the actors avoid a breakdown in routine performances by, for example, activating or repressing certain activities. These findings are similar to those of the present study. However, while the study by Salvato and Rerup (2018) relates to interpersonal conflicts where inherently conflicting goals between actors have to be balanced in a way that ensures continued cooperation between them, the present study shows similar types of actions also when the conflicting goals and demand emerge from within the routine itself.

In the case of the present study, there is an observed discrepancy between the organisation's alleged lean way of working and the bureaucratic artefactual representations. This implies that routine performances would be guided by two, arguably incommensurate, ostensives. One asks for a customer-focused, flexible pattern to emerge from performances, whereas the other expects the emerging pattern to be document-focused and stable. As the ostensive aspect enables and constrains performative actions through the mechanisms of guiding, referring and accounting (Feldman and

Pentland, 2003), the competing ostensives pose a problem to the actors as they cannot turn to the ostensive aspects of their lean task routine to account for and legitimise their bureaucratic artefact work.

Instead, the actors cope with the competing ostensives by performing the task and following the artefactual representation as separate routines, each guided by their 'own' ostensive(s). The separation of artefact routine from task routine, in this case, means that the potential ostensive conflict between the artefactual representation and the routine it represents does not materialise. The findings of this study suggest that the actors manage the tensions between the organisational values, culture and desired ways of working, on one hand, and the expectations and abstract ideas of the artefactual representation, on the other, by performing artefact work and task work as different routines. This can be compared to what Salvato and Rerup (2018) call goal-specific-actions, that is actions that are performed to satisfy one of the conflicting goals, without relating to the other. When performed distinct from one another, the actors can then recreate the pattern of artefact work in one routine without having to relate to the task and that of task work in another routine without having to relate to the artefactual representation. The conflict that could potentially arise between the task and the artefactual representation is thereby avoided, and the truce is upheld. Consequently, re-connecting task and artefactual representation at a later stage is unproblematic, even though one of them has been temporarily ignored.

While these ostensive conflicts can be avoided by reproducing the competing patterns as different routines, performative conflicts must be faced. These emerge when the performances required by the task are not allowed by the material properties or discursive content of the artefactual representation or vice versa. In these situations, the actors cannot avoid the conflict. Instead, they can manage it without compromising on legitimacy of neither task nor artefactual representation by selectively choosing to perform only one of the routines. Again, this is done through the mechanisms of guiding, accounting and referring (Feldman and Pentland, 2003) and, depending on which desired ostensive pattern is the most salient at that particular moment and place, the actors refer to shared understandings and values to justify which ostensive understanding should

guide their actions. When, for example, they break with the requirements of the artefactual representation by stating that "of course we have to deliver this to the customer" they are thereby referring to the desirable pattern of task work, ignoring the desirable pattern for artefact work. Conversely, the statement "if we don't follow the process, we will have chaos" refers to the desirable pattern for artefact work but disconnects performances from task work. This way of disconnecting the ignored routine from ongoing performances allows the actors to break with the requirements of either task or artefactual representation without the legitimacy of neither being questioned.

This selective way of dealing with competing ostensive scripts is also observed by previous studies, as mentioned previously, such as Turner and Rindova (2012), D'Adderio (2014), and Spee et al. (2016). This is allowed through the shared understandings that have been developed between those enacting the routine (LeBaron et al., 2016). LeBaron et al. (2016) further show that shared understandings are developed during flexible performances and are displayed rather than held. In a study of hospital hand-off routines they noted that "physicians expected a particular pattern, but also flexibility in handoffs" (p. 521). Applying these findings to the case in the present study, to avoid confusion in performances, on one hand, the actors cannot deviate from the expected pattern, on the other, the artefactual representation also constrains performances in a way that would result in those very deviations. Separating task from artefact routine will provide one way of getting around this as the separation allows them to recreate the expected pattern within the task routine, and then move between routines to comply with the artefactual representation in the artefact routine. This implies that by selectively performing either artefact work or task work, neither incommensurate demands on patterns nor actions must lead to reframing or questioning of either the artefactual representation or the task. This dynamic way of disconnecting and connecting with the artefactual representation and the task can be seen as an example of what Salvato and Rerup (2018) term "regulatory actions" that are taken to uphold a truce between parties with conflicting goals. In this case, the conflicting goals do not belong to conflicting actors; instead the opposing sides are the artefactual representation and the routine it

represents. The separation of task from artefact routine maintains the legitimacy of both task and representation as the actors can selectively ignore one of the routines while performing only the other and the truce negotiated by routine performances is not threatened.

Flexibility in performances is made possible by a strong shared understanding of what the respective patterns should be and that, as long as expectations are clear regarding which of them should be reproduced, ignoring one to the benefit of the other is not a problem for overall routine enactment. The choice of which parts of artefact and task work to follow and which to violate can be understood through the pragmatist lens as employed by Dittrich and Seidl (2018). They argue that depending on the situation and the means at hand, the ends-in-view pursued by actors in a specific performance might not be the same as the long-term goal, or desired pattern, of the overall organisational routine. This can in turn lead to the goal being updated to encompass the new ends. The dynamic way of relating to the overall goal of the routine, the short-term ends-in-view and the means available is also reflected in this study. However, here the goals of the task (to develop a new product) and the artefactual representation (to fulfil artefactual requirements) assume ways of working that are, by their very nature, difficult to reconcile. As the ideas behind these ways of working themselves are hard to change, so are the long-term goals of the two routines.

When the means at hand do not allow for the fulfilment of the ends-in-view of both artefact and task work, actors are forced to choose which of them should be pursued and which should be ignored. Such foregrounding of means over ends can, according to Dittrich and Seidl (2018), lead to a change in short term ends and ultimately also in a change of the long term goal of the routine. When there is no way for these adjustments to take place, the divergence of long-term goals, ends-in-view and performances, will persist. Assuming that actors wish to pursue the goals of the routine they are currently working in rather than go against it, this would cause a sense of discomfort with the actors and encourage them to change the situation (Feldman, 2000; Zbaracki and Bergen, 2010; Deken et al., 2016; Dittrich and Seidl, 2018). By separating task routine and artefact routine, and dynamically moving between them, some of this discomfort can be

avoided as actors can temporarily ignore the conflicting ends-in-view by selectively choosing to only operate in one routine, one at the time. Hence, in the presence of a constraining artefactual representation with a different long-term goal to the task, actors try to pursue different ends-in-view simultaneously in their performances. In these situations, the dynamic way of relating to means and ends can be done by enacting separate routines, rather than through the evolution of long-term goals.

According to Geiger and Schröder (2014), when rule violations are overlooked, how rules are interpreted will change, gradually, resulting in "a drift that goes unnoticed" (p. 182). However, as the findings in this thesis suggest, this is not necessarily the case. Instead, violating the artefactual representation is deemed as a necessary action to fulfil the goals of the task routine and it will not affect the dynamics of the artefact routine. This dynamic and fluid way of relating to competing demands on routine performances is also observed by Aroles and McLean (2016) who point towards an intricate dance of routine performances where things that were previously seen as non-negotiable can fade as a response to the salience of other forces, scripts and practices pushing towards different paths and outcomes. The separation of artefact routine and task routine allows actors to legitimise this flexibility in artefact following by situating performances in only one of the routines. This implies that the other routine hasn't necessarily been violated, only temporarily disregarded. Hence, actors can seamlessly disconnect and re-connect with the requirements of the artefactual representation without losing legitimacy of either the idea of the task routine, or the artefactual representation. By dynamically relating to the artefactual representation and selectively and fluidly choosing to operate in only one of the routines, while ignoring the other, tensions can be resolved and skilful actors maintain the legitimacy of the artefactual representation while still maintaining the ostensive pattern of the original task routine, even when these are in direct conflict with each other (cf. Essén, 2008; Aroles and McLean, 2016).

In the case of the more subtle tensions between organisational strategy or values and the pattern emerging form artefact work, the separation of artefact routine from task routine plays a slightly different role. Here, the separate routines are used as a way of legitimising not so much the

artefactual representation or the task, as the actions and patterns that are carried out and created on their behalf. Again, we can turn to LeBaron et al. (2016) who show that flexibility in routine performances work as long as the actors recreate the pattern that is commonly expected. However, in the case of the present study the ostensive pattern recreated through artefact work does not correspond to the common expectation of what the expected pattern of new product development should be. For example, in the case of the problem reports, the performances observed are not recreating the lean product development pattern supposedly guiding the new product development process. Instead, the actors have to legitimise and account for these performances by referring to the abstract idea reflected in the artefactual representation and the ostensive aspect of the artefact routine (Feldman and Pentland, 2003).

By not discussing the problem reports in the same meeting as the technical problems they report on, the actors can maintain the idea that they do not relate to the same pattern. That way there is no potential for misunderstandings regarding whether the pattern of task work or artefact work should be recreated. To avoid confusions the actors can therefore disconnect the artefactual representation from the task, so that the handling of the problem reports and the underlying technical problems must be performed separately, temporally, spatially and socially. Ultimately, this can lead to a shared understanding that the expectations for the pattern of artefact work are different to the expectations of the task pattern, making it close to impossible to unite the two within the same routine again.

Following the same reasoning, many actors also feel the need to distance themselves and their organisation from the artefactual representation by stating that "nobody follows the process anyway", even though they clearly do. When talking about their work, which they understand as evolving around new product development, the pattern recreated by artefact work is not part of expected performances for that task routine. Hence, when they talk about the task routine, they do not follow the process description. Process-following is instead done in a different routine, that is wholly dedicated to artefact work.

Being able to successfully move between routines and selectively connect and disconnect them with each other is a skill that has been

developed by mindful and competent actors over many cycles of routine performances as you must know which pattern you are supposed to recreate at each given point in time. Addressing the second of the issues identified at the beginning of the chapter it can therefore be argued that routine performances do not have to evolve to adapt to the artefactual representation. Rather, they can evolve into separate routines for artefact and task work. That way, the actors can avoid the tensions that may arise between the task routine and its artefactual representation by dynamically and selectively connecting and disconnecting them from each other.

7.3. Maintaining legitimacy of both task and artefactual representation

Addressing the third of the issues identified at the beginning of the chapter we can therefore conclude that even if the design of the artefactual representation is not aligned with the routine it represents it can still maintain its legitimacy without being changed. Hence, if the artefactual representation is considered a poor match with the intended patterns, when its legitimacy is not questioned the artefactual representation of the routine can constrain the organisation's ability to achieve the desired new ways of working. That this can happen despite the artefactual representation being frequently violated can be explained by the mechanisms leading to and emerging from the separation of artefact routine from task routine. This means that the artefactual representation, which despite what people say, shapes how the routine is enacted, is not changed to be better aligned with the espoused organisational intentions for how the routine should be performed.

Inertia in routines can happen for a multitude of reasons. Konlechner et al. (2016) show that instead of changing patterns, even new artefacts can solidify existing patterns when the actors chose to interpret and enact the artefact in such a way that existing patterns are maintained. Feldman (2003) also shows that even stability (or inertia) in routines is the result of effortful accomplishments on behalf of the actors. In the present study, instead of just repeating existing patterns, the actors base their actions on a shared

understanding of how the organisation operates. The ease with which the actors can connect, disconnect and re-connect with the artefactual representation could be made possible by separating artefact work from task work, thereby being able to act on the understanding that compliance with the artefactual representation is important, simultaneously as the understanding that swift new product development is high priority. The line managers and business unit managers observed in this study are thus both undermining the artefactual representation by accepting (and sometimes even encouraging) the violation of it, as well as cementing its legitimacy through the lengthy discussions preceding the violation. By not directly questioning the overall legitimacy of the artefactual representation, the actors can continue to create and recreate both the understanding that the artefactual representation shouldn't be violated, and that it can be violated when deemed necessary (c.f. Feldman, 2003).

The artefactual representation is also allowed to maintain its legitimacy even though its abstract idea suggests patterns that are not aligned with the values of the organisation. Without judging whether the bureaucratic and artefact centred handling of problem reports or checklist clean-up meetings are efficient or not, they are not compatible with the logics behind the lean management philosophy. Normally, the apparent tensions between following the artefactual representation and organisational values would be expected to cause a sense of discomfort with the actors. However, even though the actors have received training, attended workshops and read books about what lean is all about, the problem report handling or the checklist clean-up meetings are not questioned. The practice of discussing technical problems in one meeting and the reports describing the technical problems in another, or to dedicate meetings and functions to the following of checklists, allows the actors to separate the following of the artefactual representation from a routine that should allegedly be guided by principles that are in themselves contradictory to what the artefactual representation says. The separation of routines prevents them from questioning the practice.

This supports the findings of Bertels et al.(2016) who show that by taking support in the culture of the organisation, actors can engage in both the practices of shielding and shoring to allow for and cover up routine

performances that are not in line with expectations. Separating task and artefact routines provides the actors with a tool that lets both the principles of the task and the artefactual representation guide performances. Hence, when referring to the artefactual representation with "if we don't follow the process, we will have chaos" the actors can shield the performance in the artefact routine from the expectations of the task routine and vice versa. The actors can also make use of the practice of shoring or different cultural strategies for maintaining the routine even when it hasn't strictly speaking been followed. In this case, the separation of task and artefact routine provides a shoring tool in itself as it lets actors believe they are both following the artefactual representation and carrying out the task in line with organisational values (cf. Bertels et al., 2016).

Therefore, instead of being a representation of how a routine should be enacted and connecting performances with the values of the organisation, the artefactual representation can further decouple these. Sele and Grand (2016) argue that both human and non-human actants can be mediators or intermediaries in routine performances. In the case of the present study, the artefactual representation is a mediator demonstrating generative abilities in that it generates new routine performances even though these cement existing patterns rather than creating new ones (cf. Sele and Grand, 2016). Hence, if the artefactual representation of the routine does not reflect the intended direction of the change process and/or the values of the organisation, it is hard for the actors to change their performances even if they all buy into the proposed changes per se. However, even if the artefactual representation does provide a good description of the desired action patterns, the established action patterns can be so ingrained in the understanding of how the organisation operates that the actors can still interpret the artefactual representation in ways that justify the established ways of working (Feldman, 2003; Pentland and Feldman, 2008a; Konlechner et al., 2016).

This implies that even though the organisation is supposedly working towards change, the way the artefactual representation is designed conditions the actors to maintain the same patterns as previously. That this is the appropriate way of acting is also encouraged by how the managers relate to the artefactual representation, even though on other occasions

they might preach for change (cf. Feldman, 2003). The multiple routines within one routine can thereby demonstrate the same restricting abilities as other interrelated routines (Kremser and Schreyögg, 2016) so that it is hard to change one routine without also considering the other.

This shows that all aspects of the routine must be considered when designing its representation as even a 'correctly' represented pattern can lead to less desirable performances and, conversely, that 'correctly' described performances can generate a different pattern than that intended. However, skilful actors are aware of what is expected from them from the perspectives of both task work and artefact work. They know they must develop new products regardless of what the artefactual representation says, and also that they must fulfil the organisation's requirements with regard to procedure, regardless of what this implies for speed and flow in product development. Eventually, if the artefactual representation is not connected to the task routine, the performances required to satisfy all demands will start generating different patterns for artefact work and task work.

A key assumption underlying this thesis is that even though artefactual representations, can be continuously updated and adapted, they have originally been created in a place or time separated from their use (Volkoff et al., 2007; Berente et al., 2016). At the same time, once the artefactual representation has been implemented, and is socially enacted by its users, their interpretation of it takes precedence over that of the designer (Volkoff et al., 2007). Hence, artefactual representations are not in themselves necessarily deterministic for routine performances. However, their design will still have consequences for how the routine is enacted (D'Adderio, 2008, 2011). The process of designing an artefactual routine representation is therefore important (Glaser, 2017), yet it is also subject to a variety of over simplistic assumptions and misconceptions with regard to the relationship between artefactual representation and routine performances (Pentland and Feldman, 2008a).

A way of achieving a match, or a strong connection between artefactual representation and routine, is through the mechanisms of design performances described by Glaser (2017). Through reflection and iterative learning, design performances are supposed to ensure that the artefact

represents the goals and purposes of the underlying task routine, even though it cannot cover all possible scenarios in detail. A mindful and reflective design process can significantly strengthen the ties between task and artefact work, thus reducing the propensity for the emergence of unwanted patterns and performances.

However, the designing of an artefactual representation does not stop just because it has been implemented. Instead, after its implementation the actors using the artefactual representation will continue the design process by adding meaning through their performances and interpretations (for example Orlikowski, 2000; Volkoff et al., 2007). However, the material properties of the artefactual representation can also change (D'Adderio, 2008, 2011) and in large, mature organisations such as Global Tech, artefactual representations are rarely designed from scratch. Instead, they are rather updated and added to over time. These additions and updates are frequently the result of uncovered needs identified by finalised development projects and are often carried out by different people in different settings at different points in time. This means that the artefactual representation is developing incrementally by detail, rather than structurally as the result of a mindful and reflective process based on the full picture. In this case, the connection between representation and routine is weakened, or even non-existing. A lack of connection through design can therefore also lead to a separation of task work and artefact work. In addition, incremental changes and adaptions to the artefactual representation come with the risk that the updates are based only on the feedback from the artefact routine, thus resulting in the artefactual representation and the task being pushed even further away from one another.

At the same time, the present study also shows why artefactual representations do not have to be 'perfectly designed' to fill a function. The dynamic and seamless way in which the actors move between routines means that even a 'poor' representation can remain stable. By selectively connecting and disconnecting the artefactual representation from task performances, the actors manage to uphold a restricting representation while still performing their task with a high degree of flexibility. That the legitimacy of the artefactual representation is not questioned means that it can retain its stabilising powers. However, coping with tensions through

the separation of task and artefactual representation also means that the tensions are not surfaced, thereby preventing the reflection necessary for routine change to occur (Bucher and Langley, 2016; Dittrich et al., 2016; Glaser, 2017).

Nelson and Winter (1982) showed that organisational routines can in themselves be powerful mechanisms for coping with organisational tensions and incommensurate demands as they represent an organisational 'truce' that the conflicting actors have agreed to act upon. While the truce was earlier seen as stabilising (Nelson and Winter, 1982), more recent studies have argued that truces, just as routines, are processes rather than stable entities and as such need to be constantly renegotiated (Salvato and Rerup, 2018). Supporting this view, the present study shows that the truce in this case is not upheld by inflexible routines, but that flexibility in routine performances and a dynamic relationship between task and artefactual representation are requirements for the stability of the truce. If the artefactual representation would not allow for some flexibility in how it is enacted, the conflict between the representation and the task it represents would surface and the truce would be broken.

In the present study the conflict does not take place between actors, but rather between the task routine and its artefactual representation. (This may not be case however if one assumes that the conflict takes place between a distant designer of the process description and the manager who wants a lean product development process. Yet, even so, the actors that actually perform the routine are not necessarily representatives for one or the other party.) The continuous renegotiation of the truce is therefore not taking place *between* actors but is done *by the same* actor(s) within routine performances. The actors manage to do this by selectively connecting and disconnecting artefact routine and task routine in a way that allows the truce between them to be upheld (cf. Bertels et al. (2016) on strategies of action, and Salvato and Rerup (2018) on regulatory actions for maintaining truces). However, when flexible and dynamic performances 'save' a truce from collapsing, the underlying conflict is not exposed, which in turn implies that neither the artefactual representation nor the task must change to maintain the legitimacy of both.

Extending the findings by Danner-Schröder and Geiger (2016) who show that flexible enactment is required to maintain a stable pattern, the present study therefore shows that flexibility in performances is what allows for the stability of the artefactual representation to be maintained. The study by Danner-Schröder and Geiger (2016) also shows that both flexibility and stability are the result of effortful accomplishments on behalf of the actors and that these accomplishments rely on the actors' ability to know how to prioritise, align, select and recombine routine performances. The present study supports these findings and extends them to show that the same duality of flexibility and stability can be observed within the same routine when the actors know which pattern to enact in the specific situation. As discussed earlier, the actors at a local level can, by knowing when to break the requirements of the artefactual representation and when to follow them, ensure the flexible routine performances required to accomplish the task, while at the same time uphold the stability of the artefactual representation (c.f. Berente et al., 2016).

Hence, artefactual representations are so deeply enmeshed and entangled in routine performances that changing one without considering the other can have unintended, and unwanted, consequences for the organisation's ability to achieve both stability and change.

Chapter 8

Conclusion

The aim of this thesis was to explore how artefactual representations of routines shape routine performances, specifically in the case of a rigid representation of a routine that requires flexibility in its enactment. The interest in this topic was initially sparked during a wider research project looking into a large-scale transformation initiative at Global Tech, a large Swedish infra-structure provider. During the research project, process descriptions, conceptualised in organisational routines theory as artefactual representations of routines, were identified as playing an important, yet, arguably, underestimated role in the transformation. I therefore set out on an inductive study to attempt to answer three broad research questions:

1) How are stable artefactual representations of routines enacted in evolving routine performances?
2) How are tensions between dynamic routines and stable artefactual representations coped with?
3) How does the relationship between artefactual representations and routine performances influence stability and change in the routine and its representation over time?

Based on the data collected during an ethnographic study at Global Tech, a grounded theory coding structure was developed following the recommendations of Gioia et al. (2013). Organisational routines theory and the model developed by Feldman and Pentland (2003) showing that organisational routines consist of mutually constitutive, recursively related

performative and ostensive aspects, was used as a theoretical starting point for the subsequent theory building. The findings suggest that through direct and indirect effects on both actions and patterns in routine performances, the artefactual representation of the routine can be enacted in such a way that a separate routine emerges. By selectively enacting one or the other routine, dynamically moving between them, the actors can live up to the otherwise incommensurate demands of the task on one hand and the artefactual representation on the other. The selective connecting and disconnecting of the artefact routine from the task routine allows the actors to combine a rigid artefactual representation with demands for flexibility in task performances without losing the legitimacy of neither task nor representation.

8.1. Theoretical implications

Section 5.1 introduced the concepts of artefact work and task work to show how the artefactual representation creates performances that are different from those that had otherwise been carried out as part of the new product development routine. The introduction of task work and artefact work allows us to see that while the performances that are carried out to comply with the artefactual representation can be performed in close connection with those performances aimed at completing the task of new product development, they can also be disconnected and carried out more or less in isolation. However, whatever the degree of connection between task and artefact performances, making an analytical distinction between them is useful for answering the research questions above.

8.1.1. How are stable artefactual representations of routines enacted in evolving routine performances?

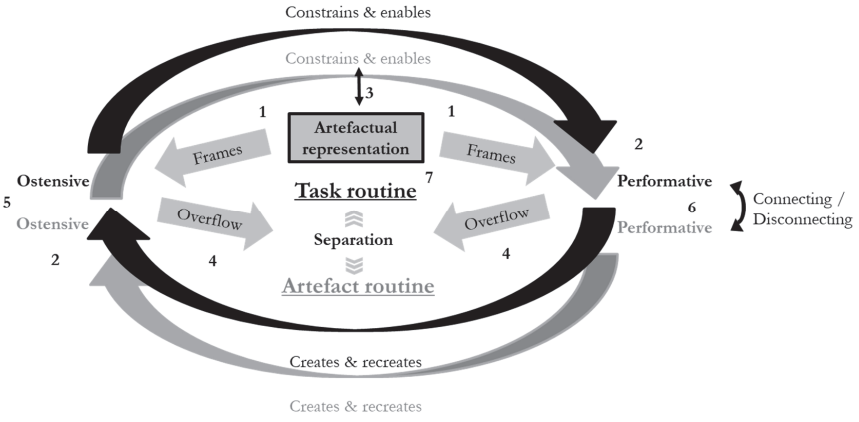
The purpose of an artefactual representation is to frame and shape the performances of the routine it represents (Cohen et al., 1996; D'Adderio, 2008, 2011; Pentland and Feldman, 2008a; Glaser, 2017). Even though the extent to which the artefactual representation can actually do this is debatable and depends on the agency of the actors (Pentland and Feldman, 2008a), it is still clear that artefactual representations do affect routine

performances one way or another (D'Adderio, 2008). The first observation made during the present study was that, unsurprisingly, the artefactual representation makes people 'do things'. These 'things' were the actions that followed directly from its material properties and discursive content. Such actions could either relate to the actions constituting task work, or they could also be examples of pure artefact work.

However, artefact work does not just consist of actions. It also has a distinct pattern and understanding that is not connected to the pattern or understanding of the task. Artefacts in general are seen as consisting of both a concrete materiality and a more abstract idea (DeSanctis and Poole, 1994; Rafaeli and Vilnai-Yavetz, 2004; Markus and Silver, 2008) and this is also reflected in how they are enacted. Hence, performing artefact work consists of both concrete performative actions as well as abstract ostensive ideas and understandings. These actions and understandings are also recursively related, implying that when enacting the artefactual representation, the actors create new patterns and understandings. These, in turn, afford new types of actions which then create and re-create new patterns and understandings, and so forth. These indirect effects are thus a result of the ongoing enactment of the artefactual representation over time rather than directly derived from the design of the representation. Hence, artefact work shows routine like properties with recursively related ostensive and performative aspects (see Figure 8).

While previous studies have shown that organisational routines can contain multiple performatives and/or ostensives (Turner and Rindova, 2012; D'Adderio, 2014), the present study shows that these can be performed not just as multiple performative and ostensive aspects of the same routine, but also as recursively related aspects of distinct, separate routines (as illustrated in Figure 8). Depending on the connection between task work and artefact work, these separate routines can be enacted simultaneously or one at the time. Hence, when situational conditions allow for the performative actions of both artefact work and task work, the expected patterns of both the artefact routine and the task routine can be recreated. Even though this might require extra work, it does not jeopardise successful completion of neither process description following nor product development work.

Figure 8. Separation of task routine and artefact routine to cope with tensions and conflicts



Based on and developed from Feldman and Pentland (2003), Pentland and Feldman (2005) and D'Adderio (2008, 2011)

1. Artefactual representations frame routine performances in a way that creates artefact work with recursively related performative and ostensive aspects.
2. Artefact work and task work are carried out in separate routines, artefact routine and task routine. When situational conditions allow, both routines can be enacted simultaneously or separately.
3. When situational conditions do not allow for both routines to be enacted, the artefactual representation can either moderate or be moderated by the internal dynamics of the task routine.
4. The overflow leads to a separation of task routine and artefact routine.
5. Ostensive conflicts can be avoided by performing task work and artefact work in separate routines. That way both expected patterns can be recreated.
6. Performative conflicts cannot be avoided but are managed by disconnecting one of the routines from performances. This is done by calling upon the ostensive aspect of the routine the actors choose to enact while disconnecting the other.
7. The artefactual representation remains stable and maintains its legitimacy even though it is frequently both ignored and allowed to get in the way of task performances.

When the conditions are such that the actions required by one of the ostensive patterns make recreation of the other pattern impossible, the actors must choose which of the routines to perform. In these cases, we sometimes see that the artefactual representation can moderate the internal dynamics of the task routine. Consequently, the actors choose to follow the representation rather than the shared understanding of what the task entails. The task routine is then ignored to the benefit of the artefact routine. At times, the opposite is observed, as expectations on the task moderate the representations ability to demand, or prohibit, certain actions to be performed, and the task routine takes precedence over the ignored artefact routine. To justify their choice of which routine to enact and which to ignore, the actors call upon the ostensive understanding of the chosen routine.

Such conflicts between artefactual representation and routine performances can lead to updates and changes to the representation (D'Adderio, 2008, 2011). However, the present study shows that, instead of changing the artefactual representation or the task, the artefactual representation can be separated and performed as a different routine from the routine it represents.

8.1.2. How are tensions between dynamic routines and stable artefactual representations coped with?

In the case in this study, the artefactual representation is shown to be quite rigid and stable. The routine it represents, the new product development routine, however, requires flexibility in performances to meet the unpredictable and uncertain circumstances it faces. D'Adderio (2008, 2011) shows that when the artefactual representation is malleable, when representation and routine performances diverge, the artefactual representation can be reframed to cover for the divergence, the overflow. In the present study however, the artefactual representation is not changed despite plenty of overflow. This suggests that instead of going towards a reframing of the artefactual representation, the overflow leads to a separation of artefact routine from task routine. That way, the overflow can be accommodated without neither task nor artefactual representation having to change (illustrated in Figure 8).

The present study also shows that the separation of routines functions as a way of coping with the conflicts that arise between the task and compliance with the artefactual representation. When the idea conveyed by the artefactual representation is not compatible with organisational espoused values and desired ways of working for the task, the conflict arises on the ostensive side of the routine. The question then is which pattern the actions should try to recreate; the pattern suggested by the artefactual representation or the pattern desired by the espoused values of the organization? When separating artefact work from task work into distinct routines, this issue is solved; the actors can recreate the pattern of the artefact routine with certain actions and recreate the pattern of the task routine with other actions.

The successful recreation of both patterns does however assume that the situational conditions allow for both types of actions to take place, or that the actions required for the recreation of one pattern would not hinder the recreation of the other. When this assumption does not hold, that is when the artefactual representation moderates the internal dynamics of the task routine or the ostensive aspect of the task routine moderates the artefactual representation's influence over the performances of the artefact routine, the actors must choose one routine at the expense of the other. However, enacting task and artefact as distinct routines can also be used to cope with these types of conflicts on the performative side of routines. When artefact routine is separated from task routine, the actors can easily turn to and connect with the ostensive aspect of only one of the routines and ignore the ostensive aspect of the routine that has been disconnected. Or, in other words, the artefactual representation can be left to only frame artefact work, thereby avoiding the overflow that would occur had the same frame been applied to task work.

Hence the separation of task routine from artefact routine is the result of a rigid artefactual representation that is not updated to adapt to flexible routine performances. The separation of routines allows the actors to cope with those conflicts that arise as a result of the persistent misalignment of the artefactual representation and the routine it represents.

8.1.3. How does the relationship between artefactual representations and routine performances influence stability and change in the routine and its representation over time?

Separation of artefact routine from task routine means that the actors can selectively connect and disconnect the artefactual representation from the routine it represents. This implies that they can break with the requirements of the artefactual representation one moment, and then go back to following it the next. By connecting the artefactual representation when it makes sense to follow it and disconnecting it when it does not, the actors can ignore the artefactual representation without having to question its legitimacy. Separation of routines allows for the actors to let order and stability guide one routine and flexibility and customer focus the other. By not considering both routines simultaneously, the actors can ignore their incompatibility. Hence the actors can drift in and out of following the artefactual representation with very little effort.

This means that seemingly incommensurate expectations on the patterns emerging from routine performances can be satisfied without the potential ostensive conflict ever surfacing. It also means that ignoring the artefactual representation for the benefit of acting on the task, or vice versa, can be done without questioning the legitimacy of the artefactual representation or the task. On one hand, this implies that issues with the artefactual representation are not identified. Therefore, an artefactual representation that is considered a poor description of the routine it represents, that is frequently broken and that is frequently allowed to get in the way of what is perceived as necessary task work, is allowed to stay the same. On the other hand, it also leads to a resilience in the artefactual representation that allows it to stay the same, even when it is temporarily considered inadequate. If this hadn't been the case, the stabilising power of the artefactual representation would be lost and the routine would lose its scaffolding.

The dynamic and fluid way with which the actors relate to the artefactual representation is therefore an effortful accomplishment that requires skill and experience to be successfully carried out. Just as Pentland and Rueter (1994) compare routines to grammars, the drifting in and out of

separate routines can be compared to the fluidity with which, for example, bilingual children change between languages, so called code-switching. Historically such code-switching was seen as the speaker being weak at both languages, whereas current research in linguistics shows that it is rather about making use of all resources available in a way that requires skill and deep knowledge of the languages (see for example Gardner-Chloros et al., 2000). It can therefore be argued that just as code-switching improves communication, the drifting in and out of following the requirements of the artefactual representation enables a duality of flexibility and stability in routine performances.

Berente et al. (2016) argue that routines work as shock absorbers which in their study allow for flexibility at a local level while still ensuring stability at an organisational level. However, the present study shows that the incompatibility between what the organisational level demands and what the artefactual representation demands can be absorbed when the routine is split into two seemingly independent routines that can be enacted separately from one another. Hence, the actors can achieve their goal of recreating the dual goals of following the artefactual representation and performing the task at a routine level; however, this also masks the obstacles for change at an organisational level. While the emergence of separate routines can therefore be a way for the actors to manage incommensurate demands on their ways of working, it can also stimultaneously lead to existing structures being cemented and reinforced when tensions do not surface and conflict is avoided.

Separating the artefactual representation from the routine it represents thereby proposes a strategy for coping with what would otherwise impose a threat to the way people value their work. As emotions surrounding organisational artefacts can be closely linked to actors' emotions towards the organisation at large (Rafaeli and Vilnai-Yavetz, 2004), making sense of the artefactual representation in a way that allows it to retain its legitimacy in the eyes of the actors also becomes important for how they view their work in the long run.

However, separation of artefact routine and task routine also allows the actors to believe they do not follow the process, thereby masking the process description as harmless, even when it has been recognised as a

poor representation of the routine. Yet, as this study shows, such reasoning underestimates the effects of the artefactual representation on routine performances. Instead, artefactual representations of routines can affect all aspects of routine enactment directly and indirectly, while also moderating their internal dynamics.

Artefact routine and task routine are thus two sides of the same routine, performed as separate routines to enable the actors to disconnect them from one another. When the overall routine evolves in a way that is not supported by the artefactual representation in the way the routine requires, the actors solve the issue by disconnecting the artefact routine from the task routine and connecting them again when they can. Hence, routine performances can evolve without compromising the stability of the artefactual representation.

Separation of routines can thus explain why artefactual representations can stay the same even though the routine they represent has evolved. It also explains how actors handle a stable and unchangeable artefactual representation without compromising on the flexibility required for successful task completion. Hence, instead of looking at process descriptions in new product development as either facilitating or constricting, process descriptions can be understood as artefactual representations that are enmeshed in new product development routines in a way that together co-create new, more or less desirable, and sometimes unexpected, behaviour patterns.

8.2. Practical implications

Process descriptions are often targeted when organisations try to change their way of working (Glaser, 2017). However, as this and previous research has shown, when being put into action such artefactual representations of routines can be enacted in unexpected and undesired ways. This study shows how skilful actors try to manage mismatches between organisational values and artefactual requirements as well as conflicting goals and targets between process description and task work.

As an outsider looking into new product development at Global Tech, the first puzzle was how the actors were able to reconcile their highly

bureaucratic and document-focused process description with the flow efficient and customer-focused lean principles they were supposed to adopt in their daily practice. The analysis of the data from the study shows that a potential explanation for this lies in the emergence of two distinct routines. The conflict between lean principles and a document-focused process description takes place on an ostensive level. The pattern expected to emerge from the completion of the task of developing new products is different from the pattern expected to emerge from following the process description. By separating the following of the process description from the new product development routine, the actors can recreate both expected patterns, and the conflict will never surface.

Separation of artefact and task routine thus implies that the ostensive aspects of the task routine are not necessarily there to enable and constrain routine performances. This leads to a situation where performances are only reproducing the ostensive pattern of the artefact routine thereby separating task from process description even further, which makes it even harder to merge them again. As a result, reflective and knowledgeable actors can develop, and defend, structures that are seemingly counterproductive from a task perspective.

The main take away for any manager trying to change the way an organisation works is therefore that sole focus can not be put on correctly representing the routines you want, but also the way in which the routine is enacted. A process description that does not reflect the routine it is supposed to represent is not necessarily a problem per se though. People have a dynamic way of connecting and disconnecting with a process description in a way that allows for flexibility in performances despite its rigidity. Even if there are no apparent conflicts between the design of the process description and how you want the routine to be carried out, the process description can still lead to actions and patterns emerging that are not according to plan.

These actions and patterns can, for example, lead to a separation of performing the task from fulfilling the requirements of the process description. Separation can, in turn, work as a way through which tensions and conflicts can be covered up, thereby allowing for behaviours where the following of the process description has been decoupled from the task of

developing new products. When these conflicts and tensions are not surfaced, needs for change either to the process description or how the task is carried out in practice can be overlooked, thus allowing for a dysfunctional process description to maintain its legitimacy or inefficient task performances to be carried out. The separation of task and process description therefore implies that the process description can be left unquestioned, even when it is frequently broken or when its expected patterns are not aligned with the desirable pattern for the task. Thus, an inefficient process description that is not aligned with the desired organisational values, intentions and goals can remain unchanged for long periods of time

On a positive note, the actors normally manage to do this in a way that, at least partially, fulfils the requirements of both the process description and their task by selectively choosing when to follow what the process description says and when to break it. However, when the process description is not accurately representing the routine, as perceived by the actors, they can get around the issue by separating the work carried out to satisfy the process description from the work carried out to perform the task. Separation means that the actors can potentially spend time and resources on artefact work and create a new routine aimed at following the process description, with the result that they lose sight of the underlying task. From a work efficiency point of view, this means that the actors can carry out work that might not add value from a task perspective (even though these actions can of course be valuable for other purposes such as administration, information transfer, control etc), such as checklist meetings. They can also perform the same actions twice, once to perform the task and once to satisfy the process description.

Another issue related to the formation of separate routines relates to the actors being deceived into thinking they do not follow a process description that they have already identified as not representing the routine. This gives the process description a harmless image while it actually affects both actions and patterns. Hence, while a certain degree of dynamic enactment of process descriptions is necessary to adapt to the context at each point in time, when too much flexibility is required by the actors, this could have unwanted side effects. A reflective and mindful design process

for the process description, as suggested by Glaser (2017), could overcome some of these issues, reducing the risk of separate routines to emerge, or at least decrease the distance between them. For managers it is also important to remember that the design of a process description is partly in the hands of those enacting it (Orlikowski, 1992; Volkoff et al., 2007; Orlikowski and Scott, 2008). Hence, mindful and reflective design performances shouldn't just end once the process description has been implemented; instead they should be ongoing, allowing the process description to evolve together with the routine it represents.

However, the importance of the design of the process description should also not be overrated. As this study shows, skilful and knowledgeable actors drift between following and breaking the process description in a way that allows them to perform their task at the same time as they are dealing with the process description. Instead, managers should try to facilitate and encourage the selective and dynamic connecting and disconnecting of artefact routine and task routine so that the actors can continue to drift seamlessly between them.

For research on process descriptions in new product development, the current study provides some additional insights. By opening up the black box containing the mechanisms through which process descriptions affect new product development outcome and performances, this study shows not only *that* contextual differences matter, but also *why* these differences matter. The data suggests that within the same project the process description can provide structure, and also lead to unwanted behaviours from a task perspective. Therefore, the use of process descriptions is not necessarily good nor bad. Instead, process descriptions can be translated into action in unexpected ways (Christiansen and Varnes, 2009) that can eventually lead to the following of the process description being carried out separately from the new product development. The ever-evolving intricate relationship between task and artefactual representation can therefore trigger actions and patterns that lead to the new product development routine being enacted in unexpected, and sometimes unintended, ways. Applying a routine dynamics lens on this complex relationship thus allows for insights that have previously been overlooked.

To conclude, when task and artefactual representation are enacted in separate routines, the otherwise apparent contradictions between them can be covered up and ignored. This implies that the legitimacy of both task and representation is maintained, for better or for worse. Therefore, artefactual representations of routines, such as process descriptions, are not just a description of a routine that can be treated as separate from the routine itself. Instead they form an integrated part of routine performances by framing both actions as well as patterns and understandings. As the present study shows, whether the process descriptions are perceived to be followed or not, they still impact how people work. And even though maintaining the legitimacy of a process description has its benefits in terms of providing the actors with a sense of stability and scaffolding on which to build their performances, for a manager intent on changing how the actors work, such scaffolding might not be appreciated. Given this, even though process descriptions should not be assumed to determine behaviour, their role should also not be overlooked.

8.3. Limitations and further research

This thesis set out to study how artefactual representations of routines shape routine performances While its contributions to theory and practice have been discussed above, it also comes with a set of limitations as well as provides scope for further research.

A main limitation of the current study relates to the organisation in which the study took place. A large complex organisation like Global Tech comes with some particular characteristics that might affect the results of the study. Firstly, the size and complexity of the organisation means that dependencies between routines, the actors, and the context are not easily identifiable. This causes issues for me as a researcher when trying to understand as well as describe how the development project team, the process description, its designers and the environment come together. At the same time, it would also be reasonable to assume that the results of the study might have been different in a smaller, more agile organisation where process descriptions are more readily changed and adapted to the changing circumstances. Secondly, the new product development routine at Global

Tech is complex. Together with a technologically complex product this means that a researcher like myself with limited technical knowledge, can not fully grasp many of the individual actions that make up the routine or the emerging patterns. Thirdly, the study only includes one organisation. Even though Global Tech is not the only large and complex organisation in the world with complex products and processes, it is possible that the combination of a large and complex organisation, and the wide gap between the bureaucratic process description and the allegedly lean philosophy, provides an environment where the separation of task and artefact routines is more salient and readily identifiable. Fourthly, the context of this study is that of incremental rather than radical innovation. Even though the Rocky project was considered a large technological step, relative to other development projects within the business unit, it should be noted that the scope of the project was to develop new versions of already existing products rather than inventing something radically new. A study in a different type of organisation or development project could uncover other mechanisms involved.

This study takes place in a context where neither the process descriptions nor the expectations on the task routine change. There is however a large body of research that shows situations in which changes in the artefact itself are observed (D'Adderio, 2008, 2011), when the application of the artefact and how it is understood changes over time (Orlikowski, 1992, 2000) or even when the institutional logics of the organisation(s) change with the help of artefacts (Hultin and Mähring, 2014). Studying how separation of artefact work and task work plays a role in those situations would also provide an interesting area for further research.

The current study is based on what is frequently called the 'practice view' on routines (Parmigiani and Howard-Grenville, 2011). Extending the scope to include also the 'capabilities view' (Parmigiani and Howard-Grenville, 2011) could provide additional insights into the role of artefactual representations in routine performances, particularly with regard to how artefactual representations and routines relate to organisational performance. Organisational routines and capabilities are commonly seen as closely connected (for example Nelson and Winter, 1982; Parmigiani and

Howard-Grenville, 2011; Salvato and Rerup, 2011) and routines have been described as building blocks of capabilities (Dosi et al., 2008), whereas capabilities have been described as high-level routines (Winter, 2000, 2003) or the ability to change routines (Zollo and Winter, 2002). While the practice view on organisational routines is mainly occupied with *how* routines evolve, the capabilities view looks more towards "what routines do (coordinate, create, change) and how they lead to firm performance" (Parmigiani and Howard-Grenville, 2011, p. 418). Applying a capabilities lens could therefore provide the analytical level needed for understanding the mechanisms and processes connecting artefactual routine representations to performance outcomes.

The identified limitations thus provide scope for further research. Studies in other settings, such as crisis response routines, or in other organisations, such as the military, civil society, small start-ups, etc. could, for example, generate different results and insights into how artefactual representations of routines shape routine performances. The model of separate routines could also lend itself to other inquiries into routines and their representations related to, for example, routine design, artefact design, artefacts and power, etc.

8.4. Concluding remarks

This thesis set out to explore how artefactual representations of routines, in this case process descriptions in new product development, affect how people work. The findings of the thesis show that not only is it a mistake to think that process descriptions will be followed to the letter; it is equally wrong to believe that the process descriptions are not followed at all. The findings also suggest that, even when the process descriptions are not followed, they still impact what people do as well as how they do it.

During the study, new insights have been gained into how skilful and knowledgeable actors can selectively and dynamically connect, disconnect and re-connect the task and the artefactual routine representation. By being simultaneously flexible and rigid in how they relate to the process descriptions, the experienced actors manage to uphold a stable artefactual representation while still performing a flexible task routine. When enacted

separately from the task, artefactual representations can therefore both stabilise as well as encourage change in organisational routines and, ultimately, in organisations. As such, process descriptions can play an important role for an organisation's operations and should not be overlooked.

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Appendix

Extract from checklist belonging to NPD Operations Directive

Product type (e.g. Meeting data)	QUESTION	DS2/7 (to initiate P-RFO)	DS2/8	DS2/8 (Pre-Requisite for ED)	DS2/9	DS3	DS4	DS4 (Standard Modules)	OK / NA / Not OK 1=Minor 2=Major	Responsible
1	**REQUIREMENTS**									
1.1	a) Are all CRs approved?	-	DS2/8	DS2/8	-	DS3	DS4	DS4		Design / System
	b) Are all planned CR(s) for this release implemented in the documentation?	-	-	-	-	DS3	DS4	DS4		Design / System
2	**DOCUMENT STATUS**									
2.1	Is the [product revision document] ([document number]-) approved and stored?	DS2/7	DS2/8	DS2/8	DS2/9	DS3	DS4	DS4		Design / System
2.2	Are the document surveys (i.e. X1A-, 3/X1A-) reviewed and ready to be released?	DS2/7	DS2/8	DS2/8	DS2/9	DS3	DS4	DS4		System / Design
2.4	a) Is the executable load module (e.g. [document numbers]) stored in [the system] with ordinary revision (A,B...) or in [the other system] with ordinary R-state (R1A, R1B...)?	DS2/7	DS2/8	DS2/8	DS2/9	DS3	DS4	DS4		Design
	b) Is the source code stored in a certified archive?	-	-	DS2/8	DS2/9	DS3	DS4	-		Design
2.7	Is the baseline correct implemented into the X1A-?	-	-	-	-	-	DS4	DS4		System
2.8	Have [roadmap work in system] and [product group] work been implemented in the product design?	DS2/7	DS2/8	DS2/8	-	-	-	-		Design
3	**PRODUCT STATUS**									
3.1	Does the Function Designation in [the main system] for this product follow defined rules? [ref. 11] and [ref. 12]	PR2	PR2	PRX	-	PRX PR2	PRA	PRG		Design / System
3.2	If the product is defined as a Standard Module, is the Product information code "SM" (Standard Module) stated in [the main system]?	DS2/7	DS2/8	DS2/8	-	DS3	DS4	DS4		Design
3.3	Is the correct Product information code (A1, A2 or A3), regarding R-state type in [another system], stated in [the main system]? [ref. 17]	DS2/7	DS2/8	DS2/8	-	DS3	DS4	DS4		Design / System / Supply
3.4	If there were any relevant remaining issues from an earlier release meeting for this R-state or earlier R-states for this product, have they all been solved?	-	-	-	DS2/9	-	PRA	PRG		Design / System
3.6	Is a compatibility list for [the component] updated in accordance with the releases?	-	-	PRX	DS2/9	PRX PR2	PRA	-		System
3.7	Concerning release of subordinate products: a) Are they released in requested PR/DS code?	PR2	PR2	PRX	DS2/9	PRX PR2	PRA	PRG		SubprojPM
	b) Are limitations and remaining issues solved?	PR2	PR2	PRX	DS2/9	PRX PR2	PRA	PRG		SubprojPM
	c) If the product uses [this special component], is this [special component] included in X1A-integration and released in requested PR/DS code? [ref 43])	-	-	PRX	-	PRX PR2	PRA	PRG		SubprojPM
3.9	Are products with reference relation "Based On" to this product, released in requested PR/DS code in [the main system]?	-	-	-	-	-	PRA	PRG		System

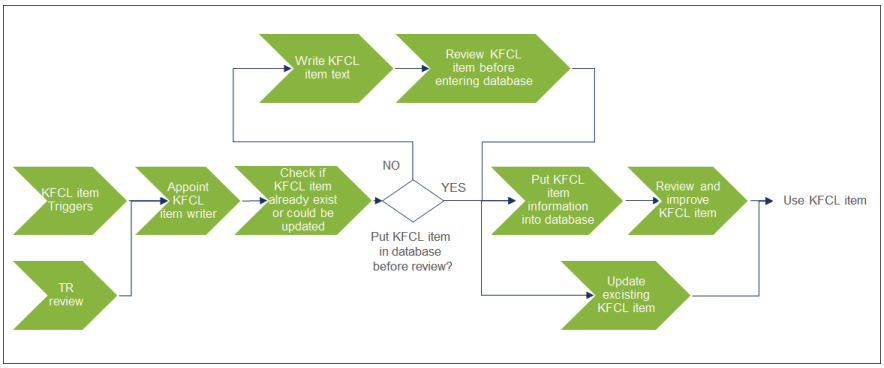
Tasks and document instructions for the last stage of NPD Operations Directive

Follow-up & Release

"This activity is intended to analyse the test result and found faults during execution. The result should state if the requirements have been fulfilled and reflect the experience gained from the test execution."

Input			Task	Methods	Tools	Output		
Decimal class	Doc name	Doc status				Decimal class	Doc name	Doc status
Document number]	integration Specification PIU	FREE	Follow up K-Gap analysis and update if relevant (OL)			Document number]	Test Requirements PIU	FREE
Document number]	Test Requirements PIU	FROZ	Follow up and handle all Change Request and Trouble Reports (OL)		[one system], [another system], [and another system]	Document number]	Freq. Spec. Test Requirements PIU	FREE
Document number]	Freq. Spec. Test Requirements PIU	FROZ	Complete the setting of export Trade Compliance control codes (CM)			Document number]	Manufacturing Spec. PIU	FREE
Document number]	Manufacturing Spec. PIU	FROZ	Update relevant documents when needed (INT)			Document number]	Verif. Report Robustness	FREE
Document number]	Assembly Drawin MECH	FREE	Describe detected, significant PIDB Guideline problems together with the solution and create new KFCL item in PIDB. (Information useful to others to prevent similar problems in future products) (OL, INT)		Product Improvement Database (PIDB)	Document number]	Export Control PIU	FREE
Document number]	Verif. Report PIU	FREE	Update Document Survey PRA/DS4 approval (CM, DESRESP, RELRESP)	Checklist	[the main system]	X1A-	Document Survey	FREE
Document number]	Verif. Report EMC	FREE						
Document number] -	Verif. Report Robustness	PREL						
Document number]	Export Control PIU	PREL						
Document number]	Change Request SS	FREE						
X1A-	Document Survey PIU	FREE						
Document number]	K-gaps list	UPDAT						

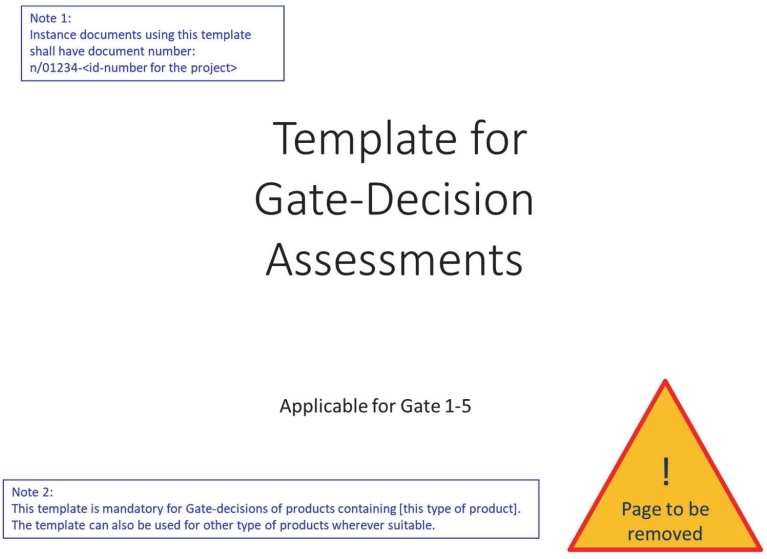
Instruction from the intranet on how to create new KFCL (Known Fault CheckList) in the Product Improvement DataBase as required by NPD Operations Directive



Extract from checklist for Gate 5 in NPD Decisions Directive

	Checkpoint: Gate 5	Purpose: Ready for customer validation and production ramp-up					
Check Id	Area	Item	Item Clarification	Clarification Link	Product	Decision Item	Input Responsible
Gate_5_DU1_01	Prerequisites	Have all remaining issues from the previous F-decision(s) been resolved? If not, which one(s) remain, and what are the status/plans to resolve them?			DU1	Decision	
Gate_5_DU1_02	Prerequisites	All code for the SP available in relevant main track(s)?	This item is applicable for all SW Feature Development (not for HW products)		DU1	Decision	
	iness case, Priority				DU1		
	Plan, Cost, Resources				DU1		
	External validation / verification				DU1		
Gate_5_DU1_03	Deliverables	Is all applicable product documentation updated, approved and baselined?	How ready we need to be differs a bit between standards but the main focus should be on what is needed for the customer.		DU1	Decision	
Gate_5_DU1_04	Test & Verification activities	Are all internal test activities planned for the feature finished?			DU1	Decision	
	Deliverables				DU1		
Gate_5_DU1_05	Risks & Open Issues	Are there any major risks and/or open issues, and in that case what are the mitigation plans for them?			DU1	Decision	PjM
	Recommendation				DU1		

Front page of template for gate decisions according to NPD Decisions Directive



Examples of slides from the template for gate decisions according to NPD Decisions Directive