The Emergence of Digital Institutions

Taline Jadaan

Department of Applied Information Technology

University of Gothenburg

UNIVERSITY OF GOTHENBURG

Gothenburg 2019

Cover illustration: Catharina Jerkbrant

The Emergence of Digital Institutions

taline.jadaan@gu.se

ISBN: 978-91-88245-06-9 (PRINT)
ISBN: 978-91-88245-06-9 (PDF)
URL: http://hdl.handle.net/2077/61757

Printed in Gothenburg, Sweden 2019
Printed by BrandFactory

This book is dedicated to my deceased parents,

Mary Yatim and Samir Jadaan.

ACKNOWLEDGMENTS

I was always told that writing a cover chapter is the only time you can express yourself freely, a fun summary of what you have been doing the last decade, a place where you can try out thoughts and ideas. So, I said to myself, go for it Taline, try your wings, go beyond the traditional comfort zone, be a bit crazy for once! But no, I went full-blown conventional style. Therefore, I left this space to the end! When I had sent the rest of the manuscript to proofreading, I knew that none of the supervisors would be able to screen the results. To be honest, this is the only chapter where a PhD student is allowed to write whatever they want. Besides, this is also the only chapter people read, (except the opponent and the grading committee, I hope) just to see if they are mentioned or not. So, ROCK AND ROLL BABY!!!

You know, they say that *to reach your goal is not the goal per se, but the journey*. I assume that the person who came up with this quote didn't conduct a PhD and faced my challenges. So, let us be honest, my journey has not been easy, and there were times (many times) I thought that I was never going to have the energy to wrap it up! Thus, I would like to start out by thanking Lena Hylving, my former colleague at RISE Viktoria, and partner in the LTL federation. Thank you for confirming that I'm not a mythomaniac and encouraging me to write a book about my life and its great (irony) adventures. I love you LIBA Lena for every single time you stood next to me, forced your hugs on me, and wiped my tears. So, to the person who came up with the quote about the journey, go back and do your homework (I would like to write something harsher but this is still going to be published, I hope you get the picture though). I would instead give creed to "hen" (hen is a Swedish figment so google it, I think you will like it) who wrote "*you don't know how strong you are until strong is the only choice you have*." You live your life for sure, and you carry your cross! Being raised as a Catholic child, I was always told that the size of the cross (obstacles) you carry on your back is dependent on how strong you are as a person. To be honest, I don't get it. How does God measure the size of the cross and is hen (I hope you googled hen by now because it is not an English hen)

applying qualitative or quantitative tools? I would assume that hen prefers a quantitative approach over the qualitative since hen never interviewed me for sure. Would it be valid then? I would argue, being a qualitative researcher, that God is missing out some of the "soft" elements when only conducting a quantitative approach. God would for sure know the how and when by now, but would hen have a clue about the why?! By the way, where is God when you need hen the most?

Let us stop pondering and get back to business! To my supervisor Lisen Selander, what would I have done without you and your butcher's knife, chopping of most of my text? I would assume that during our meetings, the feeling was similar to when leaving your kids for five minutes and you come back to total chaos. You, as a parent, (i.e., supervisor) would get frustrated and want to scream out loud, but in a pedogeological way would think that it is good that they feel free to express themselves (almost destroying the house), and that they hopefully learned something from last time. At least they didn't drag down the curtains this time. So Lisen, thank you for pushing me to get back to academia and for helping me handle all of the dark demons from the past. You made me start believing in myself again and I'm forever thankful for that, I Love You Lisen! I know that you will be a bit uncomfortable now but "*It's my party and I cry if I want to!*" #LeslieGore. And by the way, from now on you won't be able to "*call me, call me for some overtime*"!

Continuing singing this song I would like to thank my second supervisor Rikard Lindgren. Looking in the rear-view mirror, I very much appreciate your input during the process, although there were times I wanted to strangle you! You have questioned my thoughts and ideas and taught me to gear up for future adversity. The process with you has been like a roller-coaster. Thank you for making me stronger! #kenringnumåstevidra

To the Swedish Traffic Administration! Thank you for letting me in and allowing me to become a part of your organization! There are so many I would like to thank. This is just a minimal selection (axplock) of the

persons I met along the way. To Lennart Andersson, for all the great adventures during the RFID implementation. To Eric Neldemo and Göran Eskérs for supporting me in the initial phase and allowing me to go beyond my comfort zone. To Pär Karlsson and Christer Hårrskog for all the great metaphors mixed with operational challenges, and digital strategizing.

Moving on to my Umeå family! You embraced me, took me in as one of yours and never left me out, I will always be grateful and keep you close to my heart! I would like to start out by thanking Katrin Jonsson and Ulrika Westergren, for always pushing me forward and supporting me in every way. To Prof. Jonny Holmström, what would I have done without your positive and encouraging feedback on my work, and the scattered messages on Snapchat? Johan Boden, thank you for helping me out with the illustrations and for providing me with the best Christmas meatball recipe. Daniel Skog # thank you for the great feedback you gave me by the end of my PhD journey #journey. Lars Öbrand, thank you for making me realize that no one would read my cover chapter as a way of dedramatizing the whole process, allowing me to let go of some of the demons, and start writing. Daniel Nylén for being a true "bror" and providing me with the right Swedish hip-hop music I needed. Hoseah Ofe for introducing me to a whole new culture of music. Just remember that if "*you break my heart, I go date your fatha"* #ebonymayhersoulrestinpeace. Vasili Mankevich, my brother from another mother! I must admit that I didn't really like you in the beginning (and I still like your wife Brook more than you), but you have grown on me, becoming a part of my family. I really enjoy our chats and the times we find space to philosophize about life and our commonality. Henrik Wimelius, the man, the myth, the legend, #enäktabror. Do I need to say more? #densomvetdenvet. Fatemeh Moradi, thank you! Thank you for being there, supporting me, and pushing me. You have been a second aunt for my kids, and I long for the time I can give back! I Love you Eshghe man #IlovethatyouknowthatIdontlikehugs.

To my Gothenburg University family, thank you Johan Magnusson for standing up for me and supporting me in every possible way. I will never forget the encouragement and support you gave me. To Pär Meiling, thank

you for the support during the process of coming back to academia and always finding solutions for my problems. To Fredrik Svahn, thank you for being a critical eye on my work and giving great feedback during the final seminar. To Dina Koutsikouri, for the great job you did as the opponent during my final seminar and for providing me with a new weapon, "*stiff lip*." To Frida Ivarsson, hang in there and be strong! I believe in you! #davidguettatitanium.

To my Rise Viktoria family, I'm coming home! Anders Hjalmarsson, thank you for pushing me to finalize my PhD! Without your endless support, I wouldn't have taken the step. To Matilda Lindström, for allowing me to pursue my dream and supporting me, you are a true role model. To Daniel Rudmark, thank you for the great support as a PhD student facing similar challenges working in a research institute. To Mathias Karlsson and Ulf Lundquivst, for putting a smile on my face and always being the last persons with me during the after works. Last but not least, to Ann Andreasson and Magnus Andersson, thank you for picking up the shards in 2010.

Life is life, la la, la la la, let us talk about life, la la la la la. Life is life!

- Hey, let us get a grip and thank Nick Bostrom for his summer talk on P1 that gave me a new perspective on life!

- True that!

Thank you, Nick Bostrom, for making me appreciate being hit by future bird dookie. You made me confirm my whole perspective on life in relation to probability theory and to acknowledge the important aspect of life, the fact that we are not immortal and that shit can hit you. We, as individuals living in developed countries, seldom reflect upon life and challenges. Guess what, death is closer than you think. Not to dramatize and depress the acknowledgment chapter but unfortunately, we seldom reflect upon these aspects.

I, however, live close to life, maybe a bit too close sometimes. The experiences I tackled in my life may have made me a stronger person per se, but also a much more vulnerable person. It has made me appreciate the people I have around me and the people I have lost along the way #bluesmotallaods. To my mother Mary Yatim, I thank you for being a true feminist in middle east during the 80's, but I'm angry with you for being a patriot, refusing to leave Lebanon and emigrate. The result was you sacrificing yourself for an unsolved cause. You left a scattered five-year-old girl with a saddened dad. To my father Samir Jadaan, I always knew that life was not the same after the death of mom. I appreciated you for all the great effort you put in raising me, even though you left me way too early and completely unprepared. Still, thank you for trying to fill mom's absences by supporting, encouraging, and handling all of my reflections, questions, freak-outs, and doubts #fayrouzba3dak3alabali #mariahcareyboystomenonesweetday. Hey mom, dad did a pretty good job, but you set the foundations my dearest of them all! #puffdaddyIwillbemissingyou.

To Simona Aslan, you amazing girl that introduced me to parenting, you left us way too early and with great wounds my dear. I still remember when your mom, Elisabeth Aslan, called and told me that she had given birth to a girl that refused to obligate her rules. That was you Simona, from the first day you were born until cancer took you. I recall when you explained, as a 6-year-old, that there is something called BRIS and "*stop min kropp*", when your mom wanted to apply an ointment that scorched your knees. That was you Simona, a strong, confident girl that wanted to conquer the world! I pity that you didn't get the chance to fulfill your dreams, because I know that you would have made a change. When I see Greta Thunberg, I think of you Simona! I know that you would either be her or stand next to her. #luthervandrossendlesslove

To my childhood friends, Linda Malak, Eva Safo, Elisabeth Aslan, Katya Danho, Maria Bilan, and Rita Demir. Thank you for being there along the way and specifically Linda Malak, Eva Safo, and Elisabeth Aslan.

#densomvetdenvetvadnihargjortförmigjagärförevigttacksamminakäraste.
#whitneyhoustonwaitingtoexhale

To my family, stretching from Trollhättan, Göteborg, Stockholm, Umeå, Montreal, and San Francisco, I Love You All! A special shout out to my grandmother Laurine Yetim, aka Teta, thank you for always being my sounding board and being there when obstacles came my way. Habibet albe teta Laurine, o akhiran Teta! Mama akid mabsouta halla! To Larissa Kassabian and Vincentia Faraj, future Greta Thunberg, keep up the good work and try always to be your best! #tonesandidancemonkey

To Husun Safo, thank you for being there along the way and supporting me in every step I took. To my brother from another mother, but still the same father ☺. My love, Jam Bam! Jimmy, Jamil Jadaan! My God, talk about the journey we made together the last years, and how much you have grown, you are a true champion! Keep up the great work and thank you for making me a stronger person, I love you for that. #Yalili. To my sister, Tania Jadaan, what would I have done without you by my side? I know, writing these sentences wouldn't do you right, but I Love You Tano, and from the first time I saw you at BB, I knew that you would have a special place in my heart. *"I carry your heart with me, I carry it in my heart"*. I hope that you continue aiming for your dreams, and I will always stand next to you, supporting you the best way I can. #DRAKE

Saving the best for last, my two crazy monkeys, Theodor and Leonard, mommies' heart and soul! My saviors, without you, I'm nothing! You fulfill my life with a combination of total frustration and ultimate satisfaction. There are no words that can describe my love for you! Even though you drive me crazy, you still fulfill me with endless love and happiness. I guess that it is the true meaning of life. To my husband Johan Sandberg, my friend and true companion. (I wanted to write soulmate, but it would have been way too tacky, and I know you don't like tacky! But between you and me, you and the kids are all my reasons. You have stood next to me in good and bad #fufillingthepromiseofamarriage. I need to end this know and move on without the parentheses because it is getting way too long).

Meeting you at DARSIS in 2008 I never thought that we would end up with two kids, a house, and a Volvo. The only thing missing now is the dog, but since you are allergic to fur, I guess the fish-tank we bought last month will do. #benkingstandbyme.

A line will take us hours maybe;
Yet if it does not seem a moment's thought,
Our stitching and unstitching has been naught.
W. B. Yeats, "Adams Curse"

Hemavan, October 2019

The Emergence of Digital Institutions

Taline Jadaan

Department of Applied IT
University of Gothenburg
Gothenburg, Sweden

ABSTRACT

Pervasive digitalization reshapes identities and processes of public sector providers, ranging from healthcare to education and justice. Recently, significant research attention has been given to such transformations, but still, there is more to learn about the mechanisms that may lead to the establishment of "digital institutions." My dissertation seeks to provide empirical and theoretical insights into the dialectic between stability and change that many contemporary institutions encounter. Empirically, the research builds on a nine-year longitudinal interpretative case study of the Swedish Transport Administration (STA) and its efforts to grapple with emerging digital technology. Theoretically, I draw on Zietsma and Lawrence's (2010) model of institutional work to investigate the purposeful actions of actors to deploy such technology for creating, maintaining, and disrupting institutional boundaries and practices. As such, my research is guided by the following research question: *how do digital institutions emerge and come into being through the interplay of boundary work and practice work?*

Based on the theoretical model and the empirical analysis, I engage in theorizing that contributes to the current understanding of ways to organize digitally induced transformation of institutions and with what effects. First, it identifies and demonstrates exogenous and endogenous digital innovation as a key trigger of transitions between cycles of institutional stability and change. Second, it conceptualizes and illustrates a transformative trajectory in which organizational responses first revolved

around entrepreneurial initiatives, then manifested through the creation of a platform solution, and finally focused on the formation of digital strategies. These insights provide a theoretically grounded conceptualization of evolving digital institutions with a particular emphasis on the nature of boundary work, practice work, and their recursive relationships. The recursiveness is the outcome of novel micro-level practices – arising in response to blurred boundaries – that traverse hierarchical levels, ultimately growing the scope and scale of institutional arrangements. At STA, the increasing distribution of innovation agency accelerated the change process whereby the carriers of the institution – artifacts, activities, relational systems, and symbolic systems – gradually became intrinsically interwoven with digital technology. As such, it tells an important story about what the emergence of digital institutions might entail.

Keywords: Boundary work, Emergence, Digital Institutions, Digital Innovation, Digital Transformation, Institutional work, Practice work

ISBN: 978-91-88245-06-9 (PRINT)
ISBN: 978-91-88245-06-9 (PDF)
URL: http://hdl.handle.net/2077/61757

LIST OF PAPERS

This thesis is based on the following papers, which are referred to in the text by the corresponding Roman numerals.

I. Stenmark, D, Jadaan, T. Enabling process innovation through sensor technology: A multiple case study of RFID deployment, In Proceedings of European Conference on Information Systems, Pretoria, South Africa, 2010.

II. Jadaan, T, Stenmark, D. Integration for innovation: Studying the role of middleware in RFID applications, In Proceedings of American Conference on Information Systems, Lima, Peru, 2010.

III. Jadaan, T. The role of institutional work in platform establishment: An investigation of digital innovation practices for creating, maintaining and disrupting institutions, In Proceedings of the 52nd Hawaii International Conference on System Sciences, 2019.

IV. Jadaan, T. Digital strategy formation: Fostering new institutional work practices. In Proceedings of European Conference on Information Systems, Uppsala, Sweden, 2019.

V. Jadaan, T, Selander, L. Digital institutional entrepreneurship. (Under review by an international journal).

CONTENT

1 INTRODUCTION

"*Research is formalized curiosity. It is poking and prying with a purpose*" *(Zora Neale Hurtson)*

I started work leading to this thesis in 2008. For a decade I pierced deep into the Swedish Rail Road Administration (SRRA), and following its merger with the Swedish Road Administration (SRA), the resulting Swedish Transport Administration (STA). I tracked a series of IT-related initiatives in these organizations, initially aiming to understand the role and impact of digital technology[1] in a governmental agency. Retrospectively, the responsibilities of the SRRA's IT division was to deal with 'technical issues', such as maintaining systems, and digitized processes, rather than engaging in innovation or service development. Initially, many IT-related pilot and research projects failed, often due to a lack of knowledge and willingness to collaborate across organizational boundaries. In addition, governmental restrictions, such as laws and time-consuming procurement procedures, raised obstacles. Another key challenge was the 'digital competence gap' between the tech-savvies and management. Because of this, there was little if any faith in IT-related innovations, IT – from the management perspective - was about maintenance. As noted by many researchers (e.g., Besson and Rowe 2012; Vial 2019), digital technology seemed to push, or even force, transformation in the organization.

However, in the basement of STA, a few dedicated individuals were engaged in skunk work, exploring far broader capacities of, and opportunities provided by, digital technology. They were struggling with the unknown, experimenting with the technology, and breaking boundaries in order to innovate with it. They were carrying out new work practices, exploring the potential of real-time data, open data, and digital platforms. While these appeared, at first, to be very peripheral actions by a small group

[1] By digital technologies I refer to combinations of information, computing, communication, and connectivity technologies (Vial, 2019).

of individuals, over time their entrepreneurial practices with digital technology would be critical for STA's digitalization process.

As time passed, external pressures were forcing the organization to adapt to new conditions. Customers increasingly asked for digital services based on real-time data in order to plan production and operational processes. The existing IT-infrastructure could simply not meet flexibility, adaptability and re-use requirements. STA slowly realized that the tightly coupled IT-infrastructure no longer fulfilled its purpose, and that the high number of customized couplings had reached its limits. There was a need for a digital platform and digital strategy.

Over time, as digital competence increased, digital technology and the IT department became increasingly influential in the organization. The IT division manager joined the board of directors. Managers in different units of the organization increasingly debated digitalization, ecosystems, and digital strategy during project meetings. They had used the terms before, but now they grasped their meaning of such words. Management realized that without a pervasive digitalization strategy, STA would struggle to meet future demands. I observed and recorded the resulting emergence and development of such a strategy, and in the thesis, I refer to the process involved as interplay between exogenous digitalization and endogenous organizational responses.

In the final stages of my empirical study, management no longer regarded STA as an organization for building and maintaining the national road and railroad infrastructure, but increasingly as an urban development agency with a broader mission: "…*to leverage digitalization possibilities to address societal challenges*" (field notes). For example, in the 2017 Annual Report, the General Director describes how STA was assuming responsibility for addressing societal challenges and highlighted the role of digitalization in doing so:

"*On 31 August, we submitted our proposal on a national plan for the transportation system in 2018-2029…. The measures in the plan also addresses six prioritized social challenges, convert to fossil-free fuels, increase housing construction, improve conditions for business, strengthen employment throughout Sweden, use the possibilities of digitalization and create an inclusive society…. But there is still a long way to go until we can be satisfied. We need to continue to develop the operations and the transport system, where the possibilities of digitalization in particular are an important piece of the puzzle. We must therefore make space for innovations and have a courageous approach.*"

For a decade these pieces of puzzles, formed and shaped by the interplay of technology and actors (digital institutional entrepreneurs, internal and external constellations, and management), imposed change – and ultimately reformed institutional arrangements within STA. I explored how external actors impose pressure to change by engaging in innovation enabled by digital technology. I studied the role of digital institutional entrepreneurial work practices in inducing a trajectory shift with the help of sensor technologies. I observed the emergence of the digital platform, a foundational element for collaboration across boundaries. I also investigated the digital strategy formation in the organization and how that process catalyzed change in perspectives on alignment of digital technologies and business processes. At a meta-level, I explored the role of boundary and practice work through which digital technology came to shape and re-shape new institutional arrangements. I gratefully acknowledge here that I engaged in these efforts in collaboration with both various respondents and co-authors of the appended papers. The contributions of the authors are mentioned in the summaries of the papers.

1.1 RESEARCH MOTIVATION AND PROBLEM STATEMENT

The role of digital technologies in shaping and re-shaping the organization of social activity has been a foundational concern of the information systems (IS) field (e.g., Markus and Robey 1988; Orlikowski and Iacono 2001). Digitally induced sociotechnical change is often broadly referred to as digitalization—"*a sociotechnical process of applying digitizing techniques to broader*

social and institutional contexts that render digital technologies infrastructural" (Tilson et al. 2010, p. 749). Lately, as digital technologies have gained increasing capacities, digitalization has attracted broader interest in the public discourse due to promises (or threats) of fundamentally changing how individuals go about their daily lives. For example, the discussion surrounding automation and artificial intelligence has moved from a popular topic in sci-fi literature and movies into mainstream news media. In the academic literature, scholars have suggested that pervasive digitalization enabled by technological improvements, innovative applications, and widespread adoption does not merely generate incremental change, but rather challenges foundational perspectives on the role of digital technologies in organizations (Bharadwaj et al. 2013; El Sawy et al. 2010; Tanriverdi et al. 2010).

In this thesis, I explore the processes through which continuous digitalization causes fundamental change of institutions. Such change can be understood as a digital transformation—"*the combined effects of several digital innovations bringing about novel actors (and actor constellations), structures, practices, values, and beliefs that change, threaten, replace or complement existing rules of the game within organizations, ecosystems, industries or fields*" (Hinings et al. 2018, p. 53). Research on digital transformation involves a wide array of perspectives. For example, in a recent review of the literature on digital transformation, Vial (2019) identified 282 papers in IS outlets. He identified two ways to portray digital transformation: as a planned effort (e.g., Andriole 2017; Westerman and Bonnet 2015) or as an emergent process of socio-technical change (e.g., Henfridsson and Lind 2014; Yeow et al. 2018). Most of the studies Vial (2019) examined focused analytically on change at the organizational level, while others considered digital transformation as occurring at multiple levels including industries and ecosystems (e.g., Agarwal et al. 2010; Hanelt et al. 2015; Hinings et al. 2018). The digital transformation processes affecting strategies, business models, processes and practices have all been considered (Fitzgerald et al. 2014; Kane et al. 2017). However, the processes through which pervasive digitalization continuously shapes and reshapes institutions, over time leading digital institutions to emerge, have received less attention.

Institutions generally are "*social structures that have attained a high degree of resilience [and are] composed of cultural-cognitive, normative, and regulative elements that, together with associated activities and resources, provide stability and meaning to social life.*" (Scott 2008, p. 48), 2008, p. 48). Scott (2014) refers to the cultural-cognitive, normative, and regulative elements as the 'pillars' of institutions. Institutions are transmitted by various types of carriers, including symbolic systems, relational systems, activities, and artifacts (Scott 2014). Institutions function at various levels, ranging from macro-level global relationships to micro-level relationships between individuals. While resilience and stability are defining features of institutions, they are not immune to evolutionary forces. Rather, they are subject to both incremental and discontinuous change (Scott 1995). An important source of change for contemporary institutions is digital technology.

As digitalization encompasses and changes organizational practices, digital technology is an increasingly important element of institutions' materialization and source of change (Gawer and Phillips 2013). The transformative power of digital technology has been particularly discussed in the digital innovation literature. Due to its unique properties (Yoo et al. 2010) and immense recombination potentials, the properties of digital technology (Henfridsson et al. 2018), "*are fundamentally shifting the nature of innovation processes and outcomes in several ways.*" (Yoo et al. 2012, p. 1400). Scholars have also highlighted the roles of digital innovation in organizational forms, infrastructures and digital institutional building blocks (Hinings et al. 2018), and suggested that transformation involves reshaping institutional foundations (rules, norms, and meanings) (Guillemette et al. 2017).

Digital technologies are both carriers and outcomes of institutions. They constitute material objects that through their design and functionality limit and shape institutional logic, and they represent instantiations of symbolic and cognitive aspects affecting their design (Gawer and Phillips 2013; Orlikowski and Scott 2008). As digitalization proceeds and increases in intensity, digital technologies develop into constitutive elements of the "*overall institutional fabric*" rather than simply instruments "*or a means to an*

end" (Lanzara 2009, p. 4). For example, technical standards and software code become regulative elements that affect and are affected by surrounding cultural cognitive and normative elements. These regulatory functions add to, complement, or replace existing institutional arrangements (Lanzara 2009). Through the intertwining of different types of institutional carriers and actions cultural-cognitive, normative, and regulative elements are interwoven with digital technologies.

These digitalization processes cause digital institutions to emerge. Drawing on the work of Scott (2014) and Lanzara (2009), I define a digital institution as an institution in which regulative, normative, and cognitive pillars, and their carriers, are interwoven with digital technology into an 'assembled mix'. Digital institutions are "*in part an evolutionary outcome and in part a product of human intervention and design*" (Lanzara 2009, p. 4). In such assemblages, organizational practices are re-shaped and codified as digital technologies start performing them (or parts of them). This process is not simply a matter of digitization (conversion of analog data into digital data). Rather, the codification of practices triggers socio-technical change that challenges existing internal and external organizational boundaries, and changes the institutional environment in which practices are carried out. Codification of rules and social-norms involves making them explicit, translating meanings, and inscribing them into systems (Carlile 2004). One example from STA of such a codification process is the implementation of sensor technology to monitor the status and positions of wagons. At first, the implementation triggered codification and negotiation of practices, and later of boundaries upheld by rules for interorganizational interactions and responsibilities. Thus, translating implicit conventions into explicit rules over time reshapes institutions. Since such translations and explorations of technological opportunities usually involve distributed actors in sub-communities (Henfridsson and Lind 2014), institutional change can often be triggered by micro-level practices.

The developments at STA, portrayed in the early parts of the introduction, demonstrate how pervasive digitalization and micro-level practices carried out by actors within and outside the organization re-shaped institutional

arrangements and how digital technologies gradually became foundational components of STA's responses to operational and societal challenges. I turn to institutional work theory to understand how such micro-level practices translate into institutional change. Institutional work refers here to "*the purposive action of individuals and organizations aimed at creating, maintaining and disrupting institutions*" (Lawrence and Suddaby 2006, p. 215). Use of this notion and associated theory is particularly valuable for several reasons. First, it enables analysis of the processes in which actions generate dynamics and emergent change. Second, it allows broad consideration of agency in relation to institutions. Third, it provides conceptual tools for exploring micro-macro level interactions. This is important as digitalization distributes agency and blurs boundaries (Nambisan et al. 2017). I particularly draw on two distinct but interrelated forms of institutional work—boundary work and practice work. While boundary work refers to actors' efforts to establish, expand, reinforce, or undermine boundaries, practice work refers to actors' efforts to affect the recognition and acceptance of sets of routines, rather than simply engaging in those routines (Zietsma and Lawrence 2010). In this way, boundary work and practice work are two distinct but interdependent forms of institutional work. Against this backdrop, I address the following research question:

How do digital institutions emerge and come into being through the interplay of boundary work and practice work?

1.2 CENTRAL ARGUMENT

This dissertation contributes to extant research by providing a detailed empirical investigation of the conditions for shaping digital institutions through a 9-year (2008-2017) longitudinal interpretative case study (Walsham 1995; 2006) at STA. Grounded in literature on digitally induced organizational change and theory on institutional work, it provides an explanation of how digital technologies are interwoven into the very institutional fabric. The fundamental thread running through this process at STA was the recursive interactions between external stakeholders' digital

process innovation, institutional work, and strategic responses. Thus, the overall argument developed throughout this dissertation is as follows:

1. Ongoing pervasive digitalization in exogenous settings (e.g., society, industry and ecosystems) prompts organizational responses. These responses involve both emergent and planned digitalization initiatives affecting institutional arrangements.

2. Organizational responses to exogenous digitalization often involve entrepreneurial initiatives, novel digital strategies, and linking to new (or reconfiguring existing) connections to platform-based ecosystems. Such responses include and trigger endogenous digitalization processes affecting institutional arrangements.

3. Through the intertwining of actions and different types of institutional carriers with digital technologies, the cultural-cognitive, normative, and regulative pillars are reshaped. Thus, new digital institutions with "*an 'assembled mix' of technical and institutional components*" (Lanzara 2009, p. 4) emerge. Hence, digital technologies are no longer merely means to an end, but are rather interwoven into the carriers and pillars of institutions.

4. Salient effects of digitalization are the blurring of boundaries and distribution of agency. To understand how digital institutions emerge, attention should thus be paid not only to planned change, but also to change emerging from micro-level activities. Theory on institutional work provides a fruitful lens to analyze how activities translate into institutional change.

5. The boundary-blurring effects and distribution of agency associated with digital technologies demands attention to practices related to both core and peripheral parts of institutions (and associated ecosystems) in analyses of the processes involved in the emergence of digital institutions. Thus, I draw on two distinct but interrelated forms of institutional work—boundary work and practice work.

6. Digital institutions emerge, and are shaped and reshaped, through multiple, cumulative, cycles of change and stability. Such change is often triggered by exogenous and endogenous digital innovation causing institutional conflict. A sequential pattern was also discerned in the digital shaping of carriers (*sensu* Scott 2014) at STA, as the focus of the digitalization process generally progressed from artifacts, to activities, to relational systems, and finally to symbolic systems.

7. Digitalization increases pressure to constantly evolve practices due to the blurring of boundaries and distribution of innovation agency, which enable institutional entrepreneurs with sufficient motivation and technical competence to engage in boundary work and practice work.

1.3 STRUCTURE OF THE DISSERTATION

This thesis consists of seven chapters describing the research field, the question addressed, the empirical studies, findings, conclusions and implications of the findings, together with five appended research papers. Following this introductory chapter

- Chapters 2 and 3 present the theoretical foundations and summarize previous relevant research. More particularly:
    - Chapter 2 explains the notion of digital institution, and its exogenous and endogenous drivers.
    - Chapter 3 presents the theoretical framing based on institutional work in general, and boundary work and practice work in particular.
- Chapter 4 describes the methodological approach and research design applied in the empirical studies.
- Chapter 5 summarizes the five research papers.
- Chapter 6 discusses the findings in relation to the research objective.
- Chapter 7 presents the conclusions.
- Finally, the research papers are presented in full.

2 DIGITALIZING INSTITUTIONS

In this chapter I start by examining how exogenous digitalization causes pressure for change, then discuss organizational responses from the perspective of institutional work theory. Finally, I unpack the notion of digital institutions, and argue that in order to understand the emergence of digital institutions we need to take into account how pervasive digitalization transforms constitutive institutional elements.

2.1 EXOGENOUS DIGITALIZATION AS A TRIGGER OF CHANGE

Technological advances and progression in the use of digital technology have organizational effects and fuel macro-level change. For example, consumer behavior and expectations are affected by increased use of digital technologies that enable customers to become more active participants in value creation (Lusch and Nambisan 2015), engage in new types of dialogues (e.g. through social media), and increase their service delivery expectations (Sia et al. 2016). The increased availability of data enables rapid scaling and opportunities to generate cycles of learning-by-doing through immediate feedback from changed customer behavior for digital ventures (Huang et al. 2017), analytics-based process innovation (Günther et al. 2017), monetization of data[2] by selling it to third-parties (Loebbecke and Picot 2015), and complementary innovation by opening it up to external innovators (Jetzek et al. 2019).

The advances in digital technologies have challenged and transformed established industries, ecosystems, strategic values, and organizational boundaries (Nambisan et al. 2017; Parker et al. 2017; Svahn et al. 2017). The notion of IT-enabled transformation has long been acknowledged in the IS literature (Zuboff 1988). However, recently digital transformation—"*the combined effects of several digital innovations bringing about novel actors (and actor constellations), structures, practices, values, and beliefs that*

[2] Following modern usage, data is treated as a singular term referring loosely to a collection of information or dataset, rather than the plural of datum.

change, threaten, replace or complement existing rules of the game within organizations, ecosystems, industries or fields" (Hinings et al. 2018, p. 53)—has emerged as an important phenomenon and largely superseded the discourse on IT-enabled transformation. An important aspect of this definition is that it does not limit the entity of change and can include different levels of analysis (such as societies, industries, and organizations). In fact, the enlarged scope and increased interconnectedness of entities at multiple levels is a distinguishing feature of the digital transformation construct that reflects increased complexity in contemporary organizations (Majchrzak et al. 2016; Nan and Tanriverdi 2017).

In a recent literature review, Vial (2019) examines distinguishing characteristics of digital transformation. He finds that increases in numbers of technologies and actors involved have enlarged the scope and scale of change compared to traditional IT-enabled transformation. In particular, he identifies six essential properties of digital transformation: impetus, target entity, scope, means, expected outcomes and locus of uncertainty. Drivers of digital transformation may be both exogenous (society and industry trends) and endogenous (organizational decisions). The transformed entities may be one or more organizations, platforms, ecosystems, industries, or societies, and usually changes occur at multiple levels. In contrast to IT-enabled transformation, the scope is not limited to an organization and its immediate value network, but can rather have effects on a broader set of actors such as the society and customers. Similarly, the means involve not only a single operationally focused IT artifact but rather combinations of many digital technologies. In addition to transformation of business processes and business models, expected outcomes include challenges to current institutions (e.g., governance models). The locus of uncertainty is primarily located externally, while the internal aspect is far from trivial.

The extended scope and locus of digital transformation reflect how the developments in technological capacity blur previously taken-for-granted boundaries (Nambisan et al. 2017), extend the range of involved actors in value creation (Lusch and Nambisan 2015; Parker et al. 2017), and cause

increasingly rapidly evolving competitive landscapes (Tanriverdi et al. 2010; Nan and Tanriverdi 2017). Scholars have also emphasized that IT should no longer be considered an isolated functional resource applied to specific business processes but rather fused into the very fabric of all organizational activities (Bharadwaj et al. 2013; El Sawy et al. 2010). Accordingly, the literature describes digital transformation as a complex composite process in which technological advances have propelled digital technology as a wide-ranging disruptive force (Karimi and Walter 2015). In this perspective, digital transformation encompasses both profound change of large-scale complex systems such as society and industries, and organizational change through use of digital technologies for innovative purposes (Agarwal et al. 2010; Majchrzak et al. 2016). The phenomenon of interest in this thesis is transformation at the organizational level. However, as emphasized by the digital transformation literature, the intertwinement of organizational processes and relationships in wider and more loosely connected systems (such as ecosystems) implies that such endogenous change cannot be understood without consideration of transformation at the macro level.

Although digital transformation is a socio-technical process, the developments in capacity of digital technology during the last decades have been fundamental drivers of a shift towards digital transformation[3]. As incremental improvements in multiple types of capacity (e.g. computing, networking, data generation and storage) interact, the differences in degree generate differences in kind in socio-technical settings. For example, by separating function from form and content from medium, digital technology enables greater flexibility, adaptation and recombination of resources through 'liquefaction' and increases in resource density (Yoo et al. 2010; Lusch and Nambisan 2015). Liquefaction refers to the greater ease of sharing and re-combining information when it is stored in a digital format rather than coupled to a physical artefact (e.g. a book or printed

[3] While the shift demonstrated in Veil's (2019) review is a change in scholarly attention, it probably reflects a change in real-world settings. In my view, digital transformation is not replacing narrower IT-enabled transformation. Rather, digital transformation is an aggregate effect, occurring at higher system levels with more fundamental effects, arising from multiple interacting IT-enabled transformations.

documents). Increased resource density refers to the greater ease of gathering digital resources across boundaries (e.g. time, space and organizational boundaries) when required. This, in turn, enables adaptation and recombination of resources. Taken together, these characteristics of digital technology make innovation activities and outcomes 'intentionally incomplete' (Garud et al. 2008), i.e., they are subject to changes *in situ* as products and services continue to evolve after their market introduction or implementation in terms of their scope, features and value of offerings (Nambisan 2017). In this way, the malleability of digital technology renders both organizational processes and output (in terms of products and services) less bounded in terms of structures, spatial demarcations and temporal restrictions (Yoo et al. 2010; Nambisan 2017). Collectively, such exogenous developments, driven by digitalization, trigger organizational responses.

2.2 ENDOGENOUS RESPONSES TO EXOGENOUS DIGITAL CHANGE

The literature generally depicts digital transformations as endogenous (i.e. organizational) responses to exogenous digital changes that generate opportunities or threats .Vial (2019) found that most studies treat digital transformation as purposeful responses to opportunities related to digital technologies. However, the author also identified 49 studies (out of 282 in total) in which digital transformation was described as an exogenous threat occurring in the environment which the focal organization must respond to. Importantly, while I consider endogenous change as responses to threats and opportunities, the triggering exogenous digital change can either be incremental or radical. Incremental exogenous change is not necessarily perceived as significant but is rather part of the ever-present evolution of socio-technical settings. However, it can lead to endogenous responses in various ways, for example by enabling actors to innovate using slightly distinct technological functionality, new (in relation to the specific context) competences, and different use patterns (e.g., Arthur 2009; Henfridsson et al. 2018 Rudmark et al. 2012). What are initially perceived as small changes can trigger conflicts and raise the prominence of latent

contradictions between organizational elements. Radical exogenous digital change instead disrupts because it "*comes to fundamentally alter historically sustainable logics for value creation and capture by unbundling and recombining linkages among resources or generating new ones*" (Skog et al. 2018b, p. 432). Since such change is normally considered dramatic, endogenous responses are also perceived as significant. Endogenous responses normally lead to changes in some kind of organizational configurations. Here I focus on three aspects of digitalization that were particularly salient in STA's endogenous responses, mainly related to incremental exogenous digital change: *strategy formation*, *platform establishment and adoption*, and *digital institutional entrepreneurship*. In the following text, I review these concepts in detail.

Strategy formation is changing both in terms of both nature and content due to digitalization. Recently, scholars and practitioners have argued for a need to reconsider perspectives on the role of digital technologies in strategic thinking to reflect the pervasiveness of digital organizational forms. Such arguments for reconsideration center particularly on a fusion of IT strategy and business strategy, grounded in the assumption that they are inseparable (Bharadwaj et al. 2013; Peppard et al. 2014). Business strategies (e.g., in terms of marketing, supply chains, and human resources) without digital components are becoming increasingly scarce as digital technologies are increasingly embedded in processes, products and services. Essentially, the extensive digitalization of operations impacts the nature, role, and development of strategic thinking and suggests that the relationship between IT strategy and business strategy is characterized by fusion rather than alignment (Bharadwaj et al. 2013; El Sawy 2003; Pavlou and El Sawy 2010).

The role of digital technologies in strategy formation processes has dramatically changed in recent years, from *ad hoc* bottom-up approaches through top-down information systems (IS) planning approaches, strategic planning of IS and IS capability, to (most recently) digital strategizing (Marabelli and Galliers 2017; Peppard et al. 2014). The main distinguishing characteristics of these approaches are related to the role of IT in organizations' business strategies and the changing nature of actors

involved. Naturally, the shifts in approaches have coincided with developments in technological capacity and the importance of IT in business operations. Additionally, as the external environment becomes subject to more rapid and unpredictable change (El Sawy et al. 2010; Tanriverdi et al. 2010), organizations need to hold options for multiple contingencies and capacity to adapt and innovate rather than simply ability to execute plans efficiently (Pavlou and El Sawy 2011; Sambamurthy et al. 2003).

Bharadwaj et al. (2013) identify four strategic aspects that are deeply affected by the fusion of IT and business—scope, scale, speed and sources of value creation. In this context, scope refers to the activities carried out within an organization and the resultant products and services. An internally important characteristic of digital strategy is that it transcends functional structures (e.g. logistics, operations, sales, IT) as it is transfunctional. The design, implementation, and use of contemporary digital resources are not easily (or efficiently) restricted by organizational structures. Digitalization also challenges established structures in the competitive landscape as it reduces transaction costs, facilitates unbundling, and enables firms to leverage established customers when entering new niches, as illustrated (for example) by Spoitfy, Uber and Apple Music, respectively (Skog et al. 2018a).

Platform establishment and adoption has grown into an important strategic concern with substantial impact as the increased use of digital technology pushes organizations to relate to them (de Reuver et al. 2018; Constantinides et al. 2018; Yoo et al. 2010). Previous studies emphasize that the blurring of taken for granted boundaries pushes organizations towards managing relationships with a larger set of actors, loosely coupled in ecosystems rather than value chains (Parker et al., 2017; Sandberg et al. 2019; Svahn et al., 2017). Such ecosystems are often enabled by and centered around platforms (Jacobides et al. 2018) that enable complementor engagement by providing necessary functionality through their architecture, and governance configurations (Lindgren et al. 2015; Saadatmand et al. 2019; Tiwana 2015).

Seeking to identify shared characteristics across different platform types, Gawer (2014, p. 1240) suggests that platforms are *"evolving organizations or meta- organizations" that: (1) federate and coordinate constitutive agents who can innovate and compete; (2) create value by generating and harnessing economies of scope in supply or/and in demand; and (3) entail a modular technological architecture composed of a core and a periphery."* This definition point to three important features of digital platforms: they govern collaborations between loosely coupled actors (Andersson et al. 2008; Cennamo et al. 2018; Karhu et al. 2018), they are subject to network effects (de Reuver et al. 2017; Parker and Van Alstyne 2018), and the separation of resources into a core and periphery enables re-use of resources, and adaptability through augmentation (Baldwin and Woodard, 2009; Henfridsson and Bygstad, 2013; Koutsikouri et al. 2018).

The modular design (Baldwin and Clark, 2000) enables distributing selected decision right for design through boundary resources (such as application programming interfaces and software development kits) (Boudreau 2012; Ghazawneh and Henfridsson, 2013). The distribution of decision rights allows actors in the external environment to draw on available assets when developing customized solutions (Benlian et al. 2015; Lusch and Nambisan, 2015; Tiwana 2015). Variations in types and degrees of openness have led scholars to suggest that individual platform configurations enable distinct architectural leverage concerning production, innovation, and transactions (Thomas et al. 2014). Platform ecosystems are deeply affected by competing concerns and tensions among actors with misaligned interests (Eaton et al. 2015; Svahn et al. 2017; Wareham et al. 2014). Through the architecture and governance configurations, platform providers can seek to provide incentives, align stakeholders' interest, and ensure compliance with rules (Huber et al. 2017; Saadatmand et al. 2018; Song et al. 2018) Overall, the dominance of platforms as a specific type of infrastructures (Constantinides et al. 2018; Hinings et al. 2018) for interactions implies that in one way or another, most endogenous responses need to consider them.

Digital institutional entrepreneurship is a fundamental aspect of digital transformation since digital technologies change the nature of entrepreneurial processes (Nambisan 2016) that *drive* institutional change. The role of innovation and entrepreneurship *as motors* of change *is widely recognized. For example, the Austrian economist Joseph Schumpeter (1942, p. 82-83) coined the term 'creative destruction' to describe how innovation and entrepreneurship drives the* "*process of industrial mutation that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one.*" While the role of digital technologies in contemporary change processes is evident at both macro and micro levels of our societies, its more specific role in entrepreneurial processes has somewhat surprisingly received limited attention in research on entrepreneurship. In fact, scholars have argued that "*research in entrepreneurship has largely neglected the role of digital technologies in entrepreneurial pursuits*" (Nambisan 2017, p. 2). Instead, literature on technology entrepreneurship (Beckman et al. 2012) has largely treated digital technology merely as a context for empirical work (e.g., Bingham and Haleblian 2012; Vissa and Bhagavatula 2012).

In the IS field, the impact of digitalization on entrepreneurial processes is gaining increasing interest. However, relatively little attention has been paid to the role of digital technology in institutional entrepreneurial processes, what I refer to as digital institutional entrepreneurship. Such processes are distinct from start-ups basing their business model on digital technologies from the outset as they occur within, and aim to change, established institutional arrangements. Digital institutional entrepreneurship is characterized by emergence and negotiations between institutional forces and uncertain technological trajectories (Tanriverdi et al. 2010; Mankevich and Holmström 2016). For example, in an in-depth case study, Henfridsson and Yoo (2014) explored how entrepreneurial actions evolved in a car manufacturing company, resulting in new innovation trajectories. The study suggests that entrepreneurs played a key role in innovation by connecting the organization's past with its future, thus clearly illustrating the potential importance of institutional entrepreneurs in digital innovation.

Institutional entrepreneurship literature offers an understanding of how and why particular practices, rules, institutions, or logic(s) emerge or transform (Emirbayer and Mische 1998) and become established over time in organizations (Garud et al. 2007). According to DiMaggio (1988, p. 14), "*new institutions arise when organized actors with sufficient resources see in them an opportunity to realize interests that they value highly.*" Aiming to achieve change, institutional entrepreneurs battle existing practices and rules that are integrated with the dominant logic(s) and attempt to institutionalize alternative practice(s), rules or logic(s) (Battilana 2006; Garud and Karnøe 2003) that create new systems of meaning for them (Ruebottom 2013). However, this process is often riddled with uncertainty and political maneuvering (Seo and Creed 2002). It is political because institutional entrepreneurs challenge not only structures of the institution, but also the foundational elements that bind their own agency (DiMaggio and Powell 1991; Seo and Creed 2002; Van Dijk 2011).

While there is extensive literature on digital transformation, how digitalization of institutions unfolds has received scant attention (Vial 2019). In particular, the practices that drive the emergence of digital institutions are not well understood. Recently, scholars have argued that an increased understanding of the work individuals carry out in micro-level processes can sharpen our understanding of the mechanisms involved in digitalization processes (Karpovsky and Galliers 2015; Peppard et al. 2014). Before exploring the activities that undergird institutional digitalization, I first discuss the constitutive elements of institutions and their relationships to digital technology.

2.3 DIGITAL INSTITUTIONS

New digital institutions are emerging based on "*an 'assembled mix' of technical and institutional components that are in part an evolutionary outcome and in part a product of human intervention and design*" (Lanzara 2009, p. 4). Such an 'assembled mix', or assemblage, encompasses loosely structured, dynamic, and varied sets of actors in which connections and boundaries continuously shift. In assemblages, digital technology enables interactions

among actors and shapes their practices by instantiating institutional rules, norms, and meanings (Hallet and Ventresca 2006). However, due to key characteristics of digital technology (e.g. loose coupling, re-programmability, and distributedness) (Kallinikos et al. 2013; Yoo et al. 2010) these rules, norms, and meanings are always in flux. For example, the development and continuous reformation of Apple's Appstore was partly driven by distributed developers repeatedly defying the firm's institutional arrangements (Eaton et al. 2015). Thus, digital institutions are constantly evolving through 'distributed tuning' of, and in, assemblages.

As digitalization generates new, or extends existing, digital institutions, organizational practices are re-shaped when interwoven with digital technologies that start performing them (or parts of them). Well aware that the construct of digital institutions might provoke and trigger thoughts about 'pure digital' value creation systems (such as Google and Facebook), I use it here to illuminate the processes involved in fundamental digitally induced change in institutions with strong traditional physical and geographical restrictions. Building on the work of Lanzara (2009), I define a digital institution as one in which regulative, normative, and cognitive pillars, and their carriers, are interwoven with digital technology into an 'assembled mix' (Lanzara 2009; Scott 2014). In essence, the emergence of digital institutions is about how organizational practices and boundaries are re-shaped and codified as digital technologies start performing them (or parts of them). For example, at STA the decision to open up data to external actors reshaped practices and boundaries as it triggered substantial automation and changes in data generation processes, emergence of a new platform with codified rules for interactions, and involvement of new actors in the development of services.

To analyze such transformation, I draw on institutional theory and Scott's (2014) conceptualization of institutions. Institutional theory builds on the assumption that the organizational context and previous events significantly influence and shape organizational behavior. In many ways, the temporal dimension of organizations is a foundational element of institutional theory (Scott 2014, p. 1): "*The beginning of wisdom for an*

institutional theorist is the recognition that current actors and events are greatly shaped by past efforts and their enduring products." Importantly, past efforts influence both the exogenous and endogenous settings since their effects are present at many levels (industry, organization, group and individual). For example, at the organizational level, the industry in which organizations operate and seek to abide by prevailing rules and belief systems is shaped by past efforts and products (DiMaggio and Powell 1991; Meyer and Rowan 1977). At the individual level, the organization's institutional elements and their carriers represent persistent outcomes of previous events.

Table 1. Pillars and carriers of institutions (Scott 2014)

	Pillars		
	Regulative	***Normative***	***Cultural-cognitive***
Symbolic systems	Rules, Laws	Values, Expectations, Standards	Categories, Typifications, Schemas, Frames
Relational systems	Governance systems, Power systems	Regimes, Authority systems	Structural isomorphism, Identities
Activities	Monitoring, Sanctioning, Disrupting	Roles, Jobs Routines, Habits, Repertories of collective action	Predispositions, Scripts
Artifacts	Objects complying with mandated specifications	Objects meeting conventions, Standards	Objects possessing symbolic value

Scott describes 'pillars and carriers of institutions' in his frequently cited work on institutional transformation. He recognizes three 'pillars' of institutions—regulative, normative and cultural-cognitive—that make up or support institutions and have substantial resilience and consistency across time (Scott 2014). The regulative pillar consists of formal rules and laws upheld by coercive measures. Constraining and regulating behavior is a prominent aspect of institutions that ensures stability. This pillar's basis of legitimacy is legally sanctioned, and its mechanisms affect senses of fear, guilt and innocence. The normative pillar's basis of order is binding

expectations to binding, normative, expectations. Its basis of legitimacy is morally governed, and it affects perceptions of shame and honor. Actors follow normative rules because of social obligation, internal commitment and recognition of sufficient expectations to act accordingly (Parsons 1971). The cognitive pillar basis of order consists of constitutive schema and can be discerned in common beliefs, shared logics of action, and isomorphism. It affects perceptions of certainty and confusion, and its basis of legitimacy is comprehensible, recognizable and culturally supported common frameworks of meaning. The cognitive pillar involves "*shared conceptions that constitute the nature of social reality and create the frames through which meaning is made*" (Scott 2014, p. 67).

According to Scott (2014) each of these institutional pillars is operationalized through four types of carriers (or mechanisms): symbolic systems, relational systems, routines and artefacts (Table 1). Symbolic systems are models, representations, and logics (Thornton et al. 2012). For the regulative pillar, these include rules and laws. For the normative pillar, the symbolic system includes values, expectations and standards, while for the cognitive pillar carriers are categories, typifications and schemas. Relational systems are constituted by patterned expectations that are linked with social positions of actors and role systems. In the regulative pillar, these are governance systems and power systems. For the normative pillar, these are regimes and authority, and for the cultural-cognitive pillar they include structural isomorphism and identities. While structural carriers are essential, so are the activities that uphold institutions by reinforcing, protecting and at times evolving them. For the regulative pillar, they include monitoring, sanctioning, and disrupting. In the normative pillar, they include roles, jobs, routines, habits and repertoires of collective action, while in the cognitive pillar they include predispositions and scripts. Finally, artifacts are created by humans to perform various tasks but in use they also appear "*to be part of the objective, structural properties*" (Orlikowski 1992, p.406). In the regulative pillar, artifacts are objects that comply with mandated specifications. In the normative pillar, they are objects that meet conventions and standards. In the cognitive pillar artifacts include objects possessing symbolic value. Overall, it is through these elements that

institutions recreate social structures across time and guide organizational behavior. However, while demonstrating persistence across time and substantial resilience, institutions are not fixed and permanent.

The upholding elements provide 'elastic fiber' (Scott 2014) that shape behavior but over time they are also themselves re-shaped. Thus, the relationship between digitalization and institutions runs two ways (Hinings et al. 2018; Lanzara 2009). On one hand, the introduction of new technologies triggers change in institutional arrangements. On the other, the institutional arrangements often challenge the need for change and deeply affect how digitalization processes unfold in a focal organization.

A central argument running through this thesis is that in a digital institution the relationship between digital technologies and institutions has changed. While technologies have long been important carriers of institutions, this effect has been substantially strengthened. Increases in capacities of digital technologies, and both the scale and scope of their involvement in operations, has raised the degree to which digital characteristics shape not only artifacts but also the other three types of carriers (activities, relational systems, and symbolic systems). Over time, digitalization of carriers shapes and reshapes the institutional pillars. Although the mediating role of digital technologies between the institutional realm and the realm of human action has long been acknowledged in the IS field (e.g., Orlikowski and Robey 1991) the difference in degrees of (for example) digital technology's functionality, price, and use patterns, generates differences in kind. To explore processes undergirding institutional digitalization, I turn to theory on institutional work in general, and in particular work related to boundary work and practice, since it provides analytical tools for analyzing the role of purposive actions in institutional change.

3 INSTITUTIONAL CHANGE

In this chapter I explore institutional work as a lens to examine the actions through which actors translate digitalization into institutional change. First, I review institutional work as a driver of institutional change. In particular, I examine activities aimed at creating, maintaining, and disrupting institutions as different forms of institutional work. Then I explore how these forms materialize in relation to practices and boundaries, i.e. practice work and boundary work as two distinct, but interdependent, types with partly different target entities. Second, I examine how institutional work translates into institutional change. More specifically, I examine the recursive relationship in which boundaries, boundary work, practices, and practice work shape and reshape each other. Finally, I examine the cycles of institutional stability and change through which institutional change unfolds.

3.1 THE MICRO-FOUNDATIONS OF INSTITUTIONAL WORK

Institutional perspectives have been widely used in the IS field, predominantly focusing on how macro-level structure shape technology use and design at the micro-level (Boudreau and Robey, 2005; Jensen et al., 2009; Hultin and Mähring, 2014). With some noticeable exceptions (e.g., Barrett and Walsham, 1999; Barrett et al., 2013; Scarbrough et al., 2015), little attention has been given to how micro-level practices involving digital technology reshapes macro-level structures. While, recent studies demonstrate that the effects in fact runs both ways (Essén and Winterstorm Värlander, Forthcoming), the processes through which boundary work and practice work reshapes and eventually transform institutions has largely been neglected. In this thesis, I argue that the inattention to the processes through which micro-level practices and macro-level structures mutually shapes each other, and eventually can lead to transformative outcome, has impeded our understanding of the emergence of digital institutions. To this end, I next explore theory on institutional work.

Although institutions have persistent social patterns (Hughes 1936), they are not immune to change. Exogenous disruptions that the institutions must adapt to have traditionally been regarded as triggers of such change (e.g., Hoffman 1999). However, another source of change that is attracting increasing interest is agency invoked by actors' institutional work (e.g. DiMaggio 1988; Orlikowski 1992; Thornton et al. 2012). Previous research suggests that in order to change institutions, institutional entrepreneurs, as individuals, or groups of individuals, (Battilana 2006; Maguire et al. 2004) must be proficient actors (Perkmann and Spicer 2007), that can negotiate (Garud et al. 2007), "*frame*" their actions strategically (Khan et al. 2007; Misangyi et al. 2008), build legitimacy (Battilana et al. 2009) and mobilize resources (DiMaggio 1988; Garud et al. 2002). In addition, institutional entrepreneurs often need to have high status, or a unique 'social position' within their institutional field, that allows them to engage in non-conforming behavior without significant fear of repercussions (Garud et al. 2002; Greenwood et al. 2002; Maguire et al. 2004). However, this view has been criticized for over-emphasizing the importance of the "*heroic*" entrepreneur, while downplaying the width of actors involved in institutional change. For example, Lawrence and Suddaby (2006, p. 217) argue that "*such practices go well beyond those of institutional entrepreneurs - the creation of new institutions requires institutional work on the part of a wide range of actors, both those with the resources and skills to act as entrepreneurs and those whose role is supportive or facilitative of the entrepreneur's endeavours.*"

Drawing on the neo-institutional tradition in organization studies, institutional work refers to "*the purposive action of individuals and organizations aimed at creating, maintaining and disrupting institutions*" (Lawrence and Suddaby 2006, p. 215). A fundamental area of concern in this literature is "*how actors whose thoughts and action are constrained by institutions are nevertheless able to work to affect those institutions*" (Zietsma and Suddaby 2010, p. 189). Underlying this dilemma is the assumption in institutionalist perspectives that institutions constitute durable elements that deeply affect actors' thoughts, attitudes and behavior (Lawrence and Suddaby 2006). In fact, scholars have even suggested that in strongly institutionalized systems, "*endogenous change seems almost to contradict the meaning of institution*" (Scott 2008 p. 187).

Zietsma and Suddaby (2010, p. 190) suggest that the explanation for this dilemma is grounded in the interplay of two phenomena: "*boundaries—the distinctions among people and groups (Bowker and Star, 1999; Carlile, 2004)—and practices—'shared routines of behavior' (Whittington, 2006 [p.] 619).*" They argue that it is through the work of actors to create, maintain, and disrupt boundaries and practices, and the interplay of boundaries and practices, that institutional change occurs. For example, innovative applications of digital technologies in the environment must be converted across institutional boundaries and implemented into the domain of established practices to cause change in a focal institution. Strong boundaries can cause organizations to become unresponsive to exogenous change and lead to contradictions between their accepted norms and practices and those accepted in broader environments (e.g., society) (Seo and Creed 2002). Over time, such contradictions cause increasing pressure for change. The processes through which digitally induced contradictions can lead to change, the agency involved, and the actions through which it translates into reshaped boundaries and practices, are central concerns in my investigation of the emergence of digital institutions.

In the IS field, theory on institutional work has received surprisingly little attention. I reviewed all the papers citing Lawrence and Suddaby's (2006) seminal paper on institutional work where the term "information systems" appeared[4]. Among those papers, none explored the role of institutional work in digital transformation of institutions (or organizations).

In the following sections, I first examine three foundational categories of institutional work—activities aimed at creating, maintaining, or disrupting institutions. Then I explore how these categories unfold as practice work

[4] I first searched Google Scholar for all work citing Lawrence and Suddaby (2006) in January 2019 (2319 papers in total). Among those, I selected the 331 paper where the term "information systems" was used. I then excluded all papers where the authors only cited Lawrence and Suddaby without discussing their conceptualization explicitly (leaving 67 papers in my sample). Among those papers, I excluded the ones where the framework was not used to substantiate the analysis, but instead was only mentioned in a couple of sentences (leaving 19 papers). Out of these 19 papers, five were conference papers, twelve papers were published in non-IS journals and two in IS journals (Information Technology & People and International Journal of Accounting Information Systems).

and boundary work, two distinct but highly related specific kinds of institutional work, targeting different entities (practices and boundaries).

3.1.1 CATEGORIES OF INSTITUTIONAL WORK: CREATING, MAINTAINING AND DISRUPTING

Lawrence and Suddaby (2006) identify three broad categories of institutional work, labeled according to their aims–creating, maintaining, and disrupting institutions–in a review of empirically-based research on institutions. Drawing on this categorization of institutional work, I understand digitalization processes as triggering and involving antagonistic types of institutional work. When actors with distinct understandings, motives, and positions engage in or become subject to, digitalization processes they respond differently. Their responses can involve actions to create new institutional elements, maintain the status quo, or disrupt the current order. Since both organizational and technological systems are nested hierarchies, i.e., systems containing other systems, the life-cycles of the many interacting subsystems are prone to clash. As actors committed to one or multiple subsystems engage in institutional work to maintain them, other institutional work is enacted to create new arrangements from the perspective of another subsystem. Similarly, from the viewpoint of a third subsystem, other actors might engage in work practices to disrupt. Thus, multiple types of institutional work with antagonistic aims are likely to coincide in digitalization processes.

Creating institutions builds on the notion of institutional entrepreneurship and involves establishing rules and rewards, and sanctions tied to those rules. The ability to do so is often tied to specific positions (e.g., within the state, a delegate of the state or a professional body) but can also be gained through political and economic processes. Positions can also be grounded in resource-dependence of actors or specific identity in relation to an issue, and thus emerge from normative work such as constructing identities. Three sub-categories of creating institutions are recognized: overtly political work, reconfiguration of belief systems, and alterations of categorizations to change meaning systems. Each of these sub-categories includes specific forms of institutional work. The overtly political work

sub-category includes 'advocacy', 'defining', and 'vesting'. The reconfiguration of belief systems subcategory includes 'constructing identities', 'changing norms' and 'constructing networks'. Finally, the alterations of categorizations to change meaning systems subcategory includes 'mimicry', 'theorizing', and 'educating'.

Overtly political work focuses on changing the rules systems. As such change can be more easily enforced than, for example, changes in norms and belief systems, overtly political work has far greater potential to create new institutions than the other categories given sufficient authority (Lawrence and Suddaby 2006). Work focused on changing norms and belief systems is instead often involved in creating rules, practices, and technologies that complement existing arrangements. It is the most co-operative of the three sub-categories since it relies on cultural and moral pressure embedded in communities of practices. Institutional work focused on change in meaning systems can involve well-positioned actors but also has the greatest potential for institutional entrepreneurs or peripheral actors. This potential stems from the focus on using existing arrangements to reconfigure structures and institutions in this sub-category (Clemens and Cook 1999). Definitions and examples of digitally-induced institutional work of each form aimed at creating institutions are provided in Table 2.

Table 2. Forms of work to create institutions (Lawrence and Suddaby 2006)

Creating institutional work	***Definition by Lawrence and Suddaby (2006)***	***Example of digitally induced institutional work***
Advocacy	The mobilization of political and regulatory support through direct and deliberate technique of social suasion.	Formation of alliances with influential actors to influence digital technology standard.
Defining	The construction of rule systems that confer status or identity, define boundaries of membership to create status hierarchies within a field.	Creation of certification program with trusted partners.
Vesting	The creation of rule structures that confer property rights.	Developing and offering different application programming interfaces (APIs)

		with specific levels of rights conferred to stakeholders.
Constructing identities	Defining the relationship between an actor and the field in which the actor operates.	Redefining relationships with external actors as co-creators of value in digital ecosystems.
Changing normative associations	Re-making the connections between sets of practices and the moral and cultural foundations for those practices.	Transitioning from keeping data proprietary into releasing data openly to the public and relating the transition into the institutional mission.
Constructing normative networks	Constructing of interorganizational connections through which practices become normatively sanctioned and form the relevant peer group with respect to compliance, monitoring and evaluation.	Establishing a governing board managing specific collaborations in parallel with existing institutional structures, as for example The Open Alliance in the automotive industry.
Mimicry	Associating new practices with existing sets of taken-for-granted practices, technologies and rules in order to ease adoption.	Adapting a user interface to resemble previously used systems.
Theorizing	The development and specification of abstract categories and the elaboration of chains of cause and effect	Coining terms such as the department of digitalization or digital CEO, labeling its organizational characteristics and lobbying for it in the organization.
Educating	The education of actors in skills and knowledge necessary to support the new institution	Recognition of continuous development of skills and knowledge related to digital technologies.

Maintaining institutions involves supporting, repairing and recreating the mechanisms that ensure obedience to rule systems and reproduce the existing norms and beliefs. Work to maintain institutions has received less attention than the other categories (Lawrence et al. 2013). While preservative mechanisms are distinguishing characteristics of institutions, social mechanisms normally need to be complemented by actions (Lawrence and Suddaby 2006; Lawrence et al. 2013). Maintaining institutions is not the same as sheer absence of change. Instead, it involves actions and considerable effort since it is a response to endogenous and

exogenous change. For example, actors need to find ways to engage and socialize new members and incorporate exogenous change into the existing routines and patterns. Thus, the ways in which actors influence the processes that uphold persistence and stability in environments characterized by transformative change play key roles in maintaining institutions.

Maintaining includes two sub-categories: ensuring adherence to rule systems and reproducing existing norms and belief systems. The ensuring adherence to rule systems subcategory includes three specific institutional work forms: 'enabling', 'policing', and 'deterring'. The other subcategory, reproducing existing norms and belief systems, includes 'valorizing/demonizing', 'mythologizing', and 'embedding and routinizing'. These two sub-categories vary significantly in their degree of comprehensibility. Work to ensure adherence to the rule system has a high degree of comprehensibility as actors are conscious of its purpose and influence. In contrast, reproducing norms and belief systems is much less comprehensible as the original purpose and ultimate outcomes of actions remain clouded to actors engaged in routines or rituals. Definitions and examples of digitally induced institutional work of each form aimed at maintaining institutions are provided in Table 3.

Table 3. Forms of work to maintain institutions (Lawrence and Suddaby 2006)

Maintaining institutional work	***Definition by Lawrence and Suddaby (2006)***	***Example of digitally induced institutional work***
Enabling work	The creation of rules that facilitate, supplement and support institutions, such as the creation of authorizing agents or diverting resources.	Establishment of digital occupations with authorizing positions in an organization (e.g. Chief digital officer).
Policing	Ensuring compliance through enforcement, auditing and monitoring.	Enforcement, monitoring, and evaluation of ongoing digital initiatives, such as use of a new digital platform.
Deterring	Establishment of coercive barriers to institutional change	Establishment of a tightly regulated and centralized governance structure where all investments related to digital

		technologies must be approved by authorizing agents.
Valorizing and demonizing	Providing for public consumption positive and negative examples that illustrate the normative foundations of an institution.	Communication and open punishment of actors that do not adhere to policies related to investments and designs of digital technologies.
Mythologizing	Preservation of the normative underpinnings of an institution by creating and sustaining myths regarding its history.	Stimulating storytelling about how the current situation was enabled by successful use of the prevailing digital approach.
Embedding and routinizing	Active infusion of the normative foundations of an institution into the participants' *daily* routines and organizational practices.	Use of the surveillance potential of data generation and processing to ensure personnel adhere to prescribed routines, and subtly letting them know their actions can be traced.

Disrupting institutions includes destabilizing the mechanisms that uphold institutional arrangements by making members comply with them. Although creation and maintenance of institutions have historically received more attention, research has also highlighted the possibility of disrupting institutions (e.g., Greenwood and Hinings 1996; Scott et al. 2000). However, research on work to disrupt institutions remains scarce (Lawrence et al. 2013). In most cases, there are actors that are dissatisfied with the current institutional arrangements and will work to disrupt them if possible. Institutional structures allocate resources, leading actors to compete for advantaged positions or disrupt institutions hindering their access (Bourdieu 1993). Disruptive work includes confronting and destabilizing the mechanisms that uphold institutions and lead members to comply.

Lawrence and Suddaby (2006) identify three forms of disruptive work: disconnecting sanctions, disassociating moral foundations, and undermining assumptions and beliefs. A shared characteristic of these forms of work, which distinguishes them from creating new ones, is a primary focus on decreasing the impact of mechanisms promoting compliance. One aspect that influences the capacity to engage in disruptive work is the strength of influence of institutional pressure on types of

actors. For example, disconnecting sanctions and rewards is strongly associated with professions and elites with financial and intellectual means to leverage the state in disrupting institutions that do not grant them privileges. To disassociate moral foundations, a rich understanding of cultural boundaries and meanings of institutions seems essential. Lawrence and Suddaby (2006) also emphasize that influencing the symbolic and social boundaries that comprise and shelter institutions is an essential aspect of disrupting institutions. Definitions and examples of digitally induced institutional work of each form aimed at disrupting institutions are provided in Table 4.

Table 4. Forms of work to disrupt institutions (Lawrence and Suddaby 2006)

Form of disruptive institutional work	***Definition by Lawrence and Suddaby (2006)***	***Example of digitally induced institutional work***
Disconnecting sanctions	Working through state apparatus to disconnect rewards and sanctions from some sets of practices, technologies or rules.	Undermining the technical standards and understandings that restrict access to markets.
Disassociating moral foundations	Disassociating practices, rules or technologies from their moral foundation as appropriate within a specific cultural context.	Undermining perspectives about how much, and what type of, data is deemed acceptable to collect and distribute.
Undermining assumptions and beliefs	Decreasing the perceived risks of innovation and differentiation by undermining core assumptions and beliefs.	Narrating digitalization as a threat to the status quo in order to increase actors' propensity to engage in innovation.

In summary, institutional work concerns agency and how actions translate into institutional change and stability. The three categories of institutional work have been suggested to target either boundaries or practices. Accordingly, practice work and boundary work refer to two interrelated but distinct types of such work. While practice work summarizes "*how actors affect the practices that are legitimate within a domain,*" 'boundary work' refers to "*actors' efforts to establish, expand, reinforce, or undermine boundaries*" (Zietsma and

Suddaby 2010, p. 194-195). In the following sections, I explore both of these in more detail.

3.1.2 PRACTICE WORK

Practice work denotes activities through which actors create, maintain and disrupt practices. Practices are shared routines (Whittington 2006) among social groups, "*recognized forms of activity*" (Barnes 2001, p.19) guiding how people behave in a given situation (Pentland and Rueter 1994). A practice is not simply what people do (Whittington 2006). Rather, it is among groups that the appropriateness of practices is defined, they are cultured and spread to other members (Barnes 2001). Activities must conform to social expectations to become identifiable as instances of a practice. While tacit and informal aspects of practices are critical to understand practices, so are explicit and formal routines (Whittington 2006; Zietsma and Suddaby 2010).

Studies on practice work have typically focused on one of the categories of work (create, maintain or disrupt) (Zietsma and Suddaby 2010). Work to create practices has mainly focused on institutional entrepreneurship and innovation (DiMaggio 1988; Hargrave and Van de Ven 2005). This involves overtly political work, reconfiguration of belief systems, and alterations of categorizations to change 'meaning systems' (Lawrence and Suddaby 2006). Actors' efforts to maintain practices have attracted less attention (Scott 2014). These involve "*supporting, repairing or recreating the social mechanisms that ensure compliance*" (Lawrence and Suddaby 2006, p. 230). Through social control, such work complements institutional mechanisms for self-reproduction and involves ensuring obedience to rule systems and reproducing the existing norms and beliefs (Lawrence and Suddaby 2006). Recent analysis also stresses the significance of work to defend practices that are attacked (Maguire and Hardy 2009). Finally, work to disrupt practices includes destabilizing the normative, cognitive mechanisms that uphold institutional arrangements by making members comply with them. Examples include disconnecting sanctions and moral foundations, and undermining assumptions and beliefs.

3.1.3 BOUNDARY WORK

Boundaries are important instruments for acquiring status and ensuring (restricted) access to resources since they translate into "*unequal access to and unequal distribution of resources (material and nonmaterial) and social opportunities.*" (Lamont and Molnár 2002, p. 168). They are "*tools by which individuals and groups struggle over and come to agree upon definitions of reality*" (Lamont and Molnár 2002, p. 168). These characteristics and effects suggest that boundaries are strategically important for actors wanting to protect or disrupt existing systems that define access to scarce resources. In digital settings, a salient example is how platform providers such as Apple can impose requirements to receive a substantial part of monetary transactions related to apps and content in their ecosystem as they control access to a vast user base.

Studies on boundary work have suggested several typologies. For example, based on a recent review of the literature, Comeau-Vallée and Langley (2019) suggest three broad categories: competitive, collaborative, and configurational. Here, I emphasize actions to create, maintain, and disrupt (Lawrence and Suddaby 2006) configurations of boundaries, since my focal concern is the role of boundary work in the emergence of digital institutions. Thus, I draw on three categories suggested by Zietsma and Suddaby (2010). First, actors engage in boundary work that establishes boundaries to shield autonomy, prestige, and control of resources (Burri 2008; Suddaby and Greenwood 2005). For example, in analyzing the sociology of professions (Bechky 2003, p. 712) found that "*occupations fiercely guard their core task domains from potential incursions by competitors.*" Second, activities to manage cross-boundary connections involve boundary-spanning actors (Hargadon and Sutton 1997) and boundary objects (Kellogg et al. 2006; Star and Griesemer 1989). It includes "*work to establish a shared context*" (Carlile 2002, p. 451) and is exemplified by design drawing and project management software that assists coordination across boundaries between groups and departments. Third, boundary breaching can be achieved by two key strategies, framing and resource mobilization (Benford and Snow 2000; McCarthy and Zald 1977) that allows reshaping of boundaries. To understand roles of different forms of boundary work

in institutional change and stability, analysts need to consider their interactions and dependencies (Zietsma and Suddaby 2010).

3.2 THE ROLE OF WORK IN INSTITUTIONAL CHANGE AND STABILITY

3.2.1 THE RECURSIVE RELATIONSHIP BETWEEN BOUNDARY WORK AND PRACTICE WORK

There is a recursive relationship between boundaries and practices, as boundaries restrict what are considered legitimate practices, and practices support specific boundaries (Armstrong 2002; Zietsma and Lawrence 2010). Strong boundaries have been shown to promote stability by enabling surveillance and enforcement among actors (Collins 1975; Gusfield 1975) and boosting shared understandings of norms (Collins 1981). Simultaneously, the enactment of practices can reproduce relationships and conceptual schemas that are partly defined by boundaries (Barnes 2001; Swidler 2005). However, the relationship between boundaries and practices can also trigger change as it affects power and privilege, potentially fueling discontent and conflicts. For example, third-party developers' challenges of boundaries surrounding the iPhone eventually led Apple to enable external development of applications, triggering emergence of new practices regarding, for example, input control (Eaton et al. 2015). The relationship between boundaries and practices is therefore a central concern in analyses of institutional change and stability.

The relationships between boundary work and practice work are summarized in Figure 1 (adopted from Zietsma and Suddaby 2010). It illustrates the recursive relationship between boundaries and practice, as practices enact boundaries, while boundaries demarcate appropriate spaces of practices. Both practice work and boundary work can be motivated by practices. For example, discontent with current practices can lead to engagement in practice work directly, or boundary work if existing boundaries inhibit actors from influencing practices. Similarly, boundaries can trigger, or motivate, practice work and boundary work.

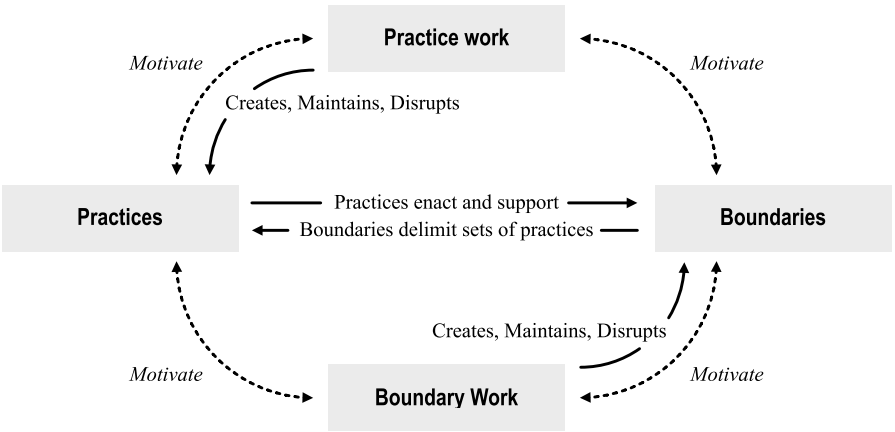

Figure 1. The recursive relationship among boundaries, practices, boundary work, and practice work (Zietsma and Suddaby, 2010).

Disadvantages associated with boundaries can motivate actors to disrupt the boundaries or delegitimating associated practices. The sets of relationship are complex, with dynamic interactions that can influence the evolution of institutions (Kellogg 2009). However, the role of the interplay between boundary work and practice work in institutional change is not well understood. To facilitate elucidation of this interplay, I next explore institutional change and stability.

3.2.2 CYCLES OF INSTITUTIONAL STABILITY AND CHANGE

The relationships among different types of institutional work, and their relative intensities, vary over time. Certain periods are characterized by institutional work that maintains practices and boundaries, while in others work to create and disrupt dominates. Zietsma and Suddaby (2010) suggest that as a result of the recursive and reciprocally supportive relationship between boundary work and practice work, institutions undergo cycles of institutional stability, conflict, innovation, and restabilization (Figure 2). During periods of institutional stability, mutually reinforcing boundary work and practice work aimed at maintaining boundaries and practice uphold a relatively stable situation. During institutional conflict, competing sets of boundary work and practice work (disrupting and maintaining) clash and cause turmoil. To resolve such conflicts, institutional innovation

cycles are characterized by combinations of boundary work and practice work providing 'safe spaces'. These are arenas where actors can engage in experimentation and development of new forms of collaboration. Ultimately, new boundaries and practices are restabilized (and institutionalized) by cross-boundary connecting and practice diffusion.

Zietsma and Suddaby (2010, p. 208) also found that transitions between the cycles are associated with three aspects of the endogenous and exogenous conditions: "*(1) the status of the boundary, (2) the status of the core practices, and (3) the existence of one or more actors with the motivation and capacity to initiate the boundary work and practice work associated with the subsequent cycle*." Grounded in their analysis of movement between cycles in the British Columbia coastal forest industry, Zietsma and Suddaby (2010, p. 210-212) developed three propositions regarding transition conditions:

> "*Proposition 1: Institutional stability will shift to institutional conflict when (a) the legitimacy of central practices becomes disputed, (b) boundaries protect those practices from disruption, and (c) an outsider exists with the capacity and motivation to engage in boundary work and practice work to challenge those practices and boundaries.*"
>
> "*Proposition 2: Institutional conflict will shift to institutional innovation when (a) practices are disrupted, (b) the boundaries that protect those practices are compromised, and (c) there is a motivated insider with the capacity to establish new boundaries to protect experiments from institutional discipline.*"
>
> "*Proposition 3: Institutional innovation will shift to institutional restabilization when (a) new practices are created that are broadly considered legitimate, (b) previously legitimate boundaries are compromised, and (c) a coalition of outsiders and insiders exists that has the capacity to cooperate to diffuse the new practices and legitimize a new boundary or re-legitimize the compromised boundary.*"

Taken together, these conceptual tools allow deeper analysis of how the relationship between boundary work and practice work shape the emergence of digital institutions (Figure 2).

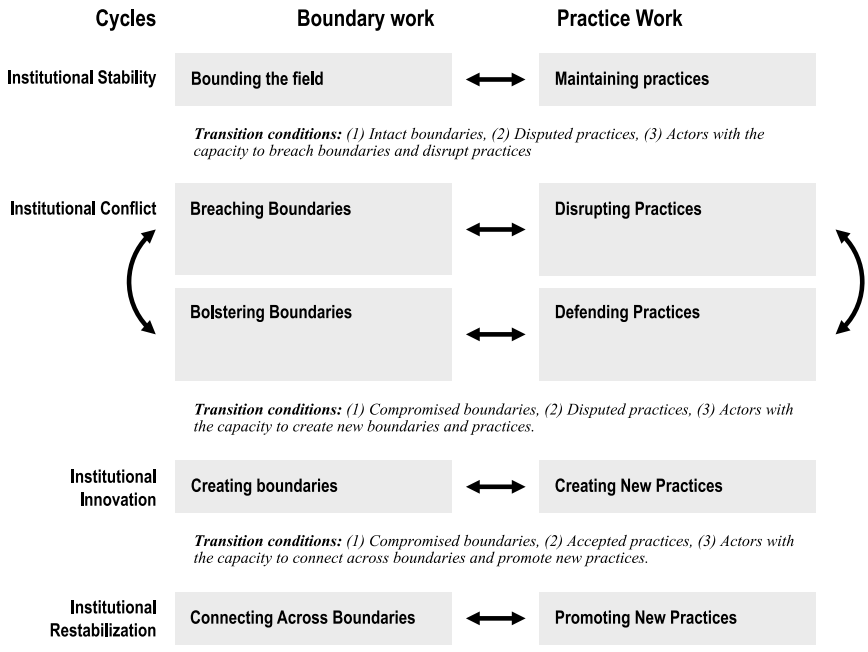

Figure 2. Boundary work, practice work, and cucles of institutional stability and change.

4 RESEARCH METHOD

This dissertation is based on a longitudinal interpretative case study (Walsham 1995; 2006) conducted between 2008 and 2017 on digital transformation in the Swedish Transport Administration (STA). In 2010, STA was established through a merger of the Swedish Railroad Administration (SRRA) and the Swedish Road Administration (SRA). I started following IT initiatives at SRRA in 2008, and continued at STA after the merger. During these years my focus extended from implementation of sensor technology to how exogenous digitalization triggered endogenous responses. The endogenous responses I focus on in this thesis were selected and examined to explore how practice and boundary work carried out by individuals within and outside the organization ultimately transformed STA into a digital institution.'

STA is a suitable case for studying how the recursive relationship between boundary work and practice work shape the emergence of digital institutions for several reasons. First, it is a large organization with significant institutional resilience, but it has transformed significant parts in response to exogenous change. Second, it operates in a sector that has been deeply affected by pervasive digitalization. Third, the institutional carriers and pillars are deeply connected to the physical infrastructure since operations depend on them. The interweaving of digital technology into the physical infrastructures generates ostensible conflicts between forces of change and stability. In this chapter, I describe how I have sought to capture such transformation, and how it has influenced the empirical studies. I also provide an overview of my empirical work, including the research context, data collection procedures, and data analysis methods, in the chapter.

4.1 RESEARCH CONTEXT

In January 2008, the Swedish ITS (Intelligent Transportation Systems) Postgraduate School was formed as associated state entities increasingly perceived ITS as a potentially important research area for developing a

sustainable, safe, and cost-effective transport system. The initiative involved VINNOVA (the Swedish Governmental Agency for Innovation Systems), SRRA, and SRA together with several Swedish companies and universities. In February 2008, I obtained a position as a PhD student in the postgraduate school, focused on how SRRA could benefit from ITS.

4.1.1 ENTERING THE FIELD

In February 2008, I traveled for an initial meeting with my industrial supervisor at SRRA, the new IT strategist. At the time, SRRA had approximately 6 300 employees, of whom 3 500 worked in the production units, Banverket Production, building physical infrastructure.[5] The headquarters were in a tall building with nine floors. Different departments were situated on different floors, and as pointed out by many respondents, the location of a department signaled its hierarchical position within the organization. The general director and her staff were situated on the top floor. The maintenance unit (part of the Operations Division, see figure 3), staffed by the operational personnel, such as technicians, IT operators and programmers, was located on the first floor and in the basement.

The IT functions were at that time divided between two sections, one responsible for operational IT related to the physical infrastructure, and the other responsible for administrative systems (called Banverket ICT) such as a support desk, enterprise systems, and supporting IT-infrastructure. Banverket ICT was a separate profit center and located some 100 km away. Interestingly, as I discovered later in the process, the IT strategist had previously worked in the maintenance department down in the basement. When he transferred to the new position, he also moved up (literally) and became the first one with an IT-related position located at a higher floor in the headquarters (level four, together with the marketing unit). The IT strategist was also the first employee with IT competence to be included in the Director-General's board. To me, this signaled that IT was largely considered a functional resource that could, and should, be

[5] Banverket Production and its 3 500 employees were subsequently privatized at the end of the 2009/10 year and became part of Infranord AB (a state-owned company with competence in building and maintaining railroads).

aligned retrospectively during the implementation of business-related decisions and had weak connection to strategic concerns.

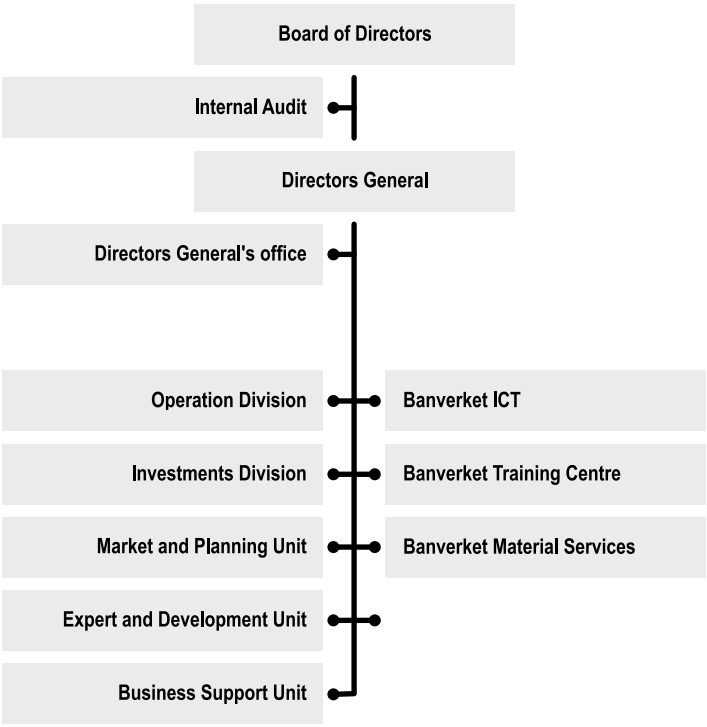

Figure 3. Organizational chart of the Swedish Railroad Administration.

For two years (2008 to 2010), I spent two weeks a month moving between the maintenance division in the basement and marketing division on the 4th floor, tracking different IT initiatives within the organization. This process enabled me to gain trust among the employees in the organization, and deep contextual knowledge. I discovered that the organization had little inhouse IT competence since most of the IT staff were consultants employed in projects, which lasted 1-5 years, and when the projects finished the consultants left the organization. This resulted in lack of cohesiveness among the employees, discontinuity in the projects, and loss of IT-related competence and knowledge. At the time, SRRA was under pressure from state officials to increase its customer-orientation and

improve its IT services. This pressure amplified tensions between the marketing division on the 4th floor and maintenance division in the basement. The tensions mainly stemmed from the assumptions that the IT staff and technicians did not understand the business side of the organization, and the marketing staff did not understand IT. While these assumptions exaggerated the lack of understanding of the 'outsiders', there was some truth in them. Actors working on technology-oriented tasks often demonstrated low degrees of interest in, and understanding of, business-oriented aspects of projects, and vice versa. It became increasingly clear to me that the organization was fragmented in two main clusters, one centered around the marketing division, focusing on developing services for STA's customers, and a 'tech' division focused on maintenance of the railroad infrastructure. Two years into the process, I found myself largely investigating the dynamics between these clusters in the organization.

4.1.2 THE ESTABLISHMENT OF STA

On April 1st 2010, STA was established through a merger of SRRA and SRA. The aims were to create synergies across different modes of transport, strengthen regional involvement, increase customer orientation, and achieve efficiency gains. For example, the Ministry of Enterprise and Innovation[6] emphasized that the establishment of STA was "*an important part of the government's ambition to develop a multimodal*[7] *perspective, achieve efficiency gains in processes and create regional participation within the area of transportation.*" STA would "*support innovation and productivity improvements*"[8] and carry responsibility for all long-term infrastructure planning regarding railroad, road, sea, and air transport, as well as for building, operating and maintaining public roads and railroads. The organization has

[6] Näringsdepartementet, 2010, Ny myndighetsstruktur: Trafikverket och Trafikanalys har bildats. Nyhetsbrev. Published 2010-04-16.

[7] Multimodal transport is the transportation of goods or passengers under a single contract, but involving at least two modes of transport.

[8] Trafikverket, 2010, Trafikverket – här börjar resan (broschyr 2010-03-11, s. 5).

approximately 6800 employees, based in its headquarters in central Sweden and six regional offices.

SRA and SRRA shared many similarities. They were both administrative authorities in the transport sector, and had similar numbers of employees, headquarters in the same city, and responsibility for physical infrastructure ranging across the whole of Sweden. However, they also had important differences. SRA had a much more customer-oriented view of IT, a flatter organization with more decentralized decision-making (reflected in the layout of the headquarters), and significantly different customers and relationships with them. For example, in SRRA's final IT strategy document there was clear emphasis on the management's view of IT as a support function. "*SRRA's IT strategy describes on an overall level the management's overall view of how IT support should be managed and developed to effectively support SRRA's operations*" (SRRA's internal IT strategy at the time of the merger in 2010). In contrast, SRA's IT strategy signaled de-centralization of responsibility and emphasized IT's role in improving operations: "*It is the concern of all employees, both managers and employees, to continuously test the opportunities IT provides for efficiency, development and renewal of the business and the road transport system.*" (SRA's last internal IT strategy at the time of the merger in 2010).

Before the merger, there were expectations that SRA could push SRRA and that SRA's more agile and user-oriented approach would be adopted. However, for the first couple of years SRRA's approach came to dominate the process and control was more centralized than in the pre-merger arrangements in SRA. The dominance of the SRRA approach during these years was partly due to an imbalance among personnel in IT-related management positions in STA, most of whom had a background in SRRA. Over time, the pervasive exogenous digitalization became difficult to disregard (see Papers 1 and 2). For example, as customers began to demand real-time traffic data for both railroads and roads to enhance their operations, endogenous responses emerged that started transforming the organization. The transformation included moving from being a traditional maintainer and provider of infrastructure towards a service-oriented and

collaboration-focused partner with a societal responsibility to facilitate development of efficient transport system with long-term sustainability. Synergies between the two modes of transport started to appear as both the exogenous setting and endogenous responses began moving towards multimodality. In this thesis I focus in particular on three aspects of these endogenous responses: (1) digital institutional entrepreneurship, (2) the establishment of a platform, and (3) strategy formation processes and how practice and boundary work carried out by individuals within and outside the organization ultimately transformed STA into a digital institution. Next, I describe these responses in relation to the larger research context and transformation process[9].

4.1.3 ENDOGENOUS RESPONSES

The first endogenous response that I identified was related to entrepreneurial practices. These practices, which rested primarily within a small group of IT specialists, emerged before the merger of the two organizations. I detailed the practices of these entrepreneurs, including opening up windows for innovation, technological disguise, exploiting internal digital resources, mobilizing expertise and technological experimentation through several small-scale pilot projects with external operators. Over time, these pilot projects, transitioned from peripheral and individual entrepreneurial practices towards organizationally sanctioned practices related to radio-frequency identification (RFID) technology. The growing organizational awareness and attention to the project triggered conflicting interests amongst management groups. The conflict mainly involved the maintenance unit and the marketing unit (see figure 4) with a formal responsibility to develop services for STA's customers. The tension between the two units was not new. Rather, it originated in historical differences between the units within SRRA. As many of the managerial positions within STA had been filled by the same persons in the new organization, the conflicting perspectives persisted. To resolve the

[9] Additional details are provided in chapter 5, paper summaries and Papers 1-5.

conflicts, a specific task group (called the RFID-group) that included actors from both units was created in mid-2013. Paper 5 details this process.

The second endogenous response was related to the establishment of a digital platform. By *assembling resources* generated in the earlier stages, the RFID-group was able to translate them into a RFID strategy, a platform, and services. Hence, new institutional arrangements including redefined boundaries and practices could be created. However, this was not a straightforward process. In late 2013, an innovative web service called Lastkajen, was established that offered customers static data[10] from the road and railroad context. Simultaneously, exogenous pressure on STA to provide real-time data increased.

By, the end of 2014, an attempt to integrate real-time rail and road data through Lastkajen demonstrated that this was not a viable option since the service was built for static data. Realization that the current systems did not provide the necessary functionality for combining a wide range of resources and enable service generation led STA to explore alternatives. The resulting endogenous responses came to focus on development of a digital platform that integrated the existing resources for data generation. I detailed the institutional work needed to establish the digital platform for distributing real-time road and railroad data. The digital platform was intended to supply an internal presentation solution for traffic management and outbound connections to train drivers and customers (both for operational data and historical data on train elements that could be used by customers for data analysis). In the beginning of 2017, the platform went live and the customer services were introduced. The release marked the outcome of an emergent digital innovation process in which institutional work changed established boundaries and practices. It also established an institutional arrangement providing foundations for future boundary work and practice work. For example, based on the platform STA is exploring opportunities to increase information sharing with

[10] I.e., data that is not updated due to events during operations.

Danish authorities, a development that is likely to trigger further innovation of processes and digital resources. Paper 3 details this process.

The third focal endogenous response that I studied occurred between 2014 and 2017 and centered around the development of a digital strategy. The digital strategy was the outcome of a series of events involving three digital strategy formation projects that incrementally built on each other (*Strat-one*, *Strat-two*, *and Strat-three*). Strat-one was initiated as key actors in STA perceived a need to respond to exogenous digitalization, and it was intended to leverage external digital competence through a top-down approach. It was managed and coordinated by a globally leading external consultancy firm, and involved a relatively small set of actors in top managerial positions. An important insight from this project was that the strategy formation process needed to involve more actors with diverse skill-sets, experience and positions. Thus, in February 2015, Strat-two was launched with the intention to involve significantly more stakeholders and match organizational needs with technological potential, through a bottom-up approach. The idea was to educate and thereby increase knowledge and awareness of pervasive digitalization and identify daily operational challenges that could be improved by digitalization. Important outcomes included a draft of a new digital strategy, engagement from a large number of actors at various positions in the organization, and realization that the ideas needed to be translated into projects aimed at operational challenges.

In August 2015, Strat-three was initiated to verify the relevance of, and synthesize, candidate focus areas, via iterations between micro- and macro-level considerations of digital strategy. Outcomes of Strat-three included incorporation of the first digital strategy into the organization's national plan for 2018-2029 (however, the digitalization strategy element only covered the period 2018- 2021). The strategy described how digitalization would contribute to the transport system's development to meet societal challenges. It also provided an assessment of associated requirements and a rough estimate of the costs of implementing the suggested digital strategy (2.7 billion Euros). The digital strategy documentation emphasized that

new ecosystems will require new business and security models, technical platforms and methods for creating solutions. It also explicitly stated that STA would not be able to leverage digitalization of the transport system without close collaboration with cross-sectional actors. A formal decision to adopt the digital strategy was finally taken in 2017. Paper 4 provides fine grained analysis of this digital strategy formation process. During the course of this study it became apparent that STA staff no longer consider themselves as merely builders and maintainers of transportation infrastructure. Instead, they have a broader mission as urban developers with responsibility "…to leverage digitalization possibilities to address societal challenges" (field notes).

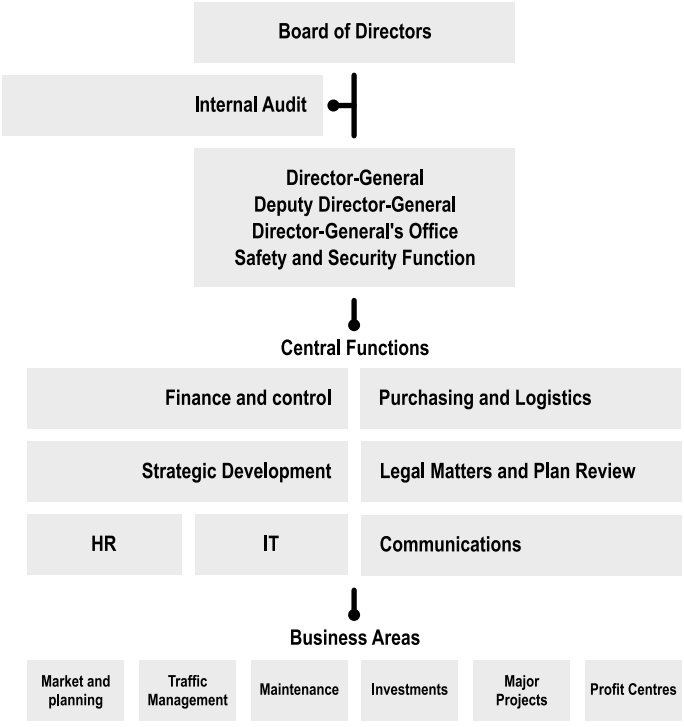

Figure 4. Organizational chart of the Swedish Traffic Administration.

4.2 DATA COLLECTION

A fundamental assumption in this thesis is that digital transformation of institutions emerges from interactions between digital technology and activities carried out by human actors within social structures (Markus and Robey 1988). To explore how such processes unfold, I collected data through a longitudinal qualitative case study carried out with an interpretive approach (Walsham 2006). Qualitative research seeks to understand interactions between people, actions and characteristics of both the social and cultural context (Myers 2009). Applying this approach allowed me to study social aspects such as practices, norms, cultural-cognitive influences and political aspects that are difficult to quantify (Myers 2009). While different ontological positions co-exist within the umbrella of interpretive approaches (e.g., Mingers 2004; Walsham 1995), they are all based on the epistemological assumption that "*our knowledge of reality, including the domain of human action, is a social construction by human actors*" (Walsham 2006, p. 320). This epistemological assumption has implications for the roles of both theories and data. Theories in this perspective are sense-making devices (Walsham 2006; Weick 1995), while data "are really our own constructions of other people's constructions of what they and their compatriots are up to" (Geertz 1973, p. 9).

I collected data in three phases covering nine years, from 2008 until 2017. While my focal concern evolved across the phases, it consistently centered on socio-technical aspects of the emergent nature of digitally induced change. Further, in all phases I was interested in the relation between micro- and macro-level change.

Across these phases, my level of involvement increased as I gained increasing access to central groups and activities in the organization. By level of involvement I refer to a distinction Walsham (2006) made between the 'neutral observer' on one end of a spectrum and an action researcher who seeks to actively and consciously change things at the other. Importantly, neutral does not refer here to unbiased or unaffected by background, knowledge and prejudices, but rather how the researcher is perceived by people in the data collection setting. Close involvement brings

advantages in terms of access, and enables rich observation of actions rather than only acquisition of expressed opinions and descriptions. However, according to Walsham (2006) it also has several disadvantages. It is more time-consuming, and subjects might perceive the researcher to have an interest in certain chains of events, and thus be less honest. There is also a risk of being socialized and losing the outsider perspective.

As my involvement increased, I reflected on these issues. I did indeed gain rich access to the setting and was able to collect vast amounts of data. For example, in addition to the data described in Table 5, I conducted around 60 additional interviews that were never used as they did not directly relate to the topics discussed here. The rich access also allowed me to verify my understanding of the data through workshops and seminars. One of my approaches to address the potential problems was to seek to provide arenas for interactions among groups, rather than steering the content of these interactions. Another approach was to iterate between periods of deeper involvement and periods of withdrawal from the organization.

In the first data collection phase (2008-2010) (see Table 5), I started out collecting data through 'chain referral' sampling (Biernacki and Waldorf 1981), exploring how SRRA was using digital technologies and how it could potentially improve operations. Later, I focused mainly on specific technological solutions and how they could affect inter-organizational relationships. In particular, I studied customers' need for real-time data in general and particular use-cases to understand how access to such data could potentially affect their operations. In addition, I followed small-scale projects on the use of RFID technology for providing (for example) information on the status and positions of both trains and specific wagons. Most of these projects involved the technicians (see Paper 5), managers in the marketing and maintenance units, and customer organizations (e.g. train operators, maintenance companies, industrial industries). During the later stage of this phase, many of these initiatives were halted as individuals perceived a great deal of uncertainty regarding the future due to the merger. Accordingly, most interviews came to address this organizational unrest in one way or another. For me, important outcomes of this phase included a

richer understanding of the technical infrastructure, use of digital technologies, and how they were deeply connected to organizational structures and challenges. This phase ended with the merger of SRRA and SRA resulting in establishment of STA, mainly because it became very challenging to access persons in the organization since they were highly occupied with the change process.

The second phase (2011-2013) was characterized by the merger and continued integration of what was previously SRRA and SRA, and increased focus (by both me and STA) on service development. After the merger in 2010, there was greater uncertainty regarding the organization's identity and structure. Since management was pushing to increase attention to customer value, issues such as the customers' identities and needs, and STA's position (actual and ideal) in the value chain, constantly resurfaced. During this phase, my data collection activities largely revolved around RFID technology, business-oriented service development, and platforms. In many ways, this was a result of the initial technology-oriented projects becoming more mature, and receiving more attention both within the organization and externally. The shift in focus was also spurred by the organizational initiatives to increase customer-orientation and the realization that existing platforms did not provide the necessary functionality.

I continued to follow the work of the technician and his team through a more distanced approach and track their activities by interacting with them roughly once every three months. Do you mean, 'However, during this phase I also sought to study managerial perspectives on digital technologies generally, and particularly their potential to provide operational improvements, affect STA's optimal organizational structure, and views on openness (e.g. data sharing internally and externally). Accordingly, my data collection activities involved interaction with a broader spectrum of actors (including people engaged in all business areas except profit centers and all central functions except Finance & Control and Purchasing & Logistics, see organizational chart in Figure 4). As I probed these phenomena, I realized that many of the challenges I perceived were grounded in larger

organizational issues. As I gained opportunity to work closely with a manager involved in strategic development and follow his work related to digitalization, I transitioned into a new phase of data collection.

In the third phase (2014-2017), the data collection mainly centered around strategic initiatives that eventually resulted in the digital strategy. In particular, I was involved with the Strat-one, Strat-two and Strat-three projects. I still followed the development of the RFID technology, mainly through interviews and interactions with the RFID group (described in the previous section). In particular, I tracked development of a digital platform aimed at leveraging the data generated through RFID technology and other sources (described in Paper 3). However, most of the data collection activities focused on the digital strategy formation process (Strat-one to Strat-three, see Paper 4) and new ways of organizing that leveraged digital technologies. I actively participated as an involved researcher by providing feedback on the work of the large consultancy firm, and informing managers about relevant research findings on digital strategy (via, for instance, presentations of information gleaned from the literature and arranging workshops). I also identified operational challenges where investments in digital technologies could generate significant benefits, through interviews, analyzing output of R&D projects based on archival data, and providing input during prioritization of R&D projects (for details, see Paper 4). In this phase, the sources of data also included respondents and diverse internally and externally generated documents. Table 5 provides a summary of the data collected across these phases.

Table 5. Data overview

Data Source	***Cycle Phase 1 (2008-2010)***	***Cycle Phase 2 (2011-2013)***	***Cycle Phase 3 (2014-2017)***	***Total***
Interviews	63	24	79	166 interviews (146 h) - average ≈ 53 min - 98 respondents
Participant observations	67	45	59	171 (total 1297h) - 84 onsite observations - 10 field visits with customers involved in RFID-projects - 18 workshops - 55 project meetings - 1 Board of directors meeting - 1 Steering committee meeting - 2 Full-day seminars
Archival data	- Technical specifications - Presentations - RFID presentations - Annual reports - Project descriptions - Project reports - Drafts of digital strategy documents - Summarized interviews from the consultancy firm - R&D project descriptions and evaluations			

4.3 DATA ANALYSIS

Before outlining my approach to interpreting the data collected in the case study, I would like to clarify how the theoretical framework grew during the course of the research and its role in the data analysis. As mentioned earlier, I was able to gather a lot of data and to observe the context of SRRA and later STA. During these years, my perspective and understanding of the role of digital technologies in the organization evolved through iterations between empirical events and theory. Thus, the theoretical framework presented in the summarizing chapters is a product of a longitudinal understanding of a phenomenon, rather than an initial

lens. Initial theoretical understandings (described in Papers 1-5) provided direction in an emergent process through which they were either refined or abandoned. Overall, this approach resembles Walsham's (1995) analogical description of initial theoretical preconceptions as scaffolding that is removed once it has served its purpose and enabled progress. Considering initial theoretical conceptions as tools for guidance enabled analysis with openness to the data and revision of my initial assumptions (Charmaz 2006; Walsham 1995).

While the collection and analysis of data are described separately, due to the longitudinal nature of the studies, and in line with the principle of abstraction and generalization (Klein and Myers 1999), I iterated between the two activities throughout the process. Myers (2009, p. 165) describes the recursive relationship between collection and analysis of data well:

"*from a hermeneutic perspective it is assumed that the researcher's presuppositions will affect the gathering of the data. The questions posed to informants will largely determine the answers that you get. The analysis will affect the data and the data will affect the analysis in significant ways. Therefore, it is somewhat simplistic to think of the data analysis as distinctly separate from the data gathering phase. Often there is some iterative activity between the various phases in a qualitative research project.*"

Moving between data collection activities and analyses allowed me to take advantage of the increased understanding that grew from iteration between theoretical and empirical insights throughout the process. For example, when I started this journey I was influenced by the theoretical notion of sense-and-respond (Haeckel 1999), literature on RFID implementation (Floerkemeier and Lampe 2005), and process innovation (Davenport 1993; Mooney et al. 1995). I later moved towards the literature on IT infrastructure development (e.g., Ciborra 2000; Hanseth and Lyytinen 2010) and digital innovation, and explored the service-dominant perspective (Lusch and Nambisan 2015). These are some illustrative examples of how my theoretical framing evolved over time.

For much of the data analysis, NVivo qualitative data analysis software was used. Details of specific data analysis iterations are described in the

appended papers, but the general approach is summarized here. The first step in the analytical rounds was inductive analysis through open coding (Charmaz, 2006). By working through the data, I familiarized myself with it and started to make sense of it (Braun and Clarke 2006).In some cases, the familiarization included transcription, and in others detailed reading of the transcripts and documents. I then imported the data into NVivo and coded all the material considered relevant. Secondly, based on the output from the first step, I spent considerable time iterating between the descriptive concepts identified in the previous step and the literature (Klein and Myers 1999) to make sense of the concepts. In this step, the objective was generally to relate specific insights to larger bodies of research, and identify research streams that could facilitate understanding of the data and for which my findings could provide useful contributions.

Finally, in a third step, I leveraged the insights gained in the first two steps to engage in focused coding in order to create and try out categories that captured specifically important codes, or aggregated them (Charmaz 2006). In this step I developed my conceptual understanding, compared the results extensively with concepts expressed in published literature, and revised it. I used two approaches in this third step. In studies reported in Papers 1 and 2, I sought to describe and understand the current status of the focal phenomena. In studies reported in Papers 3-5, I sought instead to understand the process through which events and practices unfold and cumulatively lead to outcomes. Based on such temporal analyses, I identified phases demarcated by relative continuity within phases and discontinuities at their borders (Langley 1999).

The specific analyses conducted throughout the process revealed cycles of change and stability. Thus, inspired by Miles and Huberman (1994), I revisited the analyses based on the theoretical framework described in Chapter 3 to address the research question in more detail and formulate, then conduct, a meta-, cross-case analysis. In analyzing digitally induced change at STA, I noted that shifts from institutional stability to change were associated with periods in which boundary work and practice work

related to digital innovation caused unrest and conflict. The output of this analysis is presented in the Discussion (Chapter 6).

5 SUMMARY OF PAPERS

This chapter summarizes the appended papers in terms of area of concern, theoretical framework, investigated problem, unit of analysis, and contribution. Table 6 provides an overview of these aspects.

Table 6. Overview of the papers

	Paper 1	***Paper 2***	***Paper 3***	***Paper 4***	***Paper 5***
Area of concern	Effects of digital technologies on business process innovation	Sensor technology implementation	Digital platform establish-ment	Digital strategy formation	Digital institutional entrepreneur-ship
Research question /aim	Exploration of sensor technology implement-tation, affected processes, and outcomes	Exploration of effects of different middleware approaches when implementing sensor technology	How is institutional work involved in the combinatoria l innovation processes underlying digital platform emergence?	How do organization s foster institutional work practices for digital strategy formation?	What are the practices by which digital institutional entrepreneurs engage in transformation al change of institutional arrangements?
Theoretical framework	Business process innovation	Sensor technology and business innovation	Digital innovation and institutional work	Digital strategy and institutional work	Institutional entrepreneursh ip and institutional work
Unit of analysis	The RFID implementati on process in five of STA's customer organizations.	The RFID implementation process in two of STA's customer organizations.	STA's internal process to establish a platform.	STA's digital strategy formation process	Digital institutional entrepreneurs in STA
Contributi on	Illustration of how business value is achieved as automational, informational, and transforma-tional effects, identification of three	Description of the importance of integrating business and technologic al perspective s, loose	Demonstr-ation of the role of digital malleability in bypassing institutional resistance. Identification of temporal patterns including	Empirical account of strategizing across three phases marked by distinct approaches to integrating business and digital	Identification of specific institutional work practices related to digital technologies. Illustration of how micro-level digital institutional entrepreneurship can lead to macro-level outcomes, and

major inhibitors: insufficient integration; lack of organization-al adjustment; and uneven distribution of cost/benefits.	coupling in the architecture, and emphasizing early exploitation to enable later exploration.	dependencies of activities, and distinct emphases in types of institutional work across phases.	competences. Identification of sequence of work practices. Demonstration of the cumulative nature of digital strategy formation.	distribution of agency.

5.1 PAPER 1

Stenmark, Dick and Jadaan, Taline, (2010). **"***Enabling Process Innovation through Sensor Technology: A Multiple Case Study of RFID Deployment.*" Paper presented at the European Conference on Information Systems.

Keywords: Sensor technology, Business process innovation, Boundary spanning, RFID.

The advances in digital technologies witnessed in recent years have enabled organizations to digitize much of the work that previously was carried out manually or supported by only analogue tools. As this development continues, digital technologies are likely to have increasingly profound impacts on organizations and their capacity to innovate. This paper contributes to the study of effects of sensor technologies on business process innovation by reporting a multiple case study of five Swedish organizations using sensor technology. Understanding sensor technology as a boundary spanning technology, we studied in particular the purpose of introducing Radio Frequency Identification (RFID), the intended effects on process innovation and what business processes were affected.

In this paper, my co-author and I contribute to the study of sensor technologies' effects on business process innovation by reporting a multiple case study of five of STA's customer organizations using sensor technology. We illustrate how business value from sensor technology is realized as automational, informational, and transformational effects and how they affect both operational and management processes. While the

automational effects are easiest to detect and assess, the transformational effects are likely to have the strongest and most profound impact on the organization. However, such impact is seldom immediately realized, partly due to the three major inhibitors we identified: insufficient integration with existing systems, lack of organization adjustment and uneven distribution of cost/benefits. All these aspects require further academic elucidation.

5.2 PAPER 2

Jadaan, Taline and Stenmark, Dick, (2010). "*Integration for innovation: Studying the role of middleware in RFID applications.*" Paper presented at the American Conference on Information Systems.

Keywords: Sensor technology, Middleware, RFID, Business value, integration, Innovation, Digitalization.

Sensors (more specifically, digital electronic sensors) can provide increasing possibilities for innovations (Lindgren et al. 2008), but they also typically generate more data than organizations can effectively handle. Therefore, organizations utilize various sorts of middleware components to help them reduce and process the data (Floerkemeier and Lampe 2005). However, although this is not a trivial process, the role of the middleware has received little attention from IS scholars. Moreover, literature in related fields describes the data filtering and aggregation involved in a rather superficial and unreflective manner. This paper contributes to the business innovation literature by analyzing two organizations' use of different middleware approaches when implementing sensor technology.

My co-author and I conducted an interpretative multiple case study of two organizations, focusing on how different middleware architecture approaches affect the utilization of sensor technology, particularly RFID technology. We obtained five interesting findings. First, sensor technology can digitize and automate previously manual routines, but the received value of this process alone is often limited. Second, the possibility for downstream exploitation, and thus innovation, is inhibited when sensor data are too rigidly packaged. Third, organizations should have a clear

strategy or vision regarding the desired business benefits when filtering and aggregating sensor data. Fourth, to enable innovative business solutions, organizations should combine sensor data with business application data. Fifth, and finally, when utilizing sensor data, organizations should prioritize exploitation over exploration since it enables them to obtain business innovation.

5.3 PAPER 3

Jadaan, Taline, (2019). "*The Role of Institutional Work in Platform Establishment: An Investigation of Digital Innovation Practices for Creating, Maintaining and Disrupting Institutions.*" Presented at the 52nd Hawaii International Conference on System Sciences.

Keywords: Institutional work, Platform emergence, Digital innovation, Digital platforms, Recombinant innovation.

While the significance of digital platforms for contemporary organizations has been demonstrated both in theory and practice, how they emerge is less well understood. In this paper, I argue that one source of digital platform emergence is the recombinatorial digital innovation and institutional work that individuals engage in.

I report a longitudinal study of the emergence of a digital platform at STA. I analyze how the search for useful resource pairing led to multiple cycles of institutional processes for creating, maintaining and disrupting institutional arrangements. I draw on the theory of institutional work to empirically examine how innovation processes unfolding over 10 years led to the emergence of a digital platform in the STA. I identify three phases in the process with distinct emphasis, scope and scale: exploring and customizing available resources, collaborating on standards, and platform realization. I find that actors engage in work aimed at creating, maintaining and disrupting socio-technical structures. These work practices involve exploration of possibilities of specific digital resources, their combinatorial options, and how new resources can be generated.

The analysis contributes to the literature on digital platforms by: (1) demonstrating the role of digital malleability in bypassing institutional resistance, (2) identifying temporal patterns and dependencies of activities, and (3) detecting distinct emphases in types of institutional work.

5.4 PAPER 4

Jadaan, Taline, (2019). "*Digital Strategy Formation: Fostering New Institutional Work Practices.*" Presented at the European Conference on Information Systems.

Keywords: Digital strategy, digital strategy formation, institutional work, strategizing.

Pervasive digitalization is challenging established organizational modes of forming strategies. Both theoretical and empirical accounts detail how digital strategy involves a shift in foundational assumptions. Specifically, it includes moving away from perceptions of information technologies as important, but functional, resources used to achieve business goals. Instead, scholars (e.g. Bharadwaj et al. 2013; Peppard et al. 2014) have argued that digital strategy needs to be grounded in a synthesized perspective where strategies for organizational goals are both formed and executed by leveraging digital resources. While multiple studies detail the underlying rationales for this shift, what a digital strategy is and how it is formed have received less attention.

Based on an interpretative case study at STA, I draw on the notion of planned and emergent strategy formation to analyze how the distributed agency and blurred boundaries induced by digitization are harmonized with organizational governance requirements in a 2-year long strategy formation process. I provide an empirical account of strategizing across three phases. These phases were marked by distinct approaches to balance and integrate business and digital competences. I identify distinct work practices aimed at creating new institutional arrangements in the three phases. The analysis demonstrates the cumulative nature of digital strategy formation and how organizations may develop capacity for strategizing over time. Specifically, it demonstrates how involving a broad set of actors with distinct

competences enables pairing deep understanding of problems and solution.

5.5 PAPER 5

Jadaan, Taline, and Selander, Lisen "*Digital Institutional Entrepreneurship.*" (under review by an international journal).

Keywords: Digital institutional entrepreneurship, Institutional work, Distributed innovation agency, Digital innovation.

Like many organizational phenomena, digitization has led scholars to suggest that the very nature of entrepreneurial processes has changed (Nambisan 2016). The information systems (IS) literature widely recognizes the role of digital technology and digital innovation in instigating institutional change (Essén and Winterstorm Värlander 2019; Svahn et al., 2017; Selander and Jarvenpaa, 2016). Less is however known about the role of digital technology in entrepreneurial practices and work. Prior research on digital entrepreneurship (Beckman et al., 2012; Zupic, 2014) has by large focused on technology as merely a context for entrepreneurial practices and work (e.g., Bingham and Haleblian, 2012; Vissa and Bhagavatula, 2012) in technology-intensive environments (including digital technology). Only limited effort has been made to theorize the role of digital technologies in shaping entrepreneurial opportunities, decisions, actions, and outcomes (Henfridson and Yoo, 2014; Nambisan, 2016). In fact, scholars have argued that "*research in entrepreneurship has largely neglected the role of digital technologies in entrepreneurial pursuits*" Nambisan (2017, p. 2). Against this backdrop, we explore the following research question: *what are the practices by which digital institutional entrepreneurs engage in transformational change of institutional arrangements?*

In exploring this research question, this paper addresses draws on an interpretive longitudinal qualitative case study of a nine-year long process of digital institutional entrepreneurship at the STA. The paper provides three implications. First, it reveals three phases with distinct forms of institutional work practices that the digital institutional entrepreneurs engaged in. Phase one revolved around creating political opportunity

structures by mobilizing expertise and technological experimentation. Phase two focused on resourcing through technological disguise and exploiting existing digital resources, Phase three was characterized by disrupting existing arrangements and creating new ones. It involved navigating associated conflicts through practices such as disclosing technological functionality and contesting managerial frames. A second implication is displaying how micro-level practices carried out by digital institutional entrepreneurs translate into macro-level transformational change of institutional arrangements. Third, the analysis demonstrates how characteristics of digital technologies enables a distribution of agency, and thus enable new types of actors to participate in digital institutional entrepreneurship.

6 AN EMPIRICAL ILLUSTRATION OF DIGITALLY INDUCED CYCLES OF CHANGE AND STABILITY

In this chapter, I provide a meta-analysis illustrating the process at STA through which digitally induced cycles of recursive boundary work and practice work triggered transitions between institutional change and stability (Zietsma and Lawrence 2010). It is based on previous analysis of exogenous digital change as reported in Papers 1 and 2, and the three endogenous responses to such changes (platform development, digital strategy formation, and digital institutional entrepreneurial processes). This meta-analysis does not introduce new empirical data but provides an overview of the overall transformational change at STA towards becoming a digital institution.

I draw on the work of Zietsma and Lawrence (2010) to understand the role of digital technology in transformational change (Thornton et al. 2012) of institutions – leading to what I refer to as digital institutions. As explained in Chapter 3, Zietsma and Lawrence (2010) describe how institutions transition between cycles of institutional stability, institutional conflict, institutional innovation, and institutional re-stabilization. Furthermore, they identified sets of endogenous and exogenous transition conditions that all circled around (1) the status of boundaries and (2) core practices, and (3) the presence of actors with both motivation and capacity to engage in boundary work and practice associated with the following cycle.

In my conceptualization I particularly emphasize the role of digital innovation (i.e., innovative digital technology applications[11]) as triggering cycles of institutional change and stability. I also state that such cycles are continuous, as illustrated in Figure 5. Importantly, the characteristics of digital technology enable distinct innovation patterns, such as blurred

[11] In the term `applications´ I include not only end-user technology but also examples such as hardware improvements. My perspective is influenced by Arthur's (2009) conceptualization of technology as arising and evolving through new combinations that emerge from the collection of previous ones (combinatorial evolution).

boundaries between participating agents, and blurred boundaries between processes and products (Nambisan et al. 2017). Accordingly, with digital technology, boundary work and practice work can generate effects much more rapidly and involve much wider sets of actors than previously, and both the work and outcomes are strongly influenced by the rapid unfolding of digital innovations in the exogenous environment. I illustrate how I derived these thoughts by providing an overview of the transitions between institutional stability and change at STA in the following text (see Figure 5).

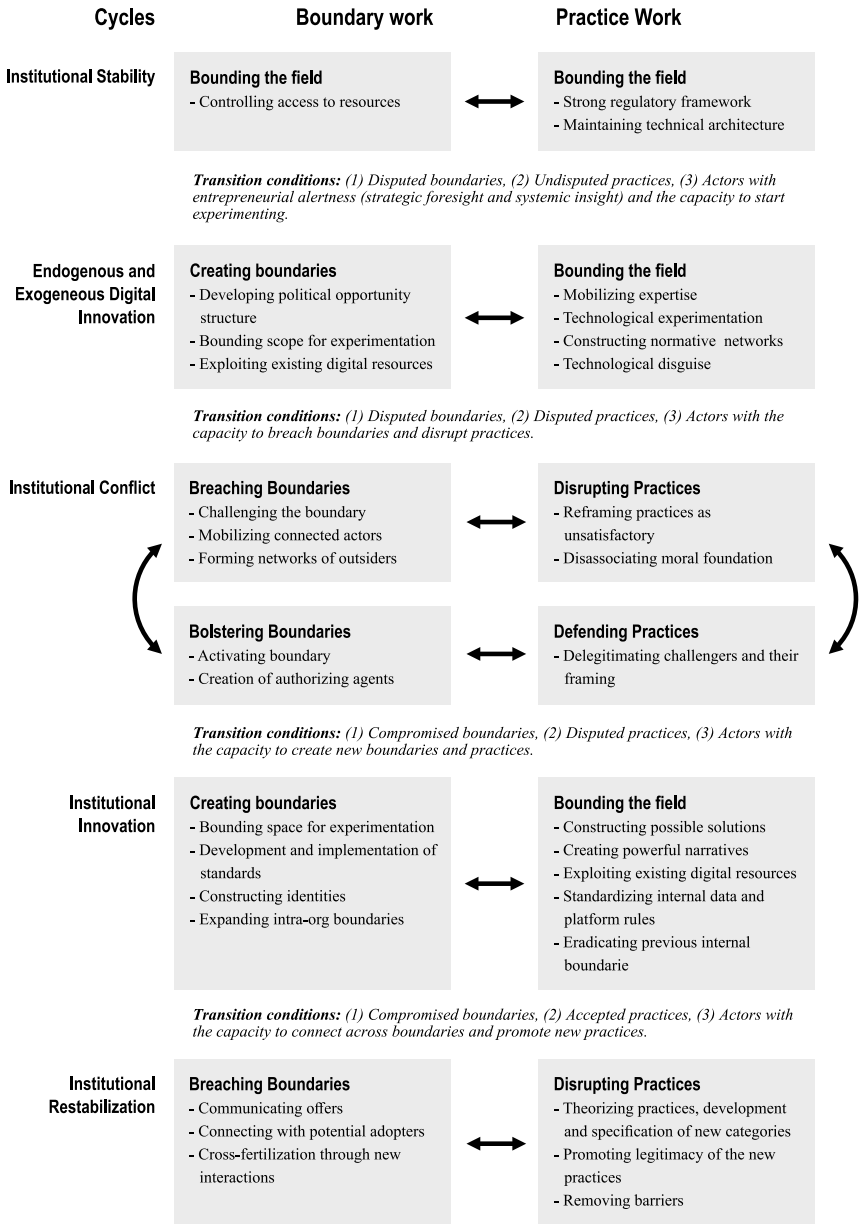

Figure 5. Boundary work and practice work triggering institutional change and stability in STA.

First Cycle: At STA, the transition from *institutional stability* to cycles of *endogenous and exogenous digital innovation* (2009-2012) was triggered by disputed boundaries regarding data sharing (see Papers 3 and 5). External actors wanted to access real-time data to improve their operations and maintenance processes. A few technologically skilled individuals engaged in this discussion and triggered a first cycle of exogenous and endogenous digital innovation.

The entrepreneurial alertness (Sambamurthy et al. 2003) and practices of these entrepreneurs (as detailed in Paper 5) played key roles in starting STA's digital transformation journey. They realized that data-sharing required the standardization and processing of new datasets generated through a multitude of new technologies and applications. The boundary work here focused on creating new boundaries as the entrepreneurs engaged in activities that stretched inter-organizational arrangements. It involved developing political opportunity structure, bounding scope for experimentation, and exploiting digital resources. Since the practice work was largely unsanctioned, and thus preferably kept disguised, entrepreneurs sought to bound the field. They mobilized expertise, carried out technological experimentation, constructed normative networks and engaged in technological disguise.

For example, without the awareness of higher-level management, the entrepreneurs mobilized expertise in the particular technology (RFID), and developed political support by involving a few selected existing customers and other stakeholders. Furthermore, they bounded the scope for experimentation by keeping the number of external organizations involved low and limiting the scale of projects. The initial lack of internal visibility enabled the entrepreneurs to start experimenting with sensor technology and exploit existing digital resources[12]. However, to provide involved external actors with the desired real-time data, the entrepreneurs had to reshape existing arrangements. Thus, they started disrupting practices and boundaries by mobilizing technological expertise (developers and RFID

[12] *Exploiting internal digital resources* and *technological disguise* practices that are elements of the mimicry form of work in creating institutions (Table 2).

consultants) and in disguise experiment with new and existing technology. For example, they tested and customized solutions by adding functionality to existing technological communication systems (OUT/IN[13]) and carried out RFID evaluations during their spare time. Furthermore, the entrepreneurs started constructing normative networks[14] that extended beyond the organization (e.g., in the Freightwise project).

Transition to the second cycle was promoted by the increases in capacity key actors had acquired to breach boundaries and disrupt practices.'

Second Cycle: The cycles of *institutional conflict* (2013-2014) involved clashes between institutional work to create and disrupt on the one hand, and maintain on the other. Creating involved boundary work such as breaching boundaries by promising new services (challenging boundaries), mobilizing connected actors through formation of interest groups exploring the potential of new sensor technology solutions, and forming networks of outsiders to create a shared European RFID rail standard (see Papers 3 and 5). Disruptive work was largely aimed at practices as the institutional entrepreneurs carried out activities to undermine assumptions and beliefs through reframing existing data provision practices as unsatisfactory. Furthermore, entrepreneurs sought to disassociate moral foundations regarding STA as not providing services, nor using RFID technology.

Resistance included maintaining boundary work as actors sought to bolster boundaries by activating enforcement through policing and creating authorizing agents (e.g., banning all new RFID projects, monitoring the behavior of entrepreneurs, and assigning auditing responsibility to the newly formed RFID group). Furthermore, maintaining type practice work included defending practices by delegitimating challengers and their

[13] OUT/IN was a system for exchanging traffic data (e.g., timetables) with customers. The idea was that OUT/IN would provide the first digital resource needed to communicate RFID data to customers.

[14] Defined as "the interorganizational connections through which practices become normatively sanctioned and which form the relevant peer group with respect to normative compliance, monitoring and evaluation" (Lawrence and Suddaby 2006, p. 224-225).

framing through questioning the validity of STA, as a governmental agency, providing services.

These conflicts caused STA decision-makers to act. In order to deal with compromised boundaries and disputed practices, division managers decided to allocate responsibility and mandates to create new boundaries and practices to a group of actors from the affected units (mainly marketing and maintenance). Establishing boundaries and practices regarding the development of new approaches to sensor technology, and related data processing and distribution, enabled a transition into cycles of institutional innovation.

In parallel, multiple similar cycles of institutional conflict unfolded within STA. For example, top managers engaged in work to maintain practices regarding strategy formation. They conducted enabling work that would support the institutional arrangements (e.g., diverting resources to external consultants that would support selected managers, see Paper 4) as they sought to introduce certainty into the existing top-down approach to strategy formation. However, these activities (e.g. Strat-one, see Paper 4) led to unexpected outcomes as they came to include substantial creating work such as advocacy, defining, changing normative associations, theorizing and educating. As a result, the intra-organizational boundaries regarding the strategy formation process were heavily questioned and cycles of institutional innovation occurred regarding strategy formation as well.

Third Cycle: As STA transitioned into *institutional innovation* (from late 2014 to 2016), both boundary work and practice work were mainly aimed at creating new organizational responses. For example, the RFID group bounded the space for experimentation around the establishment of a platform. In doing so, they gathered and leveraged the scattered insights generated in the previous cycles. They also expanded the formalized intra-organizational boundaries by creating relationships internally, and started to construct novel identities (e.g., defining relationships between STA and external actors, and establishing the role of STA as a data provider). Bounding the experimentation space also enabled the group to exploit

existing digital resources and standardize internal data generation and processing into digital platform rules, what Lawrence and Suddaby (2006) describe as defining. The most salient sign of boundary work in this cycle was the creation of the new digital platform.

Practice work in this cycle centered particularly around internal effects of the platform establishment and strategy formation processes. These processes were largely aimed at eradicating previous internal boundaries, and thus creating new practices. Standardizing internal data and rules associated with the platform involved the creation of shared practices across multiple units and expansion of intra-organizational boundaries. Thus, it sharply contrasted with the work centered on boundaries around digital institutional entrepreneurship, which was largely focused on creating boundaries in relation to external actors. Similarly, adopting a decentralized approach to the strategy formation process expanded intra-organizational boundaries that previously restricted participation. It involved creation of new practices and narratives, and construction of possible solutions in terms of both organizing the process and implementing outcomes. The changes in the strategy formation process centered on adapting the practices by switching focus to selecting ideas, rather than forming them (changing normative associations and normative networks), e.g., by involving stakeholders with diverse perspectives, and capturing opinions from a multitude of stakeholders throughout the organization. The aim was to construct a new identity and educating actors deemed relevant to create possible solutions.

The acceptance of new practices and presence of a group of actors with the capacity to create new boundaries and promote new practices enabled transition into institutional restabilization.

Fourth Cycle: During *institutional restabilization* (2016-2017), actors sought to stabilize the new external boundaries and practices by breaching the existing boundaries and disrupting practices. Breaching boundaries involved publicly communicating the new platform offering and digital strategy, connecting with potential adopters, establishing new interactions, and seeking to achieve 'cross-fertilization through new interaction'.

Disrupting practices involved theorizing practices and development, and specification of new categories, promoting legitimacy of new practices, and removing barriers.

For example, breaching boundaries to connect with potential adopters involved arranging meetings with prospective platform users, and describing and encouraging participation in the initial projects related to the digital strategy. The strategy formation process activities sought to achieve 'cross-fertilization through new interactions.' This process involved a large and diverse group of internal actors, and key aims were to identify intersections between organizational goals and the potential of digital resources, then realizing the digital strategy by achieving synergies between planned and emergent strategizing. It involved multiple iterations in which drafts of a formal digital strategy were presented, feedback was sought, and efforts were made to identify projects that would contribute to its stated goals.

The new practices were promoted by theorizing practices through sense-making of digitalization in relation to operations by engaging actors in activities such as workshops, seminars, meetings, and R&D projects. Promoting legitimacy involved publicly announcing prioritized areas (e.g. the strategy and platform), but also internally communicating their prioritization, and linking them to overarching organizational goals. Removing barriers included appointing managers with responsibility and mandates to implement new practices, sharing experiences on ways to remove barriers to adoption, and allocating resources.

By the beginning of June 2016, the first digital strategy was incorporated into the organization's national plan for 2018-2029. However, the digitalization strategy element only covered the period 2018-2021. It described how digitalization would contribute to the transport system's development to meet national objectives for the sector and important societal objectives. It also provided an assessment of associated requirements and a rough estimate of the costs of implementing the suggested digital strategy (2.7 billion Euros). The document concluded that the overall objective of the digital strategy was to facilitate the provision

and maintenance of a socio-economically efficient transport system with long-term sustainability for citizens and industry throughout the country. Similarly, in October 2016, STA launched a newsfeed on their website announcing that at the beginning of 2017 a web service, enabling identification and positioning of railroad wagons, would be available for their customers. With the help of RFID and detectors, operators would be able to track and trace their wagons, thus enhancing their operational business.

In summary, to cope with digitally induced dynamics, organizations need to foster and bridge exogenous and endogenous digital innovation across cycles of institutional conflict so that they eventually enable institutional innovation. At STA, promising digital innovation projects without strong operational champions were often inhibited by opposition in institutional conflicts (see Paper 5). Despite recognition that digital innovation projects were essential for leveraging digital technology, resistance often killed or retarded projects. Due to rapid change in the exogenous environment associated with a specific technology or process innovation, slowly moving digital innovation projects (even if sponsored) often lost their relevance. In response, new projects were initiated. The outcome was a large number of small projects, very few of which survived long enough to have any substantial impact. While this problem was acknowledged within STA (mainly during the digital strategy formation process, as discussed in detail in Paper 4), it was not easy to solve. The approach STA adopted was to use the new digital strategy as a foundation for embracing innovation, establishing new experimental boundaries around six 'emergent candidates' (promising projects that received large-scale funding), and fostering new practices associated with ensuring institutional support. While the appropriateness of different approaches is highly contextual, finding ways of bridging digital innovation across cycles of institutional stability and change is essential for management in contemporary institutions. In summary, in all my empirical case studies I found that endogenous and exogenous digital innovation challenged prevalent boundaries and practices.

7 DISCUSSION

In this thesis, I explore how the recursive relationship between boundary work and practice work that shape the emergence of digital institutions. The theoretical and empirical investigations provide three main contributions. The first is a reconceptualization of digital institutions as institutions in which regulative, normative, and cognitive pillars, and their carriers, are interwoven with digital technology into an 'assembled mix. Reconceptualizing digital institutions has implications for our understanding of the process through which digitalization shapes and reshapes them. A substantial body of literature has taken a 'digital transformation perspective', arguing that exogenous use of digital technologies generates stimuli for organizations to implement responses. However, this perspective has largely neglected the process through which digital transformation occurs (Vial 2019) and generates new institutions. The theoretically grounded conceptualization provided in this thesis provides a starting point for addressing this gap by integrating the literature on digital transformation and institutional theory.

The second main contribution is that through an analysis of the role of digital technologies in boundary work and practice work the thesis extends theory on institutional change (Zietsma and Lawrence 2010). Extant literature points to the structural changes emerging from digital transformation processes, largely without explicit consideration of how such processes occur (Vial 2019). Through a meta-analysis, I have identified boundary work and practice work associated with exogenous and endogenous digital innovation as a salient trigger of transitions from institutional stability into institutional conflict. By theorizing empirical events unfolding over a nine-year period, the thesis provides insights into how characteristics of digital technologies enable actors to engage in institutional work. In particular, it demonstrates how work to create and disrupt boundaries and practices through use of digital technologies triggers resistance in terms of work to maintain the status quo, and eventually generates institutional outcomes (Lawrence and Suddaby 2006).

The third main contribution concerns the nature of the recursive relationship between boundary work and practice work in the emergence of digital institutions. The analysis demonstrates how attention to the micro-dynamics of boundary work and practice work can help advance research on mechanisms through which micro-level actions translate into transformation. It reveals that blurred boundaries associated with digital technologies (Nambisan et al. 2017) enable external actors to engage in boundary work and thus increase pressure to develop new practices. Furthermore, characteristics of digital technologies provide new means for institutional entrepreneurs with sufficient motivation and technical competence to engage in boundary work and practice work.

At STA there were three particularly salient organizational responses to exogenous digitalization initiatives. These responses centered around: (1) a growing capacity for digital institutional entrepreneurship; (2) the development of digital platforms, enabling coordination of external relationships; and (3) navigation of the changing landscape through a distinct approach and development of a digital strategy. The three organizational responses and their outcomes are covered in Papers 3-5. Importantly, they are not empirically isolated, and do not in any way provide full coverage of the responses to exogenous digital change that occurred at STA. Rather, they were salient in the specific context of STA. Thus, they should be considered as prominent empirical examples, and analytical demarcations, in the aggregated process of shaping and reshaping STA into a digital institution.

7.1 DEFINING DIGITAL INSTITUTIONS

Synthesizing and extending previous work, I define a digital institution as an institution in which regulative, normative, and cognitive pillars, and their carriers, are interwoven with digital technology into an 'assembled mix' (Lanzara 2009; Scott 2014). In an 'assembled mix', or assemblage, loosely structured, dynamic, and varied sets of actors interact and continuously generate shifts in connections and boundaries (Orlikowski 2007). In these socio-technical assemblages, digital technology enables interactions among

actors and shapes their practices by instantiating institutional rules, norms, and meanings (Hallet and Ventresca 2006). Importantly, my criterion for the term digital institution is not the extent to which an institution is codified and upheld by digital technologies. Rather, it is the extent to which the rules, norms, and meanings (which control, constrain, support, and empower activities and actors) in the institution's socio-technical setting are interwoven with characteristics of digital technology. A prominent example of the transformation involved is STA's transition from regarding digital technologies in purely functional terms to considering them foundational elements affecting rules, values, and frames (Scott 2014) for design of strategic and operational arrangements:

"*On 31 August, we submitted our proposal on a national plan for the transportation system in 2018-2029…. The measures in the plan also address six prioritized social challenges: convert to fossil-free fuels, increase housing construction, improve conditions for business, strengthen employment throughout Sweden, use the possibilities of digitalization and create an inclusive society…. But there is still a long way to go until we can be satisfied. We need to continue to develop the operations and the transport system, where the possibilities of digitalization in particular are an important piece of the puzzle. We must therefore make space for innovations and have a courageous approach.*" *(STA, Annual Report 2017)*

As pointed out by Scott (2014, p. 95), carriers must be considered in analyses of institutions since they "*point to a set of fundamental mechanisms that allow us to account for how ideas move through space and time, who or what is transporting them, and how they may be transformed by their journey.*" Furthermore, carriers are not neutral modes of transmission, as they influence messages, how they are conceived, and how they are received. For example, during the colonization of Africa, the nature and reception of colonial ideas depended on whether they were conveyed by missionaries, merchants, or armies (Abernethy 2000). As previously stated, carriers include *artifacts*, *activities*, *relational systems*, and *symbolic systems*.

The design of *artifacts* (including digital technology) is affected by, and can eventually affect, institutional structures. In use, digital technology facilitates and constrains *activities*, for example by promoting certain

interpretive schemes and norms, while suppressing others. These activities are formed by the institutional conditions in which they occur. However, as they are repeatedly carried out over time they also affect the *relational systems*, which are patterned interactions that are related to role systems (networks of social positions). These role systems code rules and beliefs into positional distinctions in governance systems, and incorporate classifications and typifications (e.g. departments and roles). Since digital technologies enable specific interactions, often transcending existing boundaries (Bogusz et al. 2019; Nambisan et al. 2017), they are prone to challenge relational systems. Traditionally, such effects have often been considered at the practice level (e.g., Boudreau and Robey, 2005; Orlikowski, 2007). My findings demonstrate ways through which digital technology reshapes institutional properties and symbolic systems carrying it, such as rules, values, expectations, standards, and schemas. It does so by reinforcing or transforming institutional structures. Similarly, Svahn et al. (2017) found that increased use of digital technologies in the car industry reshaped views of desirable organizational capabilities, expectations regarding temporal boundaries of innovation processes, whom to open access to standards to, and governance systems. Extant research suggests that initial transformation potentially triggers a different pace and pattern of change as digital technologies generally have distinct evolutionary characteristics compared to many other resources (Nambisan et al. 2017; Sandberg et al. forthcoming). My research supports this view by demonstrating that the shaping and reshaping of digital institutions is a continuous, accumulating, and accelerating process.

At STA, a sequential pattern was discerned in the overall digital transformation process, as the focus of digitalization generally progressed across the four types of carriers, from artifacts, to activities, to relational systems, and finally to symbolic systems. In this process, the institutional pillars (regulative, normative, and culture-cognitive) (Scott 2014) were progressively interwoven with digital technologies. For example, Paper 5 illustrates how entrepreneurial activities regarding RFID technology initially centered around technological experimentation and design (artifacts). Later, they involved practices such as 'technological disguise' to

work around existing activity-based carriers, such as monitoring, roles, and scripts. As the entrepreneurial activities triggered clashes with existing relational systems carriers (such as governance systems, authority systems, and identities), the RFID group was formed. The output of the group's work to create new practices and boundaries included a digital platform that embodied new symbolic system carriers, such as rules, standards, and categories (see Paper 3). At the end of this process, the institutional pillars had been substantially reshaped, as particularly manifested in the strategy documents suggesting that digitalization was "*an important piece of the puzzle*" (STA, Annual Report 2017) in STA's mission to address societal challenges.

7.2 DIGITAL INSTITUTIONS AND TRANSFORMATIONAL CHANGE

Digital institutions arise, and are shaped and reshaped, through multiple cycles of digitally induced change and stability (Zietsma and Suddaby 2010). I draw on theory on institutional change to describe how such cycles are triggered by institutional work. In such processes, institutions transition between change and stability as boundary work and practice work to create, maintain, and disrupt clash (Lawrence and Suddaby 2006; Lawrence et al. 2013). This thesis illustrates that digitalization of institutions does not happen in a single, controlled and bounded procedure. Rather, according to initial findings of the underlying studies, it occurs through multiple, emergent, and interdependent processes where outcomes change organizational configurations, which recursively affect other digitalization processes. Thus, the thesis contributes to the literature on digital transformation in general, and theories of institutional change in particular, by providing insights on how these processes unfold in practice (Skog 2019: Vial 2019). The literature has generally focused on the input of transformation processes (e.g., Woerner 2015), output in terms of opportunities for improvement (Gimpel 2018; Karimi and Walter 2015; Matt et al. 2015), or key challenges to be addressed by managers (Piccinini 2015; Westerman and Bonnet 2015). Accordingly, longitudinal studies and empirically grounded insights on the actual process are scarce (Kutzner et

al. 2018). In this thesis, I provide a meta-analysis (see Chapter 6) of the transformational change process. The meta-analysis illustrates and exemplifies how boundary work and practice work drove cycles of digitally induced change and stability.

Zietsma and Suddaby (2010) suggest that a new institutional state can arise from institutional conflicts that are resolved by institutional innovation. As previously pointed out, institutional innovation broadly refers to "*establishing experimental boundaries that [are] protected from institutional discipline and inventing new practices*" (Zietsma and Suddaby, p. 201). They point to boundary work and practice work as the triggers of such conflicts. Here I extend their conceptualization (see Figure 6) by arguing that exogenous (see Papers 1 and 2) and endogenous digital innovation (see Papers 3-5) comprise a specific form of boundary work and practice work that may trigger institutional conflicts.

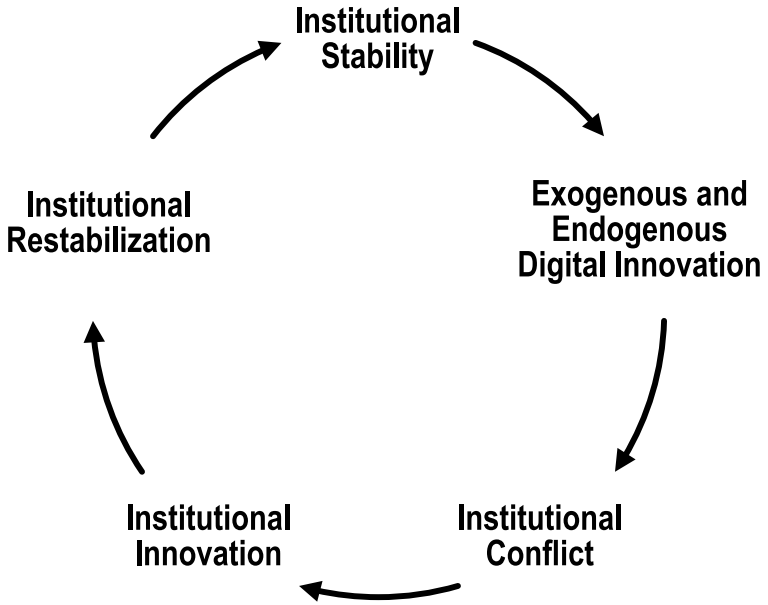

Figure 6. Digitally induced cycles of institutional change and stability.

Since institutions involve various groups and communities with different goals, assumptions, and practices, the interests of the many interacting

subsystems, or logics are prone to clash (Berente et al. 2019). As actors committed to one or multiple subsystems engage in institutional work to create new configurations, they often face resistance as actors guided by the differing perspective of another subsystem engage in institutional work to maintain them. Such clashes are sources of institutional conflict (see Papers 3-5). In this thesis, I argue that digital innovation is prone to challenge institutional stability and is a salient cause of institutional change by triggering institutional conflict.

7.3 DIGITAL INSTITUTIONS AND THE NATURE OF BOUNDARY WORK AND PRACTICE WORK

As already mentioned, the third main contribution of this thesis concerns the nature of boundary work and practice work, and their recursive relationship in digital institutions. The meta-analysis in Chapter 6 demonstrates how attention to the micro-dynamics of boundary work and practice work can help advance research on the mechanisms through which micro-level actions translate into transformation. In particular, it demonstrates that blurred boundaries increase pressure to constantly evolve practices, and that distributed innovation agency[15] (Nambisan et al. 2017) enables institutional entrepreneurs with sufficient motivation and technical competence to engage in boundary work and practice work. Thus, this thesis contributes insights into how the work that individuals carry out translates into, and explains, digital transformation of institutions. This transformation has been largely neglected in most literature, and (particularly) in variance-based models of strategic change (Karpovsky and Galliers 2015; Peppard et al. 2014).

A salient effect of digitalization and the transformation into digital institutions is that organizational boundaries are blurred (Nambisan et al. 2017). Digital technologies are embedded among constantly shifting

[15] Distributed innovation agency here refers to *"an innovation context wherein a dynamic and often unexpected collection of actors with diverse goals and motives—often outside the control of the primary innovator—engage in the innovation process"* (Nambisan et al. 2017, p. 225).

networks of other technologies and are editable, interactive, reprogrammable, and distributable (Kallinkos et al. 2013; Yoo et al. 2010). Accordingly, their usefulness is dependent on dynamic networks of functional relations with other digital technologies. For example, the usefulness of a sensor is dependent on functionality to communicate with designated processing units, data transmitted from other sensors, the functionality of the specific software used to analyze data, the services through which analyses are communicated, contextual aspects of the use situation etc. (see Paper 3) (Fleisch and Tellkamp 2006). Such connectiveness greatly increases potential amounts of relationships and potentially new types of interactions (Parker et al. 2017; Tanriverdi et al. 2010). These relationships often involve both technical dependencies and the interwoven value creation processes (Peppard et al. 2014) and legitimacy. The malleability of digital technologies also disperses control over their design (Kallinkos et al. 2013). For example, external actors can adapt the functionality, develop complementary functionality, and configure which other technologies a product is connected to, thereby enabling distinct use patterns (see Papers 1 and 2) (Henfridsson et al. 2018; Yoo et al. 2010). Dependencies and interwoven processes make it harder for a focal organization to isolate and maintain full control of the pace and direction of change (Sandberg et al. forthcoming; Svahn et al. 2017).

In my research I found that the blurring of boundaries associated with digital technologies enabled external actors to engage in boundary work, practices that otherwise would typically rest within the organization. In an example at STA, distributed third-party developers started scraping[16] data from STA's websites for unsanctioned service development. In response, STA decided to create APIs and deliver data in more controlled forms. During this process, it became clear that existing practices for generating, storing, and distributing data varied across organizational units, resulting in insufficient data quality. Hence, institutional work to create, maintain and disrupt practices and boundaries was initiated. The resulting

[16] As described by Rudmark (2013, p. 5): "Scraping is a technique to extract data from an open data source which is not intended for programmatic access."

arrangement involved new relationships with third-party developers and participation in a new platform ecosystem.

As previously suggested, I argue that it is through cycles of institutional change and stability that digital institutions emerge. As digitalization progresses, these cycles are likely to unfold more frequently due to resulting states in which the boundaries are blurred and pressure increases to adapt to changes in the exogenous environment (as illustrated by interdependencies between events described in Papers 1-5). Thus, cycles of change and stability are interrelated and path-dependent. Each cycle normally results in new interweaving of digital technologies, practices, and boundaries, leading to the emergence of new assemblages and boundaries. For example, the new use of digital technologies, and the codification of previously analog processes such as registering positions of wagons in trains generated novel practices, and reshaped boundaries (Papers 1, 2 and 5). Similarly, at STA the assemblages resulting from pilot projects related to sensor technology resulted in further pressure to change, both from actors interested in using the solutions and from maintaining connections and evolving the technical implementations, eventually driving the creation of the digital platform (Papers 3 and 5). Furthermore, the process leading to the digital platform creation (Paper 3) significantly affected actors' mental models, motivation to participate in the digital strategy formation process (Paper 4).

I also note, similarly to suggestions by Lyytinen et al. (2016) and Nambisan et al. (2017), that effects of digitalization include greater distribution of innovation agency. Thus, digital institutional work is performed not only by multiple external actors seeking to influence the organization, but may also empower internal actors with sufficient motivation and technical competence. Furthermore, since digitalization affects the scale and scope of strategic initiatives (Bharadwaj et al. 2013), thereby increasing complexity in aligning boundaries and practices (Tanriverdi et al. 2010), digital boundary work and practice work require involvement of many internal actors and interdisciplinary competences. Initially at STA, the external actors performing boundary work related to sensor technology

were limited (see Papers 1 and 2), but over time the work of external actors caught the attention of higher-level management.

In this thesis, I demonstrate that the embedded and malleable nature of digital technology allows actors with sufficient control to change specific configurations and combinations, and to leverage existing technologies for other than intended purposes. Distributed agency thus enables certain internal actors to engage in digital innovation despite limited mandates because they have superior knowledge of potential technological solutions and sufficient understanding of the use context (Jeppesen and Lakhani 2010). Thus, on one hand, digital technology can democratize boundary work and practice work aimed at creating and disrupting (Von Hippel 2005). On the other hand, successful small-scale boundary work and practice work are bound to face resistance at some point where other actors engage in boundary work and practice work to maintain institutions. Accordingly, for institutional work to have significant effects, political skills and forms of work (such as advocacy, defining and vesting) are also required for successful engagement in digitalization processes.

7.4 PRACTICAL IMPLICATIONS

To fully leverage the potential effects of digital technologies, institutions in general are likely to benefit from reaching a state in which both the institutional carriers and pillars are interwoven with digital technologies. Digital shaping and reshaping of an institution is not a trivial task, as it is a continuous, cumulative, and accelerating process. However, I suggest that facilitating organizational responses to exogenous digital change, thereby igniting digital shaping and reshaping, is imperative. For this, managers can potentially use existing institutional arrangements to signal the importance of digital technologies not only as artefacts, but as elements of the regulative, normative, and culture-cognitive institutional arrangements. Examples include emphasizing the role of digital technologies in strategic plans and their formation, allocating resources, fostering entrepreneurship, and underlining the strategic importance of digital platforms in coordinating external relationships.

To cope with digitally induced dynamics, organizations need to foster and bridge exogenous and endogenous digital innovation across cycles of institutional conflict so they eventually enable institutional innovation. To promote such outcomes, it is particularly important (*inter alia*) to foster generation of input in terms of potential digital innovations, and promote bridging by creating a healthy balance between work to create and disrupt on the one hand, and work to maintain on the other. To foster input, it is potentially fruitful (given the combinatorial and distributed nature of digital innovations) to maintain competence in development and application of digital technologies across a wide spectrum of actors and remove barriers to solving problems by disclosing operational challenges. Entrepreneurial alertness can be fostered by cultivating strategic foresight through monitoring exogenous digital change and systemic insight through promoting interactions across intra-organizational boundaries. In addition, given the emergent nature of digital innovation processes, to bridge digital innovations across cycles managers should seek to ensure a balance between change and stability. The value and effects of digital innovations are difficult to fully comprehend at their conception. Thus, managers pursuing effects of digital innovation should seek to establish an environment where uncertainty is embraced and failure is acceptable. In the (in)famous words of Donald Rumsfeld (the former US Secretary of State for Defense):

"*There are known knowns. There are things we know that we know. There are known unknowns. That is to say, there are things that we now know we don't know. But there are also unknown unknowns. There are things we do not know we don't know.*"

The research also highlights the practical importance of adopting a culture that nurtures the distribution of agency. Managers whose control is challenged may regard increases in distribution of the generation of institutionally-reshaping digital innovations as a threat. However, to fully leverage opportunities enabled by digital technologies, organizations need to draw on a large pool of potential innovators. Potential innovators include both external and internal actors with, for example, technological competences, deep understanding of the use context, and broad industrial

experiences. Thus, ensuring that work aimed at maintaining institutions does not overly control and inhibit actors with entrepreneurial alertness (strategic foresight and systemic insight) (Sambamurthy et al. 2003) from engaging in boundary work and practice work is an important managerial task in the shaping and reshaping of digital institutions.

7.5 LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

The conclusions and implications outlined above should be considered in the light of limitations of my studies. First, empirically tracing driving forces of digitally driven change in a large organization is a challenging task. For example, isolating directions of effects between actions occurring at distinct levels, in different entities, and with multiple interpretations of actors is not straightforward. As noted by Langley (1999, p. 692): "*despite the primary focus on events, process data tend to be eclectic, drawing in phenomena such as changing relationships, thoughts, feelings, and interpretations*." While my close involvement with the organization allowed me to collect rich data spanning a long time period, I also found myself observing a process in which the data pointed me in different directions. Looking back, I understand the multiplicity of signals as related to the messy and interdependent nature of digitalization processes. My thesis does not cover all the events relevant to outcomes at STA, nor my full range of experiences. However, in this thesis I have sought to be transparent about the choices and approaches underlying my sense-making process (Weick 1995). Furthermore, throughout this journey, I have sought to triangulate findings by verifying them through use of multiple data sources, and to verify interpretations with STA actors.

Second, within the IS field there is a recurring debate on the importance of unpacking the black box of digital technology, i.e., considering in detail the impact of technology (Orlikowski and Iacono 2001; Orlikowski and Scott 2008). While I sought to do so in each of the appended papers, analyzing macro-level institutional change by necessity leads to suppression of details. Proving a rich account of the full range of material aspects that

interact, and how they affect outcomes, was not feasible in my study given the vast digital infrastructure within STA. In this regard, my approach focused on exploring how the materiality of specific digital technologies, social structures, and actors formed actions and outcomes in certain contexts within the organization. During my sense-making process, three organizational responses appeared to be particularly important in the shaping and reshaping of STA. I did not start out with the intention to explore these three types of responses. Rather, it was the initial focus on sensor technology that initially guided me in the data collection. While my analysis suggests that digital innovations around such technologies, and resulting institutional conflicts, played major roles in the overall process, demarcations of the study might have led to the neglect of other important digital technologies and their material features.

Third, although the meta-analysis in the thesis is based on the previous analyses described in the appended papers, I did not revisit the full dataset with the theoretical framing in mind. Thus, the meta-analysis reflects the overall sense-making process and might involve traces of the development of my understanding. For example, it was potentially affected by aspects I considered salient at the time I conducted the initial analysis, and neglect of issues not considered important then. In the studies reported in Papers 3 and 5, I specifically analyzed how micro-level actions translate into macro-level change. As mentioned, above such studies are 'messy' and require rich access over extended time-periods. The interdependencies of events unfolding at multiple levels of analysis over time seem to be inherent features of digital transformation processes. Thus, increasing our understanding of these processes requires attention to relationships between macro-level and micro-level events, and study over extended time periods.

Fourth, while I identify digital innovations as salient drivers of institutional conflicts, I not differentiate between different types. For example, at STA activities that led to disputed boundaries were largely aimed at providing new types of services based on generating additional data through installing hardware (RFID sensors). Such adaptations might be perceived as more

intrusive than, for example, integrating existing data into new services. Accordingly, future studies should consider if certain types of digital innovation projects are more likely to lead to institutional conflict, and by extension more significant reshaping of institutional arrangements.

8 REFERENCES

Abernethy, D. B. 2000. The Dynamics of Global Dominance: European Overseas Empires, 1415-1980. Yale University Press.

Agarwal, R., Gao, G., DesRoches, C., and Jha, A. K. 2010. "Research Commentary—the Digital Transformation of Healthcare: Current Status and the Road Ahead", Information Systems Research (21:4), pp. 796-809.

Andersson, M., and Lindgren, R. 2005. "The mobile-stationary divide in ubiquitous computing environments: lessons from the transport industry" Information System Management (22:4), pp.65.

Andriole, S. J. 2017. "Five Myths About Digital Transformation", MIT Sloan Management Review (58:3), pp. 20-22.

Armstrong, E. A. 2002. Forging Gay Identities: Organizing Sexuality in San Francisco, 1950-1994. University of Chicago Press.

Arthur, W. B. 2009. The Nature of Technology: What It Is and How It Evolves. Simon and Schuster.

Baldwin, C.Y., Clark, K.B. 2000. Design Rules: The Power of Modularity Vol. 1 MIT press.

Baldwin, C. Y., and Woodard, C. J. 2009. The architecture of platforms: A unified view. Platforms, markets and innovation, 32.

Barrett, M., Heracleous, L. and Walsham, G. 2013. "A Rhetorical Approach to IT Diffusion: Reconceptualizing the Ideology-Framing Relationship in Computerization Movements", MIS Quarterly (37:1), pp. 201-220.

Barrett, M. and Walsham, G. 1999. "Electronic Trading and Work Transformation in the London Insurance Market", Journal (10:1), Issue, pp. 1-22.

Barnes, B. 2001. "Practice as Collective Action," in The Practice Turn in Contemporary Theory, T.R. Schatzki, K. Knorr Cetina and V.S. E. (eds.), London: Routledge, pp. 17–28.

Battilana, J. 2006. "Agency and Institutions: The Enabling Role of Individuals' Social Position", Organization (13:5), pp. 653-676.

Battilana, J., Leca, B., and Boxenbaum, E. 2009. "How Actors Change Institutions: Towards a Theory of Institutional Entrepreneurship", Academy of Management Annals (3:1), pp. 65-107.

Bechky, B. A.A. 2003. "Object Lessons: Workplace Artifacts as Representations of Occupational Jurisdiction", American Journal of Sociology (109), pp. 720–752.

Beckman, C., Eisenhardt, K., Kotha, S., Meyer, A., and Rajagopalan, N. 2012. "Technology Entrepreneurship", Strategic Entrepreneurship Journal (6:2), pp. 89-93.

Benford, R. D., and Snow, D. A. 2000. "Framing Processes and Social Movements: An Overview and Assessment", Annual Review of Sociology (26:1), pp. 611-639.

Berente, N., Lyytinen, K., Yoo, Y., and Maurer, C. 2019. "Institutional Logics and Pluralistic Responses to Enterprise System Implementation: A Qualitative Meta-Analysis", MIS Quarterly (43:3), pp. 873-902.

Besson, P., and Rowe, F. 2012. "Strategizing Information Systems-enabled Organizational Transformation: A Transdisciplinary Review and New Directions", The Journal of Strategic Information Systems (21:2), pp. 103-124.

Bharadwaj, A., El Sawy, O. A., Pavlou, P. A., and Venkatraman, N. 2013. "Digital Business Strategy: Toward a Next Generation of Insights", MIS Quarterly (37:2), pp. 471-482.

Biernacki, P., and Waldorf, D. 1981. "Snowball Sampling: Problems and Techniques of Chain Referral Sampling", Sociological Methods and Research (10:2), pp. 141-163.

Bingham, C. B., and Haleblian, J. 2012. "How Firms Learn Heuristics: Uncovering Missing Components of Organizational Learning", Strategic Entrepreneurship Journal (6:2), pp. 152-177.

Ingram Bogusz, C., Teigland, R., and Vaast, E. 2019. "Designed entrepreneurial legitimacy: the case of a Swedish crowdfunding platform", European Journal of Information Systems, (28:3), pp. 318-335.

Bourdieu, P. 1993. Sociology in Question. Sage.

Boudreau, M.-C. and Robey, D. 2005. "Enacting Integrated Information Technology: A Human Agency Perspective", Organization Science (16:1), pp. 3-18.

Boudreau, K. J. 2012. "Let a thousand flowers bloom? An early look at large numbers of software app developers and patterns of innovation". Organization Science (23:5), pp. 1409-1427.

Bowker, G., and Star, S. L. 1999. Sorting Things Out: Classification and Its Consequences. Cambridge, MA: MIT Press.

Braun, V., and Clarke, V. 2006. "Using Thematic Analysis in Psychology," Qualitative Research in Psychology (3:2), pp. 77-101.

Burri, R. V. 2008. "Doing Distinctions: Boundary Work and Symbolic Capital in Radiology," Social Studies of Science (38:1), pp. 35-62.

Carlile, P. R. 2004. "Transferring, Translating, and Transforming: An Integrative Framework for Managing Knowledge across Boundaries," Organization Science (15:5), pp. 555-568.

Cennamo, C., Ozalp, H., and Kretschmer, T. 2018. "Platform architecture and quality tradeoffs of multihoming complements," Information System Research (29:2), pp. 461–478.

Charmaz, K. 2006. Constructing Grounded Theory: A Practical Guide through Qualitative Analysis. Thousand Oaks, CA: Sage.

Ciborra, C. 2000. From Control to Drift: The Dynamics of Corporate Information Infrastructures. Oxford, UK: Oxford University Press.

Clemens, E. S., and Cook, J. M. 1999. "Politics and Institutionalism: Explaining Durability and Change," Annual Review of Sociology (25:1), pp. 441-466.

Collins, R. 1975. Conflict Sociology: Toward an Explanatory Science. Academic Pr.

Collins, R. 1981. "On the Microfoundations of Macrosociology," American Journal of Sociology (86:5), pp. 984-1014.

Comeau-Vallée, M., and Langley, A. 2019. "The Interplay of Inter- and Intraprofessional Boundary Work in Multidisciplinary Teams," Organization Studies, (forthcoming).

Constantinides, P., and Barrett, M. 2014. "Information infrastructure development and governance as collective action," Information Systems Research, (26:1), pp. 40-56

Davenport, T. H. 1993. Process Innovation: Reengineering Work through Information Technology. Boston: Harvard Business School Press.

de Reuver, M., Sørensen, C., and Basole, R.C. 2018. "The digital platform: a research agenda," Journal of Information Technology (33:2), pp. 124–135.

DiMaggio, P. J. 1988. "Interest and Agency in Institutional Theory," in: Institutional Patterns and Organizations B2 - Institutional Patterns and Organizations, L.G. Zucker (ed.). Cambridge, MA: Ballinger, pp. 3-22.

DiMaggio, P. J., and Powell, W. W. 1991. "The Iron Gate Revisited: Institutional Isomorphism and Collective Rationality in Organization Fields," in: The new institutionalism in organizational analysis, W.W. Powell and P.J. DiMaggio (eds.). Chicago: The University of Chicago Press, pp. 63-82.

Eaton, B., Elaluf-Calderwood, S., Sørensen, C., and Yoo, Y. 2015. "Distributed Tuning of Boundary Resources: The Case of Apple S Ios Service System," MIS Quarterly (39:1), pp. 217-244.

El Sawy, O. A. 2003. "The IS Core Ix: The 3 Faces of IS Identity: Connection, Immersion, and Fusion," Communications of the Association for Information Systems (12:1), pp. 588-598.

El Sawy, O. A., Malhotra, A., Park, Y., and Pavlou, P. A. 2010. "Research Commentary-Seeking the Configurations of Digital Ecodynamics: It Takes Three to Tango," Information Systems Research (21:4), pp. 835-848.

Emirbayer, M., and Mische, A. 1998. "What Is Agency?," American Journal of Sociology (103:4), pp. 962-1023.

Essén, A. and Winterstorm Värlander, S. (Forthcoming). "How Technology-Afforded Practices at the Micro Level Can Generate Institutional Change at the Field Level: Theorizing the Recursive Mechanism Actualized in Swedish Rheumatology 2000–2014," MIS Quarterly, No., pp.

Fitzgerald, M., Kruschwitz, N., Bonnet, D., and Welch, M. 2014. "Embracing Digital Technology: A New Strategic Imperative," MIT Sloan Management Review (55:2), p. 1.

Fleisch, E., and Tellkamp, C. 2006. "The Business Value of Ubiquitous Computing Technologies," in Ubiquitous and Pervasive Commerce: New Frontiers for Electronic Business, G. Roussos (ed.). London: Springer, pp. 93-113.

Floerkemeier, C., and Lampe, M. 2005. "RFID Middleware Design: Addressing Application Requirements and RFID Constraints," Proceedings of the 2005 Joint Conference on Smart Objects and Ambient Intelligence: Innovative Context-aware Services: Usages and Technologies: ACM, pp. 219-224.

Garud, R., Hardy, C., and Maguire, S. 2007. "Institutional Entrepreneurship as Embedded Agency: An Introduction to the Special Issue." Sage Publications Sage UK: London, England.

Garud, R., Jain, S., and Kumaraswamy, A. 2002. "Institutional Entrepreneurship in the Sponsorship of Common Technological Standards: The Case of Sun Microsystems and Java," Academy of Management Journal (45:1), pp. 196-214.

Garud, R., Jain, S., and Tuertscher, P. 2008. "Incomplete by Design and Designing for Incompleteness," Organization Studies (29:3), pp. 351-371.

Garud, R., and Karnøe, P. 2003. "Bricolage Versus Breakthrough: Distributed and Embedded Agency in Technology Entrepreneurship," Research Policy (32:2), pp. 277-300.

Gawer, A. 2014. "Bridging Differing Perspectives on Technological Platforms: Toward an Integrative Framework," Research Policy (43:7), pp. 1239-1249.

Gawer, A., and Phillips, N. 2013. "Institutional Work as Logics Shift: The Case of Intel's Transformation to Platform Leader," Organization Studies (34:8), pp. 1035-1071.

Geertz, C. 1973. The Interpretation of Cultures. New York: Basic Books.

Ghazawneh, A., and Henfridsson, O. 2013. "Balancing platform control and external contribution in third-party development: the boundary resources model," Information System Journal (23:2), pp. 173–192.

Gimpel, H., Hosseini, S., Huber, R., Probst, L., Röglinger, M., and Faisst, U. 2018. "Structuring Digital Transformation: A Framework of Action Fields and Its Application at Zeiss," Journal of Information Technology Theory and Application (19:1), pp. 31-54.

Greenwood, R., and Hinings, C. R. 1996. "Understanding Radical Organizational Change: Bringing Together the Old and the New Institutionalism," Academy of Management Review (21:4), pp. 1022-1054.

Greenwood, R., Suddaby, R., and Hinings, C. R. 2002. "Theorizing Change: The Role of Professional Associations in the Transformation of Institutionalized Fields," Academy of Management Journal (45:1), pp. 58-80.

Guillemette, M. G., Mignerat, M., and Paré, G. 2017. "The Role of Institutional Work in the Transformation of the IT Function: A Longitudinal Case Study in the Healthcare Sector," Information and Management (54:3), pp. 349-363.

Günther, W. A., Rezazade Mehrizi, M. H., Huysman, M., and Feldberg, F. 2017. "Debating Big Data: A Literature Review on Realizing Value from Big Data," The Journal of Strategic Information Systems (26:3), pp. 191-209.

Gusfield, J. R. 1975. Community: A Critical Response. New York: Harper & Row.

Haeckel, S. 1999. Adaptive Enterprise: Creating and Leading Sense-and-Respond Organizations. Boston, MA: Harvard Business School Press.

Hallet, T., and Ventresca, M. J. 2006. "How Institutions Form: Loose Coupling as Mechanism in Gouldner's Patterns of Industrial Bureaucracy," American Behavioral Scientist (49:7), pp. 908-924.

Hampel, C. E., Lawrence, T. B., Tracey, P., Greenwood, R., and Oliver, C. 2017. "Institutional Work: Taking Stock and Making It Matter," The SAGE handbook of organizational institutionalism), pp. 558-590.

Hanelt, A., Piccinini, E., Gregory, R. W., Hildebrandt, B., and Kolbe, L. M. 2015. "Digital Transformation of Primarily Physical Industries-Exploring the Impact of Digital Trends on Business Models of Automobile Manufacturers," Wirtschaftsinformatik, pp. 1313-1327.

Hanseth, O., and Lyytinen, K. 2010. "Design Theory for Dynamic Complexity in Information Infrastructures: The Case of Building Internet," Journal of Information Technology (25:1), pp. 1-19.

Hargadon, A., and Sutton, R. I. 1997. "Technology Brokering and Innovation in a Product Development Firm," Administrative Science Quarterly (42:4), pp. 716-749.

Hargrave, T., and Van de Ven, A. H. 2005. "A Collective Action Model of Institutional Innovation," Academy of Management Review (31:4), pp. 864-888.

Henfridsson, O., and Bygstad, B. 2013. "The generative mechanisms of digital infrastructure evolution," MIS Quarterly (37:3), pp. 907–931.

Henfridsson, O., and Lind, M. 2014. "Information Systems Strategizing, Organizational Sub-Communities, and the Emergence of a Sustainability Strategy," The Journal of Strategic Information Systems (23:1), pp. 11-28.

Henfridsson, O., Nandhakumar, J., Scarbrough, H., and Panourgias, N. 2018. "Recombination in the Open-Ended Value Landscape of Digital Innovation," Information and Organization (28:2), pp. 89-100.

Hinings, B., Gegenhuber, T., and Greenwood, R. 2018. "Digital Innovation and Transformation: An Institutional Perspective," Information and Organization (28:1), pp. 52-61.

Hoffman, A. J. 1999. "Institutional Evolution and Change: Environmentalism and the US Chemical Industry," Academy of Management Journal (42:4), pp. 351-371.

Huang, J., Henfridsson, O., Liu, M., and Newell, S. 2017. "Growing on Steroids: Rapidly Scaling the User Base in Digital Ventures through Digital Innovation," MIS Quarterly (41:1), pp. 301-314.

Huber, T.L., Kude, T., and Dibbern, J. 2017. "Governance practices in platform ecosystems: Navigating tensions between cocreated value and governance costs," Information Systems Research (28:3), pp. 563–584.

Hultin, L. and Mähring, M. 2014. "Visualizing Institutional Logics in Sociomaterial Practices," Information and Organization (24:3), pp. 129-155.

Hughes, E. C. 1936. "The Ecological Aspect of Institutions," American Sociological Review (1:2), pp. 180-189.

Jacobides, M.G., Cennamo, C., and Gawer, A. 2018. "Towards a theory of ecosystems," Strategic Management Journal (39:8), pp. 2255–2276.

Jarzabkowski, P., Kaplan, S., Seidl, D., and Whittington, R. 2016. "On the Risk of Studying Practices in Isolation: Linking What, Who, and How in Strategy Research," Strategic Organization (14:3), pp. 248-259.

Jensen, T. B., Kjærgaard, A. and Svejvig, P. (2009). "Using Institutional Theory with Sensemaking Theory: A Case Study of Information System Implementation in Healthcare," Journal of Information Technology (24:4), pp. 343-353.

Jeppesen, L. B., and Lakhani, K. R. 2010. "Marginality and Problem-Solving Effectiveness in Broadcast Search," Organization Science (21:5), pp. 1016-1033.

Jetzek, T., Avital, M., and Bjorn-Andersen, N. 2019. "The Sustainable Value of Open Government Data," Journal of the Association for Information Systems (20:6), p. 6.

Kallinikos, J., Aaltonen, A., and Marton, A. 2013. "The Ambivalent Ontology of Digital Artifacts," MIS Quarterly (37:2), pp. 357-370.

Kane, G. C., Palmer, D., Nguyen-Phillips, A., Kiron, D., and Buckley, N. 2017. "Achieving Digital Maturity," MIT Sloan Management Review (59:1), pp. 1-31.

Karhu, K., Gustafsson, R., and Lyytinen, K. 2018. "Exploiting and defending open digital platforms with boundary resources: android's five platform forks," Information System Research (29:2), pp. 479–497.

Karimi, J., and Walter, Z. 2015. "The Role of Dynamic Capabilities in Responding to Digital Disruption: A Factor-Based Study of the Newspaper Industry," Journal of Management Information Systems (32:1), pp. 39-81.

Karpovsky, A., and Galliers, R. D. 2015. "Aligning in Practice: From Current Cases to a New Agenda," Journal of Information Technology (30:2), pp. 136-160.

Kellogg, K., Orlikowski, W., and Yates, J. 2006. "Life in the Trading Zone: Structuring Coordination across Boundaries in Postbureaucratic Organizations," Organization Science (17:1), pp. 22-44.

Kellogg, Katherine C. 2009. "Operating Room: Relational Spaces and Microinstitutional Change in Surgery," American Journal of Sociology (115:3), pp. 657-711.

Khan, F. R., Munir, K. A., and Willmott, H. 2007. "A Dark Side of Institutional Entrepreneurship: Soccer Balls, Child Labour and Postcolonial Impoverishment," Organization studies (28:7), pp. 1055-1077.

Klein, H., and Myers, M. 1999. "A Set of Principles for Conducting and Evaluating Interpretive Field Studies in Information Systems," MIS Quarterly (23:1), pp. 67-94.

Koutsikouri, D., Lindgren, R., Henfridsson, O., and Rudmark, D. 2018. "Extending digital infrastructures: a typology of growth tactics," Journal of the Association for Information Systems (19:10), pp. 1001-1019.

Kutzner, K., Schoormann, T., and Knackstedt, R. 2018. "Digital Transformation in Information Systems Research: A Taxonomy-Based Approach to Structure the Field," Proceedings of the 26th European Conference on Information Systems (ECIS). Portsmouth, UK.

Lamont, M., and Molnár, V. 2002. "The Study of Boundaries in the Social Sciences," Annual Review of Sociology (28:1), pp. 167-195.

Langley, A. 1999. "Strategies for Theorizing from Process Data," Academy of Management Review (24:4), pp. 691-710.

Lanzara, G. F. 2009. "Building Digital Institutions: ICT and the Rise of Assemblages in Government," in ICT and Innovation in the Public Sector: European Studies in the Making of E-Government, F. Contini and G.F. Lanzara (eds.). London: Palgrave Macmillan UK, pp. 9-48.

Lawrence, T. B., Leca, B., and Zilber, T. B. 2013. "Institutional Work: Current Research, New Directions and Overlooked Issues," Organization Studies (34:8), pp. 1023-1033.

Lawrence, T. B., and Suddaby, R. 2006. "Institutions and Institutional Work. ," in Handbook of Organization Studies, C.H. SR Clegg, TB Lawrence and W. Nord (ed.). London, Sage.

Lindgren, R., Eriksson, O., and Lyytinen, K. 2015. "Managing identity tensions during mobile ecosystem evolution," Journal of Information Technology (30:3), pp. 229–244.

Loebbecke, C., and Picot, A. 2015. "Reflections on Societal and Business Model Transformation Arising from Digitization and Big Data Analytics: A Research Agenda," The Journal of Strategic Information Systems (24:3), pp. 149-157.

Lounsbury, M., and Crumley, E. T. 2007. "New Practice Creation: An Institutional Perspective on Innovation," Organization Studies (28:7), pp. 993-1012.

Lusch, R. F., and Nambisan, S. 2015. "Service Innovation: A Service-Dominant Logic Perspective," MIS Quarterly (39:1), pp. 155-175.

Maguire, S., and Hardy, C. 2009. "Discourse and Deinstitutionalization: The Decline of DDT," Academy of Management Journal (52:1), pp. 148-178.

Maguire, S., Hardy, C., and Lawrence, T. B. 2004. "Institutional Entrepreneurship in Emerging Fields: HIV/Aids Treatment Advocacy in Canada," Academy of Management Journal (47:5), pp. 657-679.

Majchrzak, A., Markus, M. L., and Wareham, J. 2016. "Designing for Digital Transformation: Lessons for Information Systems Research from the Study of ICT and Societal Challenges," MIS Quartly (40:2), pp. 267-277.

Mankevich, V., and Holmström, J. 2016. "Gateways to Digital Entrepreneurship: Investigating the Organizing Logics for Digital Startups," In Academy of Management Proceedings (Vol. 2016, No. 1, p. 13995). Briarcliff Manor, NY 10510: Academy of Management.

Marabelli, M., and Galliers, R. D. 2017. "A Reflection on Information Systems Strategizing: The Role of Power and Everyday Practices," Information Systems Journal (27:3), pp. 347-366.

Markus, M. L., and Robey, D. 1988. "Information Technology and Organizational Change: Causal Structure in Theory and Research," Management Science (34:5) pp. 583-598.

Matt, C., Hess, T., and Benlian, A. 2015. "Digital Transformation Strategies," Business & Information Systems Engineering (57:5), pp. 339-343.

McCarthy, J. D., and Zald, M. N. 1977. "Resource Mobilization and Social Movements: A Partial Theory," American Journal of Sociology (82:6), pp. 1212-1241.

Meyer, J. W., and Rowan, B. 1977. "Institutionalised Organisations: Formal Structure as Myth and Ceremony," The American Journal of Sociology (83:2) pp. 340-363.

Miles, M. B., and Huberman, A. M. 1994. Qualitative Data Analysis: An Expanded Sourcebook. Thousand Oaks: Sage Publications.

Mingers, J. 2004. "Real-Izing Information Systems: Critical Realism as an Underpinning Philosophy for Information Systems," Information and Organization (14:2), pp. 87-103.

Misangyi, V. F., Weaver, G. R., and Elms, H. 2008. "Ending Corruption: The Interplay among Institutional Logics, Resources, and Institutional Entrepreneurs," Academy of Management Review (33:3), pp. 750-770.

Mooney, J. G., Gurbaxani, V., and Kraemer, K. L. 1995. "A Process Oriented Framework for Assessing the Business Value of Information Technology," in: Proceedings of the 16th International Conference on Information Systems, J.I. DeGross, G. Ariav, C. Beath, R. Hoyer and C. Kemerer (eds.). Amsterdam: pp. 17-28.

Myers, M. D. 2009. Qualitative Research in Business and Management. Sage.

Nambisan, S. 2016. "Digital Entrepreneurship: Toward a Digital Technology Perspective of Entrepreneurship," Entrepreneurship Theory and Practice (41:6), pp. 1029-1055.

Nambisan, S., Lyytinen, K., Majchrzak, A., and Song, M. 2017. "Digital Innovation Management: Reinventing Innovation Management Research in a Digital World," MIS Quarterly (41:1), pp. 223-238.

Nan, N., and Tanriverdi, H. 2017. "Unifying the Role of IT in Hyperturbulence and Competitive Advantage Via a Multilevel Perspective of IS Strategy," MIS Quarterly (41:3), pp. 937-958.

Nylén, D., & Holmström, J. (2019). Digital innovation in context. Information Technology & People.

Orlikowski, W. J. 1992. "The Duality of Technology: Rethinking the Concept of Technology in Organizations," Organization Science (3:3), pp. 398-427.

Orlikowski, W. J. 2007. "Sociomaterial Practices: Exploring Technology at Work," Organization Studies (28:9), pp. 1435-1448.

Orlikowski, W. J., and Iacono, S. 2001. "Research Commentary: Desperately Seeking the 'IT' in IT Research: A Call to Theorizing the IT Artifact," Information Systems Research (12:2) pp. 121-134.

Orlikowski, W. J., and Robey, D. 1991. "Information Technology and the Structuring of Organizations," Information Systems Research (2:2), pp. 143-169.

Orlikowski, W. J., and Scott, S. V. 2008. "Sociomateriality: Challenging the Separation of Technology, Work and Organization," The Academy of Management Annals (2:1), pp. 433-474.

Parker, G., Van Alstyne, M., and Jiang, X. 2017. "Platform Ecosystems: How Developers Invert the Firm," MIS Quarterly (41:1), pp. 255-A254.

Parsons, T. 1971. The System of Modern Societies. Prentice Hall.

Pavlou, P., and El Sawy, O. 2010. "The "Third Hand": IT-Enabled Competitive Advantage in Turbulence through Improvisational Capabilities," Information Systems Research (21:3), pp. 443-471.

Pavlou, P. A., and El Sawy, O. A. 2011. "Understanding the Elusive Black Box of Dynamic Capabilities," Decision Sciences (42:1), pp. 239-273.

Pentland, B. T., and Rueter, H. H. 1994. "Organizational Routines as Grammars of Action," Administrative Science Quarterly (39:3), pp. 484-510.

Peppard, J., Galliers, R. D., and Thorogood, A. 2014. "Information Systems Strategy as Practice: Micro Strategy and Strategizing for IS," The Journal of Strategic Information Systems (23:1), pp. 1-10.

Perkmann, M., and Spicer, A. 2007. "Healing the Scars of History': Projects, Skills and Field Strategies in Institutional Entrepreneurship," Organization Studies (28:7), pp. 1101-1122.

Piccinini, E., Hanelt, A., Gregory, R., Kolbe, L.,. 2015. "Transforming Industrial Business: The Impact of Digital Transformation on Automotive Organizations," Thirty-Sixth International Conference on Information Systems (ICIS), Fort Worth, USA.

Rudmark, D. 2013. "The Practices of Unpaid Third-Party Developers–Implications for API Design". Americas Conference on Information Systems

Rudmark, D., Arnestrand, E. and Avital, M. 2012. "Published. Crowdpushing: The Flipside of Crowdsourcing," . European Conference on Information Systems Proceedings. 187.

Ruebottom, T. 2013. "The Microstructures of Rhetorical Strategy in Social Entrepreneurship: Building Legitimacy through Heroes and Villains," Journal of Business Venturing (28:1), pp. 98-116.

Saadatmand, F., Lindgren, R., amd Schultze, U. 2019." Configurations of platform organizations: implications for complementor engagement," Research Policy, (48:8)

Sambamurthy, V., Bharadwal, A. S., and Grover, V. 2003. "Shaping Agility through Digital Options: Reconceptualizing the Role of Information Technology in Contemporary Firms," MIS Quarterly (27:2), pp. 237-263.

Sandberg, J., Holmström, J., and Lyytinen, K. 2019. "Digitization and Phase Transitions in Platform Organizing Logics: Evidence from the Process Automation Industry," MIS Quarterly (forthcoming).

Scarbrough, H., Robertson, M. and Swan, J. 2015. "Diffusion in the Face of Failure: The Evolution of a Management Innovation", British Journal of Management (26:3), pp. 365-387.

Schumpeter, J. A. 1942. Capitalism, Socialism and Democracy. New York: Harper and Row.

Scott, W. R. 1995. "Institutions and Organizations. Foundations for Organizational Science," London: A Sage Publication Series.

Scott, W. R. 2008. Institutions and Organizations: Ideas and Interests. Sage.

Scott, W. R., Ruef, M., Mendel, P. J., and Caronna, C. A. 2000. Institutional Change and Healthcare Organizations: From Professional Dominance to Managed Care Chicago: University of Chicago Press.

Seo, M.-G., and Creed, W. D. 2002. "Institutional Contradictions, Praxis, and Institutional Change: A Dialectical Perspective," Academy of Management Review (27:2), pp. 222-247.

Sia, S. K., Soh, C., and Weill, P. 2016. "How DBS Bank Pursued a Digital Business Strategy," MIS Quarterly Executive (15:2), pp. 105-121.

Skog, D., Wimelius, H., and Sandberg, J. 2018a. "Digital Service Platform Evolution: How Spotify Leveraged Boundary Resources to Become a Global Leader in Music Streaming," Hawaii International Conference on System Sciences (HICSS), pp. 4564-4573.

Skog, D. A., Wimelius, H., and Sandberg, J. 2018b. "Digital Disruption," Business and Information Systems Engineering (60:5), pp. 431-437.

Song, P., Xue, L., Rai, A., and Zhang, C. 2018. "The ecosystem of software platform: A study of asymmetric cross-side network effects and platform governance," MIS Quarterly, (42:1), pp. 121-142.

Star, S. L., and Griesemer, J. R. 1989. "Institutional Ecology, Translations and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907-1939," Social Studies of Science (19:3) pp. 387-420.

Suddaby, R., and Greenwood, R. 2005. "Rhetorical Strategies of Legitimacy," Administrative Science Quarterly (50:1), pp. 35-67.

Svahn, F., Mathiassen, L., and Lindgren, R. 2017. "Embracing Digital Innovation in Incumbent Firms: How Volvo Cars Managed Competing Concerns," MIS Quarterly (41:1), pp. 239-254.

Swidler, A. 2005. "What Anchors Cultural Practices," in The Practice Turn in Contemporary Theory. Routledge, pp. 83-101.

Tanriverdi, H., Rai, A., and Venkatraman, N. 2010. "Research Commentary-Reframing the Dominant Quests of Information Systems Strategy Research for Complex Adaptive Business Systems," Information Systems Research (21:4), pp. 822-834.

Thomas, L. D., Autio, E., and Gann, D. M. 2014. "Architectural Leverage: Putting Platforms in Context," The Academy of Management Perspectives (28:2), pp. 198-219.

Thornton, P. H., Ocasio, W., and Lounsbury, M. 2012. "The Institutional Logics Perspective: A New Approach to Culture, Structure, and Process. Oxford University Press on Demand.

Tilson, D., Lyytinen, K., and Sorensen, C. 2010. "Research Commentary-Digital Infrastructures: The Missing IS Research Agenda," Information Systems Research (21:4), pp. 748-759.

Tiwana, A. 2015. "Evolutionary competition in platform ecosystems," Information System Research (26:2), pp. 266–281.

Tiwana, A., Konsynski, B., and Bush, A. 2010. "Platform Evolution: Coevolution of Platform Architecture, Governance and Environmental Dynamics," Information Systems Research (21:4), pp. 675-687.

Van Dijk, T. A. 2011. Discourse Studies: A Multidisciplinary Introduction. Sage.

Vial, G. 2019. "Understanding Digital Transformation: A Review and a Research Agenda," The Journal of Strategic Information Systems (28:2), pp. 118-144.

Vissa, B., and Bhagavatula, S. 2012. "The Causes and Consequences of Churn in Entrepreneurs' Personal Networks," Strategic Entrepreneurship Journal (6:3), pp. 273-289.

Von Hippel, E. 2005. Democratizing Innovation. Cambridge, MA: MIT Press.

Walsham, G. 1995. "Interpretive Case Study in IS Research: Nature and Method," European Journal of Information Systems (4:2) pp. 74-81.

Walsham, G. 2006. "Doing Interpretive Research," European Journal of Information Systems (15:3), pp. 320-330.

Wareham, J., Fox, P.B., Giner, J.L.C. 2014. "Technology ecosystem governance," Organization Science (25:4), pp. 1195–1215.

Weick, K. 1995. "What Theory Is Not, Theorizing Is," in: Administrative Science Quarterly (40:3), pp. 385-390.

Westerman, G., and Bonnet, D. 2015. "Revamping Your Business through Digital Transformation," MIT Sloan Management Review (56:3), p. 10.

Whittington, R. 2006. "Completing the Practice Turn in Strategy Research," Organization studies (27:5), pp. 613-634.

Wijen, F., and Ansari, S. 2007. "Overcoming Inaction through Collective Institutional Entrepreneurship: Insights from Regime Theory," Organization Studies (28:7), pp. 1079-1100.

Woerner, S. L., and Wixom, B. H. . 2015. "Big Data: Extending the Business Strategy Toolbox," Journal of Information Technology (30:1), pp. 60-62.

Yeow, A., Soh, C., and Hansen, R. 2018. "Aligning with New Digital Strategy: A Dynamic Capabilities Approach," The Journal of Strategic Information Systems (27:1), pp. 43-58.

Yoo, Y., Boland, R. J., Lyytinen, K., and Majchrzak, A. 2012. "Organizing for Innovation in the Digitized World," Organization Science (23:5), pp. 1398-1408.

Yoo, Y., Henfridsson, O., and Lyytinen, K. 2010. "Research Commentary: The New Organizing Logic of Digital Innovation: An Agenda for Information Systems Research," Information Systems Research (21:4), pp. 724-735.

Zietsma, C., and Lawrence, T. B. 2010. "Institutional Work in the Transformation of an Organizational Field: The Interplay of Boundary Work and Practice Work," Administrative Science Quarterly (55:2), pp. 189-221.

Zuboff, S. 1988. New York: Basic Books.