PLATFORMIZATION
Digital Materiality at the Limits of Discourse

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Doctoral Dissertation

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ABSTRACT

The digital platform has served us well as a metaphor for an imaginary 'something' made comprehensible through theories such as matchmaking, externalities, and network effects. But as much as metaphors and theories can help us imagine and understand some aspects of a phenomenon, they can also limit us in seeing others. To understand and explain these formations of digital technology in a more nuanced way, existing theories on digital platforms need to be supplemented. In this thesis, I contribute to this emerging body of knowledge by, for example, building on and developing the concept of platformization. This thesis also illuminates, discuss, and theorize the ambivalent ontology of digital artifacts more broadly. A practice that highlights the somewhat indeterminate modes of existence of digital artifacts and the discursive work needed to make them intelligible. Hence, the thesis emphasizes and pays attention to the continuous dance between digital technology and our understanding of the same. For example, innovations and developments in a technological field may influence the meaning of an already established concept (e.g., deep learning and "AI"). Consequently, evolving material aspects of digital technology challenge prevailing discursive expressions of what 'digital technology' means. Therefore, we must be receptive to technological changes and reflect on whether these changes have consequences for our already established theories and concepts.

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PREFACE

About a year into the thesis work two things happened that clearly affected my research and the way I looked at technology and technological change. During the writing of my second paper, I encountered the works of Charles Bazerman, and specifically his book *The Languages of Edison's Light* had a great influence on my thinking. Here, Bazerman examines how Thomas Edison and associates developed incandescent lighting, the various technologies needed, and how they made them meaningful: "They, of course, were making electricity and light; they too were making generators, meters, switches, and lamps; but they were also making meanings" (Bazerman, 1999, p. 333). Bazerman's work made me think and reflect more broadly on the importance of the discursive work required to make technology meaningful – how technology needs to be made comprehensible in different discursive systems for it to be used and spread. But also, how a specific technology in itself could be thought of as a discursive system. Given that digital technology is (re)configurable and (re)programmable, there exists a lot of possibilities in how to arrange a digital, sociotechnical (Sarker et al., 2019) assemblage. These arrangements, I suggest, are discursively developed, orchestrated, and maintained. Thus, the discursive dimension not only concerns how digital technology is understood and communicated but also how it can be imagined – how technology can be assembled, built and what it can become.

Around the same time, I came across the writings of Gilbert Simondon, a French philosopher of technology[1]. Simondon can be described as a radical process thinker (Letiche & Moriceau, 2017). His philosophy on technology and technological change is quite original I would say, where he speaks of 'modes of existence of technical objects', that the technical object is "defined by its relationship with an environment that it also modifies" (Chabot, 2013, p. 4). Implicit in such reasoning is the understanding that there are 'modes of existence' not (yet) realized. Thus, Simondon is paying attention to the coming into being of things; he emphasizes the *becoming* over what *is*. His thinking on technology emanated from a feel-

1 His works have quite recently found their way beyond the borders of the French language, for example through translation of *Du mode d'existence des objets techniques/On the Mode of Existence of Technological Objects* (1958/2017).

ing that humans have become alienated in relation to technology (Mills, 2016); that the industrial development had led to an imbalance between technology, how it actually works, and how it is perceived and presented in culture: "A gap manifests itself in our civilization between the attitudes provoked in man by the technical object and the true nature of these objects [...]" (Simondon, 2017, p. xv). His philosophy on technology and its place in culture is interesting and exciting in the light of today's (digital) technological development.

Both authors became valued, thought-provoking interlocutors and gave me the confidence to embark on a more philosophical excursion. In Bazerman's writing I appreciated and realized the importance of the discursive work that surrounds technology to make it intelligible, meaningful, and useful. In Simondon's writing, I recognized the aspiration to inquire into the nature (or essence) of technology to then be able to understand and discuss how it is/can be integrated with society. This excursion was then further inspired by the thoughts of Hui (2016) that "[...] as digital objects have emerged as a consequence of historical and technological development, so have they also inherited certain metaphysical presuppositions" (p. 3 – 4). Presuppositions that I felt needed to be reflected upon, pondered, and perhaps even questioned.

To be able to perceive, understand and depict 'digital technology', we may first need to revise – or maybe rather supplement – our view of what digital technology is and how it evolves. Thus, we may not really grasp the digital realm and the formations that emerge there if we are not prepared to question our own assumptions about what, for example, an object is and can be, what it consists of and how it evolves (Hui, 2016). Thoughts and reflections on simple, obvious, and perhaps even irrelevant things, it may seem, but for our understanding of a digital society they can turn out to be fundamental.

Previous technological achievements have primarily been introduced in a tangible paradigm. A paradigm in which our (philosophical) assumptions about how, for example, objects are identified, classified, and theorized have been formed and established. But objects in the digital realm seem to challenge this way of perceiving things (Kallinikos et al., 2013). Perhaps the defining difference between technological change in our time compared to previous eras lies not in the technology per se, but rather

in the fact that digital technology seems to challenge our philosophical assumptions about what a technological object is.

Consider the Industrial Revolution. An era that is often compared to our own because of the disruptive and transformative technology that was introduced. Back then, technologies were tangible and material. But as our everyday life is becoming increasingly digitalized something paradoxical is happening: The more dependent we become on (digital) technology, the more distanced we seem to become from the material aspects of technology. Hence, as guises and forms of digital technology spread across the globe a kind of dematerialized materiality is emerging. A digital materiality. And this has consequences. For example, contemporary literature mentions how digital technology blur boundaries of firms and industries. Of course, this has to do with technology; but to be able to understand *how* then technology makes this blurring possible, we need to think, ponder, and perhaps in the end question our assumptions about what digital technology is and can become (Faraj & Leonardi, 2022). It is about technology, for sure, but also imagination.

So, what is this thesis about? What is it a case of? To be able to make a comprehensible, coherent, and hopefully exciting story, I chose the 'digital platform' as the main protagonist since it is the phenomenon that I used as my object of study over the years and thus recur in the articles. But under the hood, as I have hinted in this preface, this thesis grapples more broadly with how we make sense of digital technology in continuous flux: It thus deals with digital materiality at the limits of discourse.

CONTENTS

Part 1

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DIGITAL MATERIALITY AT THE LIMITS OF DISCOURSE

CHAPTER 1
INTRODUCTION

> *The concept of industry was unproblematic at the dawn of the 20th century. The Dow Jones index in 1912 included companies whose industries were there right in the name: Amalgamated Copper, American Sugar, Central Leather, National Lead, US Rubber, and US Steel. Their products defined what industry they were in, and it was easy to visualize industry inputs (suppliers) and outputs (buyers).* – (Davis & Dewitt, 2022, p. 866)

This thesis mainly concerns major digital platforms (van der Aalst et al., 2019), their origins, functions, and evolution. How they provide opportunities as well as challenges (e.g., Rahman & Thelen, 2019; Van Dijck, 2021; Gawer, 2022). And how (or even if) they could be understood as things in the world (Hui, 2016). When reflecting on these platforms and their evolution one is struck by how they seem to expand within the digital realm with relative ease, almost randomly at times; an expansion without clear and definite boundaries as it seems (Alaimo & Kallinikos, 2022). Thus, it becomes increasingly difficult to ignore their influence as many

of the activities that take place in today's digital realm are orchestrated by these platforms (Van Dijck, 2021). One cannot help but wonder if the founders of the major, contemporary platforms could imagine where their creations would go when created just a few decades ago. Did they have a clue?

Consider the following: Founded in 1994, *Amazon* first materialized as an online marketplace for books. Since then, this online marketplace has expanded into a multitude of product categories – hence 'The Everything Store'. But it didn't end there (as it rarely seems to do in the digital sphere), because in addition to a growing e-commerce business, Amazon has also developed and grown to focus on such diverse areas as, for example, cloud computing (AWS) and digital streaming (Amazon Prime Video). *Google* appeared on the scene in 1998 with its search engine as its biggest asset. Since then, the company has developed to offer a multitude of other services such as, email, navigation, cloud computing, video sharing, machine learning APIs, and the list goes on. *Facebook* started its operations in 2004 with the intention of creating a social networking site, where the access to the platform was initially limited to Harvard students. At the end of 2021, the company changed its name to Meta Platforms, but the social media platform that is Facebook lives on. A platform that now spans the globe with billions of users. A platform that is constantly evolving, but now appears as an artifact among others (e.g., Instagram, WhatsApp) under the umbrella of Meta Platforms.

So, what are Amazon, Google, and Facebook (and Meta too for that matter) really? How should we understand and categorize them? These questions and their answers have implications for various domains. For example: In terms of research, it is vital to be able to define, specify and clarify the types of objects that are being researched. Given the ever larger and more complex creations that digital platforms may evolve into, they challenge our assumptions about what a digital artifact is (Ekbia, 2009; Kallinikos et al., 2013; Hui, 2016). Thus, the question becomes a matter of ontology (Couldry & Kallinikos, 2017; Davis & Dewitt, 2022) and research design (Williams & Pollock, 2011). But more practically the questions concern how individuals, organizations and societies can cope and thrive in an ever-changing digital society. A society where major, digital platforms increasingly appear as fundamental constituents (Plantin &

Punathambekar, 2019; Van Dijck, 2021; Gawer, 2022). Hence, "their significance will not only result from technology, but also from the societal dynamics that they give rise to and are entangled with" (Flyverbom, 2022, p. 5).

Over time, I have come to perceive these creations as ever-evolving, generative systems (Zittrain, 2008). Systems characterized by an openness in design (Garud et al., 2008), enabled by a cloud computing paradigm (Narayan, 2022), and which never seem to be finished but always in the making (Kallinikos et al., 2013). Characteristics that make them elusive and hard to categorize. Against this backdrop, it is logical that it is with the notions of generativity and generative systems that this story begins.

1.1 DIGITAL PLATFORMS AS GENERATIVE SYSTEMS

As I close Jonathan Zittrain's (2008) book *The Future of the Internet – And How to Stop It* after yet another re-read, I realize that this is where this story sort of begins – where his ends. Zittrain's influence in the field of information systems is broad and recognized. His development of the concept 'generativity' (as a way of understanding and explaining the latent, innovative power inherent in digital technologies) has contributed to discourses such as *digital innovation* (e.g., Yoo et al., 2010; 2012), *digital artifacts* (e.g., Kallinikos et al., 2013), *digital entrepreneurship* (e.g., Nambisan, 2017), *digital infrastructures* (e.g., Tilson et al., 2010b) and *digital platforms* (e.g., de Reuver et al., 2018).

Zittrain (2008) has been a great source of inspiration and influence in thinking about digital systems as being (more or less) generative; how they develop and function through a close collaboration between humans and machines. A perspective that points to an ongoing technological development (a material aspect), but also how this development needs to be understood and incorporated into the conceptual space of human understanding to be leveraged (a discursive aspect). For example, Zittrain problematizes how to approach notions of law and regulation in relation to emergent generative systems characterized by performativity and evolution:

> Traditional cyberlaw frameworks tend to see the Net as an intriguing force for chaos that might as well has popped out of nowhere […] Then the name of the game is seen to be coming up with the right law or policy by a government actor to address the issues. Such approaches can lead to useful, hard-nosed insights and suggestions, but they are structured to overlook the fact that the Net is quite literally what we make of it. (Zittrain, 2008, p. 242)

In other words, the Internet and its connected devices are to be considered artifacts in constant evolution – both as things in the world, as well as conceptual ideas in the minds of people. Thus, representations of digital technology appear as artifacts with a history and potential future.

Indeed, Zittrain (2008) recognized digital technology as an unprecedented source of creativity and innovation. But at the same time, he sensed that the transforming power of the Internet and its connected computers could paradoxically threaten the openness that had been the very basic idea of the early Internet and the various communities that grew there. He thus reflected on what a further expansion of the Internet and its connected devices would lead to and stated that "[…] we must piecemeal refine and temper the PC and the Net so that they can continue to serve as engines of innovation and contribution while mitigating the most pressing concerns of those harmed by them" (p. 245). Hence, how to make sense of generative systems, built for openness without a seemingly finite goal and which evolve over time? How to manage them? Ultimately, how to make use of their inherent innovative capabilities while not being affected by potential side effects and misuse? To encapsulate this seemingly contradictory condition, Zittrain (2008) coined the term 'generative dilemma'. A dilemma that speaks to how, while benefiting from the positive effects that a generative system enables, we must also be prepared to find ways to deal with the setbacks, problems and contingencies that inevitably arise in such a system. The various solutions that may exist "to the generative dilemma will rest on social and legal innovation as much as on technical innovation [...]" (p. 61).

Fast forward nearly fifteen years and the technology landscape has changed drastically, to say the least. The digital dawn that Zittrain (2008)

reported on[2] has evolved so that we now talk about, for example, always-connected, ubiquitous computing devices (e.g., laptops, phones, tablets, tablets, sensors, and whatnot). Furthermore, notions such as the 'cloud', 'IoT' and 'AI' grows stronger as ideas about abstract, yet powerful, computational resources. Ideas that nevertheless remain in a kind of obscurity as it is discussed both what they are and can do (a material perspective), as well as how they can be understood and conceptualized (a discursive perspective). However, it does not seem too bold to argue that these ideas and technologies increasingly defines our digital society. In this growing, industrialized digital landscape, major digital platforms emerge as solidified structures operating as factories of sorts. They establish themselves by offering computational services and products, packaged to solve customer-specific (e.g., Uber) as well as more general (e.g., Microsoft Azure) problems.

So, why is this important? Well first, it's about trying to understand if (and if so how) digital technology differs from previous technology. And then, how this difference can, for example, enable innovation, entrepreneurship, and economic growth, but also lead to conceptual confusions, institutional frictions, and wider societal challenges[3]. A vital premise for this thesis is that traditional discursive systems have evolved to perceive technology (of whichever kind) as quite stable (Gustavsson, 2017; Gustavsson & Ljungberg, 2020). From this assumption follows a conception of 'society' as a domain in which technological artifacts appear as discrete, tangible, and well-defined and thus remain within specific categories for long periods of time. In stark contrast to this worldview, major digital platforms emerge as fluid, elusive creations with an ambivalent ontology (Kallinikos et al., 2013). A circumstance that can lead to traditional discursive systems having difficulties understanding and dealing with digital platforms (Cecez-Kecmanovic, 2016). Hence, Zittrain's (2008) generative dilemma remains.

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2 Characterized by a kind of settler spirit where (desktop) computers were connected to a relatively (by today's standards) sparsely populated Internet.

3 Here I would like to acknowledge Simondon (2017; 2020), Mackenzie (2002) and Hui (2016) and their thinking on technology, technological change, and society, as a crucial inspiration for my own.

1.2 DIGITAL PLATFORMS AND THE GENERATIVE DILEMMA

This is written during the time of the pandemic. Two years of uncertainty has passed. Two years that have questioned much of what we previously took for granted, like coming to the office to work in the morning; like spending time with loved ones to celebrate birthdays and holidays; like meeting friends in town for a bite to eat and ending the evening with a movie or a theatre visit; like traveling.

This period has also revealed (and intensified) how deeply various digital platforms have become embedded in the fabric of society to act as a form of invisible infrastructure. I use the word 'invisible' here to emphasize this as a kind of hidden, uncoordinated evolution rather than a deliberate, planned one. Hence, by choosing to use these platforms (as users/companies/organizations/nations) we contribute to their spread and growth. At first, we may see them as opportunities and alternatives but as usage increases, we become dependent, and these platforms instead emerge as critical and fundamental resources in an increasingly complex digital society. Thus, they grow strong in silence[4].

Consider the following example that to some extent illustrates the generative dilemma of our time: A few years ago, just before the pandemic, the CEOs of some of the so-called big tech companies were called to testify before the US Senate. It was questioned whether these companies had grown too large, that their power threatened a functioning market and that they therefore needed to be regulated in some way. Now, a few years later, it could be argued that it was largely due to the computational capabilities provided by these companies which allowed nations to implement their preferred strategies for dealing with the pandemic and its effects. The generative dilemma appears here as a question of how to relate to these tech companies when they grow into actors with great power to influence society and its development; actors that offer communication and computational capabilities of unprecedented scope and scale, and on which we

4 Already here I can reveal that this development which, on the one hand appears to be fundamental to our future, but at the same time seems so difficult to grasp and understand, that I am curious about. To get a grip on how this development unfolds, we need to understand these platforms and the dynamics by which they operate.

are increasingly dependent (Narayan, 2022). Or in the words of Flyverbom (2022, p. 12): "As digital architectures become critical infrastructures for both private companies and public institutions, multiple organizational questions about legitimacy, power and knowledge become salient."

As an example, consider Zoom: Before the pandemic the video conferencing platform was probably not that well known to the general public, but has grown into an important, if not indispensable, component for businesses, organizations and individuals alike. A component that, on the one hand, enabled people to maintain contact between friends and loved ones, but also contributed to sustaining organizational structures and processes digitally. Zoom (and similar platform-based services) thus facilitated a migration from a mode of action that was primarily based on geography and locations, to a full-fledged everywhere/anywhere online approach in just a matter of days.

This emblematic example give emphasis to a dimension of digitalization that this thesis aims to address: How representations of digital technology challenge prevailing discursive systems to articulate new understandings of what technology 'is' and can conceivably 'become' – understandings that in turn may influence the further material development of said technology (c.f. Bazerman, 1999). In the case of Zoom, consider the engineering work required to scale the platform to in turn be able to meet the increased demand for the services provided, with the ultimate aim of increasing the discursive value of the platform. The discursive expansion of 'Zoom' can thus be described as going from initially being perceived as a tool, to becoming a verb ('to zoom'), to how the platform is now also understood as a fundamental, digital infrastructure for the maintenance of organizational structures and communication channels. Thus, in recent years Zoom (and similar digital platforms) have become entangled in organizations as important infrastructures. They enable new patterns of behaviour and therefore stimulate new ways of thinking and conceptualizing, for example, 'work' – what it is, for whom and from where.

Another aspect of the generative dilemma related to digital platforms is privacy. Returning to Zittrain's idea of 'generativity' it refers to an unfiltered access to (digital) technology paired with the ability of individual users to modify it without the constraints of controlling parties. Generativity thus suggests that digital technology is intentionally unfinished, a

quality with enormous implications for creativity and innovation (e.g., Yoo et al. 2010; 2012; Yoo, 2013; Henfridsson et al., 2018). But Zittrain (2008) predicted a future where the development of digital artifacts would increasingly move towards devices linked to restrictive platforms and where owners and manufacturers would be able to control the users' access to the devices and their functionality; a future where many of the devices connected to the Internet would be controlled to some extent by companies (Zuboff, 2019). Companies that would then be able to guide the development towards artifacts and representations of the digital (e.g., platforms) with increasingly greater control capabilities: "The future is not one of the generative PCs attached to generative network. It is instead one of sterile appliances tethered to a network of control" (Zittrain, 2008, p. 3).

1.3 REFLECTIONS ON MOTIVES AND REASONS FOR THIS RESEARCH

I do not think my doctoral journey started the day I first walked through the doors of the University, but long before. In a way, it feels like the almost twenty-five years spent in the IT industry prior to doing this, somehow prepared me for what was to come. Undoubtedly, my previous professional career has influenced my thinking about 'digital technology'. So, I think it cannot be ignored that my practical experience has shaped my view of digital technology. Therefore, it seems appropriate to give a brief account of how this practical knowledge has been accumulated over the years, and how I think it has shaped me.

In 1995 I started working at an industrial company as an IT support technician. My daily work consisted primarily of operating the local IT environment at a site in Gothenburg. Around 500 employees worked at the site, and we were five person who handled IT related issues and had the overall responsibility for the infrastructure both from a maintenance as well as a development perspective. The servers and systems were running in a 'datacentre' located in a storage room on the ground floor of the building. The emphasis on 'local' is important here since from a networking perspective the site could in a way be regarded as an isolated island. An island which to large extent did not have contact with the other parts

of the company's network. Mainframes and e-mail systems communicated over specific protocols, but extended phenomena such as PCs communicating outside their own geographical location (LAN) were still unusual. Neither where we connected to the Internet (which existed at the time, but where more to be seen as an odd and creative scene, and not primarily intended for use by the businesses). When I left the company 23 years later the world looked completely different. Interconnected networks were now household, and I worked in a group with twenty persons with the overall responsibility of maintaining and developing the PC/Client Infrastructure for our different customers. Different customers with different types of infrastructural challenges: One customer with a widespread and decentralized IT-Infrastructure residing in 400+ geographical locations over the world, with over 80.000 users. Another with a centralized IT-Infrastructure, where the vast majority of their systems resided at one location, but also with a user-base of even greater magnitude (100.000).

During the years I have worked as a programmer, architect, systems integrator, and protocol analysts. And it was in my role as network protocol analyst I began to perceive technology in a, for me, new way. As a protocol analyst you 'tap the wire' and listen to the network traffic flowing through cables. The reason to do this can be different and happen at different layers in the digital stack, such as: A malfunctioning/slow working application; systems/infrastructure design issues; intermittent communication problems etcetera. What one primarily searches for is to find patterns in the traffic flow; patterns that differ from the expected ones and can explain the issue at hand. What I noticed, and what struck me, when I started doing this was that there was always a huge, continuous chatter over the networks – computers talking to servers, servers talking to computers, servers talking to servers. I sometimes ended up dissecting the irrelevant traffic instead of the relevant, just to learn new patterns (e.g., network protocols), and how the different parts of the infrastructure "talked" to each other.

From having previously performed the engineering craft mainly with the help of documentation, I was now also able to lift the veil and experience first-hand how systems were connected, how they reacted to different configurations. I became interested in the flows behind the scenes so to speak – the semantics, the protocols, issues of interoperability and the

larger assemblies. In short, how things fit together. What began to fascinate me (and still does) is how the various members of an infrastructure communicate with each other, and how this communication, in recursive and reciprocal ways, can affect the infrastructure as a whole as well as its specific members.

Over the years, the IT industry has been a moving target. New technologies are introduced while old ones evolve. But, at least for my thinking, the last few years have led to a kind of paradigm shift. Traditionally, IT operations have basically been based on companies having their own data centres, with an infrastructure that is mainly located 'on-premises'. This assumption has in a way been fundamental for the planning of IT infrastructures and their further development. However, of lately, major cloud platforms and their potential for large-scale operations have come to question this assumption (Narayan, 2022). These platforms approach all types of markets and enable digital capabilities and computing power on an unprecedented scale. Their ability to evolve, innovate, create, and capture value in new, novel ways has turned them into actors of great power on the global scene. My motivation to engage in this doctoral project can thus be linked to my growing fascination with these major platforms, along with a dawning realization that it was becoming urgent to understand how they function and integrate with society[5].

5 My fascination with large, global platforms stems from a vision of a potential future where they appear and operate as established, self-evident and essential infrastructure deeply entangled with organizations, individuals, and societies (some would probably argue that we are already there). To be able to cope with and manage such a future, we need to comprehend the logics according to which digital platforms develop and operate. In short, how they arise and evolves. Thus, to be able to initiate and engage in, for example, constructive discussions on how digital platforms should/could/would be regulated, we first need to build frameworks and intuitions on their various modes of existence: "Until we can think of technical objects [...] in their own terms, then their role in constituting who or what we are remains shrouded. The intelligibility of our own anxieties about technology is entwined with the way we think about technology" (Mackenzie, 2002, p. 3).

1.4 QUESTION AND AIM

This thesis's ambition is to contribute to the understanding of digital platforms (de Reuver et al., 2018), where the guiding, overarching research question is: *How can we understand and articulate digital platforms as constituents of a digitalized society?*

A broad ambition, one might say, with a lot of ground to cover, but the intention is of course not to propose a kind of one-size-fits-all solution. The aim is instead to investigate specific yet representative phenomena in the emerging digital society. Digital technology is often portrayed as fundamentally different from previous types of technology. But what this difference is and consists of often appears a little unclear. Undoubtedly, digital technologies enable a culture of participation (Zittrain, 2008) and engagement in value creation and capture by lowering barriers for entrepreneurs and innovators to engage in opportunity seeking (Nambisan, 2017). At the same time, a relatively small number of digital platforms (van der Aalst et al., 2019) has emerged as dominant actors through the converging nature of the Internet with a lot of power in their hands (e.g., Gawer, 2022; Petit & Teece, 2021; Van Dijck, 2021). How to deal with this generative dilemma – the tension between the innovative potential of digital platforms and the regulations potentially needed to keep things under control – is probably one of the most pressing and challenging questions of our time (Rahman & Thelen, 2019). Embedded in this tension are questions that touch several of the cornerstones of today's society, such as: How to manage the sensitive triad of privacy, data, and algorithms; how to balance the fine line between security and functionality; how do digitalization (or lack thereof) affects trust in institutions and authorities; and what about work?

To be able to explain how digital technology challenges existing cultures, norms, and ways of thinking, we must first understand its various modes of existence (Simondon, 2017). In this thesis, this idea is operationalized through a primary focus on digital platforms and their evolution. More specifically, how platforms, through their technology, on the one hand influence existing discursive systems, but also how these technological artifacts themselves can be understood as discursive systems; systems

where digital technologies are gradually developed and made understandable by the people who design, operate, and further develop them.

In summary, this thesis investigates how representations of the digital (i.e., digital platforms) manifest and develop over time. And further how these representations, made meaningful, influences mindsets, opinions, beliefs, and 'truths' in various areas of society (Bazerman, 1999). Accordingly, digital artifacts are both cultural and material (Dourish, 2017; Lee, 2017; Schulte, 2013). They are cultural in the sense that they are socially constructed technologies invented and implemented by engineers, developers and entrepreneurs who acts in already existing discursive systems; systems that shape (and are shaped by) actors, the tools they use, the way they perceive the world, and the technological artifacts created by them (Kallinikos, 2002). At the same time, digital artifacts exhibit features – materialities – that enable, constrain, or limit use (Dourish, 2017; Kallinikos et al., 2013). These features determine how digital technology can be approached, but unlike other types of technologies (where use is often limited to specific types of tasks), digital technologies are inherently incomplete and thus open to unexpected uses to a much greater extent (Kallinikos et al., 2013). Hence, the primary theoretical concepts guiding this thesis is *discourse* and *digital materiality*.

1.5 THESIS STRUCTURE

This thesis is divided into two parts: (Part 1) summary chapters (or kappa) and (Part 2) a collection of peer-reviewed papers and an unpublished manuscript (see table 1).

The outline of the summary chapters is as follows: (1) An Introduction to the thesis with aim and research question, (2) followed by a positioning section where related research is presented, (3) then, the thesis's two fundamental theoretical perspectives are discussed, (4) along with some thoughts on the research strategy, (5) coming this far, it is time to engage with the papers, (6) and then a broader discussion, where I follow up on things and topics that spans the papers; (7) and finally, a conclusion.

Table 1: The papers.

Papers	Authors	Research Question	Published at
1. Entrepreneurship in the Digital Society	Mikael Gustavsson Jan Ljungberg	How do the unique characteristics of digital technology and the digitalization of society affect entrepreneurship?	ICIS 2018
2. Platformization of a Cloud Service	Mikael Gustavsson Jan Ljungberg	How can we understand the process of platformization in the context of a cloud computing service?	ICIS 2019
3. Uber and the Swedish Taxi Market: A Discourse Analysis	Mikael Gustavsson Jan Ljungberg	How does digital platforms interplay with institutional forces in the shaping of new organizational forms and work practices?	SCIS 2020
4. Algorithms and Their Work: A Performativity Perspective	Mikael Gustavsson Jan Ljungberg	How can we understand algorithms performances in the world?	SCIS 2021
5. Organizing a Business Environment through Platformization: The Case of Uber	Mikael Gustavsson Ioanna Constantiou Jan Ljungberg	How does platformization interact with organizational strategy?	Unpublished manuscript

CHAPTER 2
POSITIONING

This thesis is positioned within related research on digital materiality, digital innovation, digital platforms and platformization. Although this is not an exhaustive review of the literature, representative perspectives on the various streams are outlined.

2.1 DIGITAL MATERIALITY

Digital technology is often presented as a flexible technology related to the abstract world of logic and software: As a "*technology without matter*, a conceptual scheme or frame in which a number of cognitive relations and procedures are laid out and ordered in ways that make possible their machine execution"(Kallinikos, 2012, p. 77; italics in original). Digital technology thus opens up to a greater extent than previous technology for arrangements and rearrangements (Yoo, 2013). However, despite these seemingly endless possibilities of becoming, this does not mean that the digital realm is free of what can be thought of as solidified representations (Hui, 2016). Representations that appear and evolve as ambivalent arti-

facts with specific but sometimes changing properties (e.g., algorithms, word processors, network protocols, databases, platforms) (Kallinikos et al., 2013; Leonardi, 2012; Dourish, 2017). When we discuss digital materiality, we are thus talking about how certain forms and functions of digital technology – shaped in a specific manner, over a longer period of time – exclude certain things while enabling others (Dourish, 2017; Kallinikos, 2012).

2.2 DIGITAL INNOVATION

One of the fundamental properties of Information Technology is the binary nature of computing (Kallinikos, 2009). As a direct consequence of this characteristic, it follows that the analog nature of reality can be reduced to binary variations, and that this transcendence enables people to reproduce and shape their (digital) reality (Kallinikos 2009; Baskerville et al., 2020). These variations can be interpreted as syntactic or semantic. Where syntax stipulates how things are written (bit sequence), while semantics is about what things mean (interpretation of bit sequence). Semantics is therefore concerned with the association between syntax and concepts (Lee, 2017). These basic characteristics are fundamental to digital innovation.

In turn, the fundamental properties underlying digital innovation are re-programmability, data homogenization, and the self-referential nature of digital technology (Yoo et al., 2010; 2012; Kallinikos et al., 2013). Characteristics that trough digitalization have opened up unprecedented opportunities for entrepreneurs and organizations as they enable digital innovation characterized by convergence and generativity (Yoo et al., 2012). Where convergence points to the digital technologies inherent possibility to fuse together previously separated infrastructures, services, and appliances (Tilson et. al 2010a; 2010b). This can, for example, lead to previously separate distribution channels (such as text, image, sound, video) merging and previously separated actors thus ending up within the same domain (Seo, 2017). Generativity, on the other hand, points to the nature of digital technology as intentionally unfinished – that digital technology can be compiled into a variety of different combinations (Kallinikos, 2012; Kallinikos et al., 2013; Yoo et al., 2010; 2012; Yoo, 2013). But this incompleteness can be ambiguous because the dynamic nature of digital

artifacts makes them difficult to control (Zittrain, 2008): "They are objects yet they lack the plenitude and stability afforded by traditional items and devices" (Kallinikos et al. 2013, p. 357-358).

2.3 DIGITAL PLATFORMS

The concept of digital platform has somewhat paradoxically emerged as a concrete, yet ambiguous entity in the discourse on digitalization (Gillespie, 2010). Concrete in the sense that different aspects of functionality and characteristics are described in the literature, while the very nature of digital platforms remains ambiguously floating between being an instance of software, an organization and a market. (Constantinides et al., 2018; de Reuver et al., 2018; Sutherland & Jarrahi, 2018).

Digital platforms mediate activities between buyers and sellers and/or provide technologies and interfaces to third parties to help them build their products and services (Kenney & Zysman, 2016). In a sense, the notion of 'digital platform' points to a constellation of digital arrangements (infrastructures, data, and algorithms) that serves to arrange and organize social and economic activity. Due to the platform's ability to create an infrastructure that encourages collaboration, communication, and shared value creation, they often operate at the heart of ecosystems (Parker et al., 2016; Iansiti & Levien, 2004). An important aspect of strategic thinking and ecosystems is that a digital platform can operate in several ecosystems at the same time. In one ecosystem, the platform can play a significant role as a central actor while operating more on the periphery in another (Iansiti & Levien, 2004).

This situation is exemplified in that some of the global digital platforms have grown into digital conglomerates of sorts, operating in various fields and ecosystems as they now do (see Hermes et al., 2020). Due to their ability of continuously leverage on technological capabilities (let it be platforms, infrastructures, or data) they are agile and elusive in nature – not afraid of approaching various markets or invent new ones – and often experiment with implementations of novel services, products, and business models through data-driven approaches (Mackenzie, 2019).

Various categorizations of platforms have been proposed in the literature (e.g., Evans & Gawer, 2016; Gawer, 2014; Moazed & Johnson, 2016;

Srnicek, 2017). These categorizations have in turn spurred various streams of research on the nature and characteristics of digital platforms. One stream understands platforms as ever-changing and continuously evolving artifacts, but primarily concentrates on how boundary resources has developed and changed (e.g., Ghazawneh & Henfridsson, 2013; Skog et al., 2018; Eaton et al., 2015). Hence, this stream acknowledges platforms, through the lens of boundary resources, as malleable, yet semi-stable artifacts consisting of interconnected components changing over time. Of lately, an adjacent perspective has occurred which also adhere to a process perspective but further recognize and inquiries into platforms tendency to slip across market boundaries – to mutate (Alaimo et al., 2020; Mackenzie, 2019; Gustavsson & Ljungberg, 2019). A perspective which highlights how platforms initially were developed as solutions to specific problems but often seems to evolve along unforeseen and open-ended trajectories (Garud et al., 2008; Henfridsson et al., 2018).

2.4 PLATFORMIZATION

The concept of platformization relates to the development of platforms but has been presented in slightly different ways in various research strands. In the stream of *software studies*, platformization has occurred as a notion which recognize the rise of digital platforms as dominant infrastructural and economic models (e.g., Helmond, 2015; Nieborg & Helmond, 2019; Nieborg & Poell, 2018; Van Dijck, 2021). Helmonds (2015) original thoughts on platformization points to a platform's ability to expand and function outside its digital border: I.e., a dual logic, where a platform extends and decentralizes as an infrastructural model into the wider web and then uses this infrastructure to centralize and make external data ready for its own platform to use. Thus, the opening up of a platform – via associated boundary resources (exposed API:s) – becomes an important and strategic prerequisite for platformization to occur and unfold. Others have suggested a broadening of the concept – where complementary ideas from the fields of business studies and critical political economy are incorporated – with the aim of researching platform expansion from a more institutional perspective (Nieborg & Poell, 2018). Thus, the concept of platformization as employed within software studies does not primarily

connote the actual development and evolution of the platform per se, but rather how a platform extends its functions and reach through the growth of an 'external' infrastructure (*infrastructuralization of platforms*; Plantin et al., 2018).

The *information systems* literature approaches the notion of platformization primarily by recognizing the becoming of platforms, i.e., how an infrastructure, or other digital artifacts, develops into a platform (e.g., Islind, 2018; Gustavsson & Ljungberg, 2019; Constantinides et al., 2018; Bygstad & Hanseth, 2018). One perspective emphasizes the importance of strategic actions, e.g., managing a multi-sided market, ignite positive feedback, pricing etcetera (Constantinides et al., 2018). While another adopts a more evolutionary perspective and understands platformization as an ongoing sociotechnical process rather than a radical shift (Islind, 2018; Gustavsson & Ljungberg, 2019). Bygstad & Hanseth (2018) accentuate the problems which prevails in several large, incumbent, silo-oriented infrastructures. Infrastructures which cannot simply transform into pure platforms. Through the notion of a 'platform-oriented infrastructure', the authors present a hybrid solution where a platform layer is applied over the various vertical systems. This layer contains boundary resources which then becomes critical artifacts in connecting the silo systems with their users. Hence, for Bygstad & Hanseth (2018) platformization does not primarily point to a full-fledged transformation, but rather a patchwork, where one can reap the benefits of platform thinking without breaking an existing, highly entrenched infrastructure.

CHAPTER 3

DIGITAL MATERIALITY AND DISCOURSE

> *People and technologies are distinctly different and have separable existence, exceeding their relations between them. At the same time, many of the capacities and properties we associate with both people and technologies are emergent properties of the structures they form together.* – (Kempton, 2022, p. 9)

The motivating factor for writing this thesis was to understand how digital platforms challenges existing cultures, norms, and ways of thinking. This is about technology for sure, but also about meaning making (Gillespie, 2010; Bazerman, 1998; 1999). Thus, **"**[w]hile information systems are technologically realized their meaning, use and effects in the social context are socially constructed [...]" (Cecez-Kecmanovic, 2016, p. 47).

To be able to reach to the technology in this thesis, literature is used that theorizes digital artifacts – their features and characteristics; literature that thus concerns *digital materiality* (e.g., Dourish, 2017; Kallinikos et al.,

2013; Yoo et al., 2010; 2012; Zittrain, 2008). Through digital materiality we can get at how certain forms and functions (Kallinikos, 2012), solidified over a longer period of time (Leonardi, 2012), can appear as digital artifacts (e.g., Kallinikos et al., 2013; Ekbia, 2009), infrastructures (e.g., Tilson et al 2010a; 2010b), or platforms (e.g., de Reuver et. al, 2018).

Although a specific digital artifact may be designed and developed for a given purpose (e.g., Google maps), the same artifact can then be reused more extensively to produce yet other artifacts in often unpredictable ways (Huang et al., 2021; Garud et al., 2008; Yoo, 2013). This openness in design leads to digital technology being experienced to some extent as "fluid", which can challenge established perceptions of how technology works. Thus, it seems that digital technologies can be guided by different evolutionary trajectories, which makes it highly relevant to investigate how said technologies are made meaningful by different actors and groups. What digital technology 'is', what it 'can do', what it 'can enable', and what it 'can become'. And to account for the meaning-making process the concept of *discourse* is used (Laclau & Mouffe, 2001). Discourse, as used in this thesis, aims to embrace, and explain how actors perceive and shape their 'reality' in certain ways; what is considered true or false, relevant or irrelevant, and what thereby enables or constrains alternative ways in which a topic can be defined and understood (Howarth & Stavrakakis, 2000; Laclau & Mouffe, 2001). Understood in this way, discourses are unfixed systems of meaning, but which are often experienced as self-evident and taken for granted.

3.1 DIGITAL MATERIALITY

> *[C]omputation relies on a new type of materiality that disrupts some of the concepts that are fundamental to philosophy, for example, what is an object? Does a digital object have substance (or is it possible to talk about it in this way?)* – (Hui, 2016, p. 3)

What is digital technology, really? Can we think and reason about it as being made of something, of some kind of 'matter'? These questions are relevant to ask in a thesis that aims to treat and describe a society in digital

change. One way to describe the evolution of digital technology would be to trace its material evolution (i.e., hardware): The development from the early computers that were built using vacuum tubes, via the development of discrete transistors, through the subsequent development of computers built on integrated circuits where a cluster of transistors were integrated on a chip, to microprocessors. This would be a way of explaining the evolution of computation as a kind of force; that is, how the development of different types of materials has enabled for orders of magnitudes of compute to emerge and digitalization to occur. But this thesis instead focuses on how digitalization in turn has generated an environment of pervasive digital technology where 'technology' has paradoxically been abstracted from something we recognize as material. So, the focus is not primarily on the physical materiality (or hardware), but on the software-related processes working there. A focus which recognizes that "[...] current technological developments signal a qualitative change. Digital artifacts are intentionally incomplete and perpetually in the making" (Kallinikos et al., 2013, p. 357).

If we are to navigate this environment with reasonable certainty and precision, we need to address and engage with its various manifestations, their 'materialities' and qualities (e.g., Adner et al., 2019; Yoo et al., 2010; 2012; Dourish, 2017; Kallinikos et al., 2013). For example, some digital artifacts can be said to operate and function in a fairly robust and consistent manner over time (e.g., apps, programming languages, word processors, databases, network protocols). This invites us to start thinking and reasoning about software and digital technology having a material dimension; that these artifacts seem to have solidified and thereby achieved a kind of computational, or digital, materiality. A materiality that enables and/or constrains, but unlike the materialities of previous technologies may prove more (or less) malleable over time. Hence, when I refer to digital materiality (or maybe even materialities; c.f. Dourish, 2017), I am "referring to the ways that [...] digital materials are arranged into particular forms that endure across differences in place and time" (Leonardi, 2012, p. 29).

One of the challenges of reasoning and writing about digital technology is that the very concept of 'digital technology' tends to become so all-encompassing that it risks losing relevance. That is, by not being too specific about what 'digital technology' is (by abstracting away technologies

such as networks, computers, mobile phones, applications, programming languages, operating systems, databases, network protocols and whatnot) one can talk about almost anything but paradoxically not say that much, at least when it comes to technology. Sometimes this abstraction can be used deliberately to obscure the granularity of technology when one is not primarily interested in the details of technology, but what it enables or limits, and thus how it affects. But if one is specifically interested in what it is about digital technology that contributes to its transformative effect, one needs to think about and investigate what characteristics such technology possesses (Kallinikos et al., 2013). As an example, consider the following two examples of 'digital technology': (1) For the Internet to function as a reliable mechanism for forwarding data packets – and thereby enable the exchange of digital information – technologies need to be stable and standardized. Hence, the TCP and IP standards that are fundamental to the functioning of the Internet has basically looked the same for decades (Clark, 2018). (2) Now, compare that set of technologies to an operating system, like Windows or macOS; they are software systems in constant change, partly in terms of functionality but also in terms of security. These are just two examples of what could be considered 'digital technology' but that develop fundamentally differently over time. Although both can be considered generative, one is characterized by stability and continuity, while the other is characterized by change and evolution.

Another challenge in reasoning and writing about digital technology, closely related to the first, is how to understand (and if necessary, describe) the transcendence between physical materiality (e.g., routers, fiber-optic cables, and servers) and digital materiality (e.g., network protocols, operating systems, and word processors). Returning to the earlier description of digital technology as malleable, one might be tempted to equate digital materiality with clay and thus imagine a potter/programmer shaping a lump of clay/code into various artifacts (e.g., vases, bowls/apps, databases). While this analogy serves a purpose in describing the creative potential latent in the digital, there is a fundamental difference between the clay and the digital, I would say. Clay can be intuitively recognized as a physical, tangible, moldable substance, but how can one perceive and recognize the digital? Without a deeper reflection, what we are trying to understand here as digital materiality would almost be perceived as a form of magi-

cal substrate that appears out of thin air. But digital materiality derives from physical entities and processes: For example, from large quantities of transistors that do their work in computers; storage media that allocate and deallocate memory; signals that carry data in fiber optic cables and over wi-fi networks. Hence, as these physical operations passes layers of technology – layers that gradually peels away a tangible world – and reaches the top of the stack (e.g., an application, a streaming service, or a programming IDE), physical materiality has, in a sense, morphed to digital materiality. And here, among layers of technology, the clay analogy sort of cracks. Because while the clay undoubtedly is the one substrate that the potter works with, one cannot be so sure when it comes to the digital.

Let us consider the phenomenon of 'Low Latency Trading' (Mildenberger, 2022). Through algorithmic trading, asset managers and stock traders strive to gain an advantage in the market by acting more swiftly than their competitors. In this context, the term 'latency'[6] takes on different meanings at different layers of the stack that runs between physical and digital materiality (or conversely one could say that each layer contributes to the full understanding of what 'latency', in this specific context, is). At the lower levels, latency refers to how fast data packets travel through a network. In algorithmic trading, the actual (cable) distance between transmitter and receiver plays a significant role – the shorter the faster. In addition, the material properties of the network cable may also affect how quickly a data packet is transferred. Moving up the stack, 'latency' incorporates how fast computer programs executes. Therefore, the architecture of the executing computer systems matters, i.e., what types of processors, memory, storage media, network cards, etcetera. Now, the operating system comes in as an interpreter and orchestrator, dictating how (quickly) instructions in software are translated into operational events for the underlying hardware system to act on. The operating system is thus a layer that, on the one hand, manages the underlying hardware, while at the same time acting as a kind of digital canvas for the upper layers to operate on. In these upper lay-

6 Latency is a term used to describe 'network performance', where latency is then the delay between a transmitter and a receiver of network packets. One way to define latency - i.e., 'round-trip latency' - is to measure the elapsed time between a transmitted network packet and the response received for said packet.

ers, latency also encompasses the performance of software and algorithms. For example, when building an application, the choice of programming language can make a difference, but also how efficiently the program itself is composed.

The very concept of latency thus has a clear meaning in network communication – how quickly packets are transported over a line – but how 'latency' is then experienced by a user can be affected by the different layers in the digital stack. This means that digital materiality is not only difficult to deal with conceptually, but also that one's level of analysis – on which layer or layers of the digital stack one focuses on – can affect what one is trying to convey. As the example intends to show, what 'digital technology' entails can differ markedly depending on focus. As the example also shows, the digital stack consists of several layers, from the lower hardware-based, to the more software-based layers such as operating systems and programming languages, and on top of them the applications we as end users encounter in our everyday lives. Hence, the concept of 'digital technology' can embrace a lot and thus sometimes appears to be quite vague, especially when it comes to understanding how specific representations of technology affect. To remedy this, additional specificity is required.

In *The stuff of bits: An essay on the materialities of information* Paul Dourish (2017) outlines how representations and forms of digital information possesses properties (i.e., materialities) "that constrain, enable, limit and shape the ways in which those representations can be created, transmitted, stored, manipulated, and put to use" (p. 6). However, digital materiality should not be considered as a kind of substance but should rather be understood as how digital artifacts come into existence through relations (Kallinikos et al., 2013; Hui, 2016). The emphasis on relations here speaks of an artifact that is assembled and thus exhibits a kind of materiality and form, but which is open to change as relations can change over time (Faraj & Leonardi, 2022).

Using materiality/materialities as a theoretical lens can therefore help to open for a more exhaustive investigation and subsequent understanding of how specific representations of the digital (e.g., applications, network protocols, databases, word processors, cloud platforms, IoT sensors) emerges, operates, and affects. It is thus a perspective that can help us explain digital representations and forms as evolving artifacts in a material world, and not just as something that pops up from nothing.

3.2 DISCOURSE

> *"As technologies and societies become more complex, so do the symbolic accompaniments to the material technology."* – (Bazerman, 1999, p. 336)

There exist a wide variety of approaches how the concept of discourse is presented and utilized (Jørgensen & Philips, 2002). This thesis aligns to the strand of discourse theory as developed by Laclau and Mouffe (2001) in *Hegemony and Socialist Strategy: Towards a Radical Democratic Politics*. It is also heavily inspired by Bazerman (1998; 1999) and his thinking on rhetoric and technology.

Discourse theory (Laclau & Mouffe, 2001) assumes a systemic thinking where a discourse is understood as a system of meaning, a system within which people navigate to make their 'world' meaningful. Discourse theory also presupposes an 'objective' reality where, for example, rocks, waterfalls, earthquakes, meteors, and gravity exist, but where these phenomena are made meaningful through discourse: "Discourse is not the same as the material, but still very necessary to make sense of it" (Carpentier, 2017, p. 19). This perspective aligns with Bazerman's (1999) view on technologies as potent artifacts built in social worlds. Worlds of symbolic transactions and meaning attributed discourses. For example, Bazerman's notion of 'symbolic engineering' emphasizes the importance of "the development of symbols that will give presence, meaning, and value to a technological object or process [...]" (p. 335).

Thus, a discourse represents a 'reality' made meaningful in a certain way and specifies, for example, what is considered true or false, relevant or irrelevant, thereby limiting alternative ways in which a 'thing' can be understood and defined (Howarth & Stavrakakis, 2000; Laclau & Mouffe, 2001). This way of looking at things echoes Leonardi's words when he writes about sociomateriality (2012, p. 37):

> Materiality exists independent of people, but affordances and constraints do not. Because people come to materiality with diverse goals, they perceive a technology as affording distinct possibilities of action. The perceptions of what functions an artifact affords (or constrains) can change across different contexts even though the artifact's materiality does not.

To adopt this perspective is to realize that, for example, a digital platform is articulated as a meaningful object in discourse both depending on its materiality, how parts of digital technology are organized and stitched together, but also how it is understood and conveyed by actors in already established social structures. Thus, the same digital platform (materially speaking) can be perceived differently depending on, for example, intention, experience, knowledge, and worldview.

This approach to discourse lends itself well when trying to think about and explain scenarios of digital transformation and change. As the theory is sensitive to both continuity and discontinuity – where discourses emerge as a result of the interplay between discursive path shaping and dependence – it can be used in situations where taken-for-granted knowledge exists (products of discourse), and where new phenomena may question this prevailing order. A conceivable scenario where one could apply the theory would be when a digital platform questions an organization's way of working, its established routines and thus challenges prevailing worldviews and existing systems of meaning.

Laclau and Mouffe's (2001) discourse theory is grounded in a macro-textual approach (Carpentier, 2017), where a broader definition of 'text' is employed, and where text can be understood as a materialization of systems of meaning. Unlike micro-textual approaches, where focus is targeted more specifically to the use of language, a macro-textual perspective pays attention to meanings and representation embedded in text and not so much how language itself is employed. Thus, discourse theory takes a broad perspective on language and texts where a focus on how meaning is created, represented, and communicated. Hence, "[i]n this macro-textual approach, where discourse becomes discourse-as-representation, or discourse-as-ideology, the focus is placed on the meanings, representations, or ideologies embedded in the text […]" (Carpentier, 2017, p. 15-16).

One of the underlying assumptions of discourse theory is that discourses are social and political constructions that establish systems of relations between objects and practices, thereby providing positions that social actors can recognize. Accordingly, identity is moulded through relation between objects. Therefore, a political project aims to weave together different strands of discourse to control a field of meaning (Torfing, 2005; Howarth & Stavrakakis 2000). Discourse theory is interested in and analy-

ses how social actors articulate the various discourses that make up social reality. To understand how this is achieved, we briefly go through two categories that form the basis of the theory: discursivity and discourse (Howarth & Stavrakakis 2000).

Discursivity is the theoretical horizon within which 'all' objects exist. This means that every 'object' can be incorporated into a discourse, thus there is nothing social that is determined outside the realm of discursivity. However, this does not mean that discourse theory denies the existence of a physical, objective world. Instead, the meaning of an object, its social construction, depends on the discourse within which the 'object' is articulated and perceived (Nabers, 2015; Laclau & Mouffe, 2001; Howarth & Stavrakakis, 2000). From this follows a view that society is unfixed and imbued with uncertain, indeterminable 'things'. An assumption that leads to the idea of the social as inherently unstable, that it is never closed but always open to change (Nabers, 2015).

Discourses are then perceived as systems of meanings that arise within the field of discursivity (Howarth & Stavrakakis, 2000; Åkerström Andersen, 2003). Hence, social practices are carried out through discourse. Whatever we think, say or do is coloured by discourse, and in turn discourse is constantly modified by what we think, say, and do. (Torfing, 2005). Hereby, meaning is acquired and built through discourse. Thus, discourses define societal structures. An important characteristic of a discourse in the discourse theoretical tradition is that it is political; that it implies antagonism and the ongoing struggle between outsiders and insiders. Thus, discourses are always exposed to political forces and dislocations of their structures. Consequently, discourse cannot really be understood without reference to transformation, uncertainty, and change (Nabers, 2015; Howarth & Stavrakakis, 2000).

CHAPTER 4

RESEARCH STRATEGY

Digital technology is socially constructed (it is, after all, constructed by humans in existing, discursive systems) and thus open to human choices, desires and preferences in design and use. But it is increasingly difficult to neglect the structural characteristics of major digital platforms (Rahman & Thelen, 2019; Van Dijck, 2021; Narayan, 2022); characteristics which question if we have a choice whether we want to use their functionality or not. At one level, of course, it is reasonable to assume that we always have a choice to opt out, but the ongoing digitalization has raised the stakes for that choice. That is, as more and more social functions are digitalized (a digitalization often made possible either directly or indirectly by large digital platforms), our eventual choice to refrain from use may lead to limitations in our lives. As many of the digitalized solutions in our society shift from interesting complements of traditional practices to necessary and fundamental infrastructural building blocks, we are herded into spaces of digital use.

As indicated in the introduction, the motivation for doing this PhD project was to understand and research the digitalization of society. But I

realized early on that to be able to research how individuals, companies, institutions, or society in general are affected by digital technology, there was a need to understand and make comprehensible how this technology is formed – how it functions and develops (Faraj & Leonardi, 2022 ; Flyverbom, 2022; Kallinikos et al., 2013; Nambisan, 2017). Therefore, an engagement in the conceptualization of technology became the primary research focus going forward. And where the empirical habitat became primarily what is described in the literature as 'digital platforms'. A phenomenon I had a practical interest in, and where I saw openings to contribute to the knowledge of the same (de Reuver et al., 2018): That certain platforms have scaled to proportions which are difficult to fathom (van der Aalst et al., 2019), and where their increasing reach in the tangible world (i.e., connectivity and geographic reach through cables, data centers and servers) and increasing complexity in the digital realm (i.e., large amounts of services; interconnections between platforms; achieving infrastructural status) poses a clear theoretical challenge. A challenge that consists in how to embrace them (i.e., level of abstraction) and write about them as 'objects' in constant change, (i.e., to perceive them both as a being and a becoming) (Cecez-Kecmanovic, 2016). Furthermore, since these platforms increasingly affect our society on a macro level (Baskerville et al., 2020), we need to supplement studies based on how organizations and individuals use these platforms in local contexts with studies that focus on the phenomenon itself (Williams & Pollock, 2011); however interesting and illuminating research on a digital platform in local contexts may be, they can hardly explain how the phenomenon itself has come into existence and how it operates on a grander scale (Kallinikos, 2004).

The research strategy therefore came to diverge from the perhaps more popular perspective of use to primarily focus on what is being used – that is, the platform itself. I thus engaged in my research with the idea that if we are to understand how these platforms function and by extension affect individuals, organizations, and societies, this more platform-centric perspective needs to be explored and theorized (Williams & Pollock, 2011). Also, I recognized that to be able to understand how these types of sociotechnical constellations grows into macro-phenomena of our everyday life, they need to be studied in a historical context (Kallinikos, 2004). Consequently, to be able to participate in meaningful discussions about how

digital platforms affect societies, we need to trace their origins and chart their evolution – only then, I think, can we begin to perceive their sociotechnical essence, what they are and can become.

4.1 RESEARCHING DIGITAL PLATFORMS

In *The digital platform: a research agenda*, de Reuver and colleagues (2018) notes that the digital platform has begun to find its way into the mainstream of information systems literature. At the same time, they point out that the 'digital platform' as a sociotechnical concept is difficult to embrace on an overly abstract level. The challenge, I would say, is to find the right level of generalizability: That is, how much of the sociotechnical complexity can be stripped away in pursuit of a broad understanding and applicability of the concept, while not abstracting too much and ending up in a situation where the 'digital platform' has lost much of its connection to technology. Evidently, digital artifacts appear as cultural and material creations (Doursih 2017; Lee 2017; Schulte 2013). Hence, there is a consensus that technology and society affect each other. The question then becomes in what ways can we understand and investigate this situation. That is, how can we approach these phenomena as empirical phenomena.

Orlikowski and Iacono (2001) made us mindful to the importance of finding and theorizing the IT artifact. For sure, it is still a relevant and necessary exercise to undertake when one intends to discuss the sociotechnical. But a challenge in trying to investigate, understand and theorize ever greater creations (Williams & Pollock, 2011), such as digital platforms, is to decide, define and depict what that artifact really is (Couldry & Kallinikos, 2017). Thus, to be able to embrace them we need to reach a necessary (high) level of abstraction. For example, a cloud platform can consist of countless services, many of which are accessed via APIs. If we were to study any one of these services individually, we could be more concrete in our analysis because we would then be able to directly relate the material part (the API) to our theorizing. But to conceptualize the 'cloud platform' as a sociotechnical entity we need to find "a good-enough way to reason about materiality on a high enough abstract level" (Gustavsson & Ljungberg, 2019, p. 4). The concrete technology constituted by all individual services thus needs to be aggregated into more comprehensive

theoretical constructs. This in turn means that the more concrete description of specific technology is in a sense 'peeled off' as we rise in levels of abstractions. But that doesn't mean the technology is not there, just that it is now implicitly present. In my case, this behavior becomes apparent as the data analysis initially engages with the specific technologies described in the empirical material, but where the overall analysis ends up in a more aggregated and abstract description of the technology in terms of 'narratives' (paper 2) and 'patterns' (paper 5).

Perceiving technological artifacts as discrete and fixed stems from an expectation (intuition) that technology is static. From this follows a view where technology is expected to be relatively easy to categorize, and that artifacts stay within their categories over time (e.g., a sewing machine, microwave oven, a coffee maker). This assumption about how technology works and develops invites high levels of abstraction, I think. But what makes digital technology different, and thus challenges this assumption, is its inherent possibility to be restructured (Kallinikos et al., 2013); to be used for purposes other than those originally intended (Henfridsson et al., 2018); to drift (Ciborra & Hanseth, 1998).

One reason why it may be difficult to perceive artifacts of digital technology as ever-changing things is because of their *invisibility*, that "[t]echnical mediations can be thoroughly 'metabolized' in collective life, to the extent that they become an invisible infrastructure […]" (Mackenzie, 2002, p.213). If we take an app that connects to a platform as an example, then that app becomes part of a larger whole; part of a comprehensive system that exchanges data and information. As users, we thus confront interconnected systems (e.g., digital platforms) through their front-end interfaces, such as apps on our phones or websites in our browsers. Accordingly, a user may talk about 'technology' in terms of how these interfaces changes over time, how some new type of functionality is introduced to the app, but the individual user cannot really say much about the (invisible) underlying infrastructure, how systems are interconnected, where data is transported, how often algorithms are updated, etc. Yet these are things that affect the user either more concretely (like a new button in the app) or more subtly (like a change in an algorithm).

Most often, I think we tend to relate to and think of digital platforms through their outcomes, what they do, and not how they are being built.

This perspective obscures us from an understanding of digital platforms inherent technological capacity to change and evolve. Thus, "[w]e are generally oblivious to the variety of structures which similarities of use conceals" (Dumouchel, 1992, p. 410). Imagine two digital systems that produce the same result, but with different architectures, and that we could somehow perceive this difference – as we do when we compare a scythe and a combine harvester (both produce the same outcome, but are very different in form, function, and modus operandi). But our eyes (as well as our perceptions in general) are veiled to most of the building blocks of the digital domain. Apps thus become keyholes through which we can perceive functions that digital platform affords, but keyholes with limited possibilities to discern a digital platform's mode of existence. As Clark (2018) puts it in his reflection on *Designing an Internet*:

> The Internet is not just a technical artifact connecting computers but also a social artifact connecting people that is deeply embedded in society. Users do not directly observe the core architecture of the system – they partake of the system using the applications that are designed on top of it. (p. 47)

Hence, we need ways and means to expose the digital phenomena we are trying to explore, and which can help us describe, understand, and explain the technological reality of which we are a part (Bakerville et al., 2020).

4.2 ON DATA COLLECTION AND ANALYSIS

Since the aim has been to research digital platforms and their effects from various perspectives, the specific research design approach differed between the papers (e.g., case studies (papers 2 and 5), discourse analysis (3) or conceptual paper (1, 4)). But one thing that most of them have in common is the choice of data and how it was collected. Given my interest in major, global platforms and how they have evolved over time, it seemed natural to search for data on the web (Helmond & van der Vilst, 2019). And then mainly in the form of blogs since this is a type of data that in a way encap-

sulates time (in a piece of text), over time[7]; it thus opens for the possibility of investigating how different actors understand and convey their 'reality' at specific moments in time. This way of collecting data has become more and more established (e.g., Eaton et al., 2015; Skog et al., 2018; Alaimo et al., 2020; van der Vilst et al., 2022).

One of the advantages of using web-based data is the large amount of data available; information that I probably would not have been able to access using other data collection methods (Rogers, 2013). However, this amount of data can become a kind of disadvantage if you do not reduce and structure the data in a systematic way (Urquhart & Vaast, 2012). Another disadvantage of this type of data is that one cannot ask follow-up questions and orchestrate the "conversation" as one would in a proper interview situation. Furthermore, it can be argued that a blog could be linked to a public image that a specific company wants to convey. But I think it is reasonable to consider that blog posts are of no worse quality than data collected through, for example, interviews.

In an attempt to get close to the technology, I have largely used data from various so-called engineering blogs. The content of these blogs is largely technical and describes, at different levels of the digital stack, how the platform develops. Just to illustrate: In working on the Cloud paper, we were searching for a way to articulate the platformization of Microsoft Azure. Thus, we searched for an archive that would provide us with a rich data set regarding both the material aspect of, and the discursive work that has occurred on, the platform over time. Here we found the official Microsoft Azure blog to be particularly well suited. The blog provided news and information about what happened (and had happened) on and to the platform, such as new software releases and updates (material aspect), as well as information about conferences, courses, cost structures, organizational changes, acquisitions, etc. (aspects of discursive work).

Two interesting analytical aspects with respect to this type of data are: (1) Often the blog posts are written by authors who either developed the solution themselves or who were in close contact with those who devel-

7 In some papers, the blog data has been supplemented with other types of data, such as books, reports, white papers, news articles and YouTube videos (interviews and presentations).

oped it; a circumstance that makes it possible to get "close" to the technology in a way that would otherwise have been difficult. Given that major, digital platforms (which are the focus of this thesis) employ various engineers/system developers/architects etc., it would in principle be impossible to conduct interviews with everyone[8]; here, instead, I get access to their ideas through the blog. (2) The blog posts are written in the "now" so to speak and thus constitute opportunities to access and understand how the author/authors reasoned about a specific topic at a given point in time. This type of data can thus open for credible explanations of technological evolution; explanations that can seriously engage with how a particular technology was developed and perceived at a given time, but how that perception and what the technology can achieve may change over time.

8 But even if I managed to get interviews, I imagine they would be conducted in more general terms than the technical depth the authors can convey when they calmly reflect and write about their solutions.

CHAPTER 5

THE PAPERS: COMMENTS ON ORIGINS, THEORY AND METHOD

In what follows, a summary of each paper (see table 2) is presented along with reflections on the process of writing them. The papers reflect an intellectual journey and the interests that developed over the years it took to complete. Although they primarily were developed and shaped to stand on their own, they have interdependencies and thus contribute to a larger whole. Given the increased theoretical/philosophical nature of the thesis, it can be read in two different yet complementary ways: A practical and pragmatic one, and a more philosophical one.

On the surface, this thesis is about how we can understand different aspects of digital platforms: How digital materiality (where platforms emerge as solidified instances of the same) question previous theories on how individuals and companies discover, create and manage opportunities (paper 1); how digital platforms comes into existence, operates and evolves (paper 2 and 5); how digital platforms integrate with existing discursive systems (paper 3); and how algorithms – the engines of platforms – work and function (paper 4). Thus, this thesis depicts an emerging landscape

where taken-for-granted beliefs and truths, manifested by prevailing institutions and markets, are challenged by digital platforms; platforms which in turn are enabled by large-scale, cloud-based infrastructures. A landscape where algorithms and algorithmic chains – working in and across platforms – influence how a digital society is realized.

But on a deeper level, and as alluded to it the preface, this thesis deals with something more fundamental, namely: How to understand digital technology and change. That is, the (human) ability to imagine what digital technology is, enables and can become. In this latter perspective, the 'digital platform' is more to be considered as an empirical and emblematic example. An example that enables me to think and write about digital materiality as solidified representations in the digital realm. In this more philosophical project, I investigate whether the prevailing notion of 'digital platform' is an appropriate metaphor for how certain types of digital technologies (often provided by so-called 'big tech' companies) are shaped and then integrated into ever wider and more complex sociotechnical networks.

Table 2: The papers.

Papers	Authors	Research Question	Published at
1. Entrepreneurship in the Digital Society	Mikael Gustavsson Jan Ljungberg	How do the unique characteristics of digital technology and the digitalization of society affect entrepreneurship?	ICIS 2018
2. Platformization of a Cloud Service	Mikael Gustavsson Jan Ljungberg	How can we understand the process of platformization in the context of a cloud computing service?	ICIS 2019
3. Uber and the Swedish Taxi Market: A Discourse Analysis	Mikael Gustavsson Jan Ljungberg	How does digital platforms interplay with institutional forces in the shaping of new organizational forms and work practices?	SCIS 2020
4. Algorithms and Their Work: A Performativity Perspective	Mikael Gustavsson Jan Ljungberg	How can we understand algorithms performances in the world?	SCIS 2021
5. Organizing a Business Environment through Platformization: The Case of Uber	Mikael Gustavsson Ioanna Constantiou Jan Ljungberg	How does platformization interact with organizational strategy?	Unpublished manuscript

5.1 ENTREPRENEURSHIP IN THE DIGITAL SOCIETY

The idea for this paper originated from a curiosity about the prefix 'digital', and how it in some sense helps to describe phenomena influenced by digitalization, such as 'digital marketing ',' digital law ', or for that matter, 'digital platform'. More specifically, I was interested in how the concepts of 'entrepreneur' and 'entrepreneurship' – the theories and frameworks about the same – have been handled and presented in the literature in relation to the digital. A review of the literature showed that entrepreneurs and their activities in the digital realm are named in a number of different ways (e.g., Internet entrepreneur, e-commerce entrepreneur, digital entrepreneur). In addition, three themes emerged which described how the authors chose to discuss the impact of digital technology in relation to entrepreneurship (e.g., 'as technology', 'as trait', or 'as process').

In the paper *Digital Entrepreneurship: Toward a Digital Technology Perspective* Nambisan (2017) acknowledges that things have been written about entrepreneurship and the transformational power of digital technology, but that there nevertheless is a lack of relevant theories and frameworks which describe and discuss *how* digital technology makes a difference. This statement inspired further thinking about how to conceptualize and theorize 'digital entrepreneurship' by taking technology seriously, using an adequate language, concepts and theories that could help express the characteristics of digital technology. Consequently, the discourses on digital artefacts (e.g., Kallinikos et al., 2013) and digital innovation (e.g., Yoo et al., 2010; 2012) came to form the basis of a theoretical framework; a framework that compares various digital properties with different types of technological representations that manifest in the digital realm; representations which in turn could be perceived, used, and leveraged as entrepreneurial opportunities.

By departing from recognized and established dimensions in entrepreneurship theory, the paper intends to investigate how these are affected (or not) by the qualities of the digital. After the presentation and discussion of the framework, we engage in theorizing and apply the framework to the previously presented (entrepreneurship) theoretical dimensions – we reflect on and discuss how they are affected (or not) by the qualities of the

digital. Our reasoning ends in an open question: Is the digital entrepreneur a new species, or should we talk about entrepreneurship in the digital society? Hence, we ask whether one can see the digital entrepreneur as a new phenomenon, or whether one should perceive the entrepreneur as operating in a digital context – a context with new logics and rules of the game that needs to be learned and related to.

This paper contributes in two ways: (1) It tries to take the digital seriously and thus tries to define qualities of the same, summarized in a framework. A framework that in turn is applied to existing dimension of entrepreneurship theories, and thereby seeks to problematize and discuss how (or if) the digital affects the entrepreneur as a theoretical concept. (2) In a broader perspective, the paper can probably serve as a template for how to study and conceptualize the impact of the digital on already established fields and their theories. Thus, the paper can help when trying to find a language that captures the transformative in digital technology.

5.2 PLATFORMIZATION OF A CLOUD SERVICE

The motivation for writing this paper stemmed from a curiosity about cloud platforms and their evolution. Over the years, cloud platforms have grown in terms of service offerings and are becoming indispensable for individuals, entrepreneurs, organizations, and society at large. As the title of this thesis hints at, a key issue is what we can describe and what might be outside the limits of discourse. Given the increasingly sophisticated technological capabilities and rapid development of cloud platforms, we may lack the language and theories to describe them.

One problem is that a cloud platform consists of multiple services (such as storage, machine learning, analytics, etc.), which makes it hard to find a sufficiently abstract level to describe, understand, and reason about the 'cloud platform' as one entity. For example, we can imagine accessing a service such as a face recognition API on a cloud platform. A service which in turn consists of several different sub-services. And if we continue down the stack, we eventually end up in the more physical reality of data centers and server rooms, switches, and routers and how signals travel through fiber optic cables. It is thus important to find the right level of abstraction (Burton-Jones et al., 2015) which allows one to write about technology at a 'cloud platform' level.

However, taking a purely material perspective would have limited the scope of the analysis and thus what I had the opportunity to research here. I could see in the empirical data (the blog) that the technology was there, but I also experienced a form of continuous meaning-making; how the authors of the various blog posts on the one hand described the technology in detail, but also how they often discussed how it would/could/should be used.

Here Bazerman's (1999) notion of 'symbolic engineering' opened new vistas in my thinking on how to understand a cloud platform. As Bazerman (1999) writes: "Thus, it is useful to extend the notion of heterogeneous engineering to encompass symbolic engineering; that is, the development of symbols that will give presence, meaning, and value to a technological object or process within a discursive system" (p. 335). Henceforth, I no longer came to perceive the authors of the various blog posts as just engineers who design and develop technology in a traditional sense, but also as symbolic engineers who convey meaning to the artifacts they have created. Bazerman (1998; 1999) thus became a source of inspiration for building a framework that would consider both the digital material aspects of the platform and the ongoing meaning-making of the same.

At this stage, the concept of platformization (Helmond, 2015) came to play an important role in theorizing. Coming this far in my thesis work, I perceived platformization as a process that explained how a platform, as a sociotechnical artifact, developed. A process that recognized and reflected technology and technological change as well as strategy, and thus digital materiality as well as discursive work. A perspective which emphasized that strategic decisions and digital technology are reciprocal greats, where the discursive work highlights that technology is not an objective, static "thing", but a contingent creation where engineers build, develop, and maintain technology through their understanding and imagination of what technology can make possible.

The paper's main contributions are: (1) To build on and further develop the notion of 'platformization' (as theorized by Helmond (2015) based on a study of a social media platform) by considering the characteristics of cloud platforms. (2) A proposed process perspective of platformization anchored in the platform's technological capabilities (digital materiality) and the continuous meaning-making (discursive work) that makes the artefact comprehensible.

5.3 UBER AND THE SWEDISH TAXI MARKET: A DISCOURSE ANALYSIS

This paper, along with the fifth, originates from an interest in Uber as a phenomenon. Three things motivated this paper: (1) Uber's evolution as a sociotechnical artifact. Hence an interest in how such a large digital platform has come into existence and continues to develop. I consider Uber as a paradigmatic example of a certain type of sociotechnical evolution. Thus, I saw a chance to approach Uber as an empirical example of a specific digital platform, but with the intention to investigate whether there were underlying mechanisms that could explain how the broader category of 'digital platforms' operate and evolve. (2) Uber's identity and how we should categorize these types of organizations. Unlike traditional companies (but like other large, digital companies), Uber appears to drift (Ciborra & Hanseth, 1998). That is, Uber was developed as a solution to a specific problem (taxi) but over time has entered other markets (for example, food delivery and freight). This makes one wonder: What is Uber? (3) Uber as a sign. How they are made meaningful, partly through their own representation but also how they are perceived by other actors in markets they enter. This approach, I realized, should have an inside/outside perspective: It needs to reflect how Uber imagines, understands, and communicates its technology (i.e., inside), but also account for how actors incorporate (or not) Uber as a meaningful phenomenon in an existing discursive system (i.e., outside).

This paper concerns the third aspect, and the premise was to investigate how a digital platform is made meaningful within an existing discursive system. More specifically I wanted to analyze two discursive regimes ('the Swedish taxi market' and 'Uber's engineer discourse') coming together and trying to negotiate (or win) a third. Here, Uber's entry into the Swedish taxi market constituted a good empirical basis for analyzing how digital technology can challenge existing structures (c.f. Gustavsson, 2017); structures where technology manifested as material representations are crucial, but at least as important are people's perceptions of these representations and what they enable or constrain (Reimer & Johnston, 2019). Thus, this paper investigates, on the one hand, how the Swedish taxi market reasoned about 'technology', but also how Uber understood and portrayed the digi-

tal technology that they themselves developed and offered. It would then be possible to compare these two discursive regimes and further reflect on what a potential third regime could mean.

I decided to use Laclau and Mouffe's (2001) discourse theory. The strength of using Laclau and Mouffe's discourse theory in this case can be summarized as follows: (1) It opens for an analysis where one can examine different groups' various comprehension and understanding of the same, material phenomenon (and in this specific case, in how groups perceive and think of (digital) technology). (2) It enables and encourages an analysis of historical events; for example, institutions are not perceived as complete entities a priori but 'things' that emerges over time as a form of discursive materiality. (3) That there is an objective reality, but we as humans, in our will to understand and comprehend the same, interpret this reality in different ways given our experiences, knowledge, culture etcetera. These points echo John Searle's (2010) thoughts on the nature of human society and the mode of existence of social entities in that "we have to avoid postulating different ontological realms […] [w]e are just talking about one reality, and we have to explain how the human reality fits into that one reality" (p. ix-x).

The discourse analytical work carried out in the paper thus came to investigate and expose two different systems of meaning (or discursive regimes) – "The Swedish taxi market" and "Uber Engineering discourse". The analysis concluded that they could operate side by side relatively unproblematically until faced with the question of how to understand digital technology as specifically put forward in a state public inquiry (SOU) regarding 'a new category of taxi'.

The paper makes two contributions: (1) On the one hand, it contributes as an empirical case how a digital platform enters an existing market, and where the platform needs to relate to the market's historical development in order to integrate as a relevant actor in the existing discursive system. (For example, there are markets where Uber has not been able to enter due to regulatory barriers). The focus here on the discursive emphasizes perceptions and meaning making, and by juxtaposing the two discursive regimes I open for an explanation of how two different 'worldviews' (Reimer & Johnston, 2019) can (or tries to) coexist while they understand and perceives (digital) technology differently. (2) Since discourse

theory can explain institutional development, it appears as a fruitful but perhaps overlooked framework for understanding digital technology and its change in organizations and institutions. There are a lot of different 'voices' on what specific types of digital technology is, and how it could/should/would be used, but sometimes perhaps without what Bazerman (1999) would call 'material accountability'. Here, discourse theory can be a rewarding approach to critically examine and expose different systems of meaning which are formed around digital technologies (such as, for example, blockchain, IoT and AI). Technologies that may be difficult to define due to their elusive nature; a fact that can lead to a form of semantic vagueness which opens for interpretations and constant negotiations about what a technology is (or not).

5.4 ALGORITHMS AND THEIR WORK: A PERFORMATIVITY PERSPECTIVE

The idea for this paper arose in part from a curiosity in two, as we term it in the paper, 'paradigms' of algorithms (logic and learning)[9]. But also, how humans and machines seem to come together to create (algorithmic) structures, and how these are then maintained and/or changed.

The view on how technological artifacts operates and contributes building structures has been widely discussed and theorized. From being considered a tool employed by people in their construction of structures, to attribute material artifacts more room for maneuvering by acknowledge them as actants with inscribed behaviors, to perceive technological artifacts as somewhat autonomous actors operating in our reality. More recently, a discourse on 'digital first' has occurred (e.g., Baskerville et al., 2020). This strand of literature not only emphasize the view on digital technology as representations of the world, but also as mediators of reality: "[T]he links which computation enables between higher- and lower-level processes open up new avenues for exploring and constructing reality" (Kallinikos, 2009, p. 199). Such a reversal shifts focus from primarily per-

9 Put simply: In the logic paradigm, the algorithms are designed and developed by humans, while in the learning paradigm, the desired output of the algorithm is dictated by humans, but where the algorithm's inner workings are shaped by data during training.

ceiving technology as a tool in the work for efficiency and effectiveness in organizational settings, to a further understanding of digital technology as a necessary and fundamental element of people's everyday life (and potential future). As algorithms become increasingly sophisticated, powerful, and entangled in the fabric of society, they affect us in both the physical and digital domain – and in ways we can barely comprehend. To theorize this shift, we need useful concepts and metaphors.

This paper thus proposes a performativity perspective on algorithms. Another concept that was considered early in the process was agency, but as it is a very theory-laden concept where meaning can vary greatly (which is discussed in the paper) it was dropped. Instead, I came to turn to the notion of performativity. Performativity refers to how language is not only used to describe and represent the world, but also to do things in the world (Austin, 1962; Searle, 1969). Performativity can be seen as the very activity that contributes to the creation of a subject, but also the perpetuation of the same – as a circular, self-producing activity. Over time, these iterative actions produce a kind of taken-for-granted knowledge that gives the appearance of an underlying structure. Performativity is thus not only linked to the representation of a subject but also to the production and becoming of the same (Barad, 2003).

The algorithmic performativity perspective introduced in the paper rests on the assumption that software is a technology that can be shaped and then shape. The concept of algorithm is linked to the notion of performativity through an amalgam of thoughts: (1) algorithms exist as material instances of compiled, executable computer code; (2) algorithms execute and operates within a symbolic realm; (3) algorithms perform and thus influence the very same reality in which they are embedded. This amalgam emphasizes a performativity perspective where algorithms operate through symbols making imprints in the world.

An algorithmic performativity perspective thus highlights algorithms as temporal manifestations and not fixed creations, recognizing them as vivid and vibrant actants doing their work in the world. By acknowledge them as co-creators and mediators of the 'reality', we can appreciate and understand their wider implications: How during development they are performatively shaped, but when put to work they performatively shapes.

Furthermore, algorithmic performativity may unfold differently depending on algorithmic paradigm, logic or learning.

One contribution the paper makes is to highlight and discuss how algorithms, through iterative, reciprocal actions with humans, create a society that rests on an increasingly algorithmic foundation – and what that may entail. Additionally, the proposed conceptual framework spurs further theorizing by highlighting the temporal, relational, and reshaping aspects of algorithms.

5.5 ORGANIZING A BUSINESS ENVIRONMENT THROUGH PLATFORMIZATION: THE CASE OF UBER

Much of what has been written about Uber investigates the transformative/disruptive power of digital technology, thus focusing on the consequences of the technology rather than how the platform itself comes into being as a sociotechnical artefact. This type of research is relevant, interesting, and necessary but lacks a perspective that digs deeper into technology to understand and explain the role of the digital. I would therefore think that the purpose of this paper is quite different from most studies which uses Uber as an empirical case: The primary interest became to investigate how Uber as a digital platform developed over time, and what this development enabled in terms of organizational capacity.

One can here recognize a relationship with the paper about the cloud platform, where we suggested a model that acknowledged digital materiality, but also recognized the ongoing discursive work which conveys meaning to materialized technology and foster imaginations of what it could become. Here one can discern a connection and development in my thinking about digital platforms. When we started working on this paper, I had developed and anchored an idea of a digital platform as an unfixed, sociotechnical (it is both about human and machine) and cultural (it is a contingent creation with a history) artifact.

In this thesis, the concept of platformization has proven fundamental as an attempt to embrace and thus explain both the expansion (a spatial

dimension) and development/evolution (a temporal dimension) of a digital platform. The spatial aspect is about how the platform extends beyond its digital border and thus affects an increasingly large space, and the temporal aspect speaks of the platform's potential to change its capacities and forms over time. In the specific case of Uber and given the approach we wanted to take with this paper, it became clear that platformization would be a key concept in trying to depict and explain the platform's development and further impact.

So, what would happen if one approached Uber from an evolvable systems perspective (Agarwal & Tiwana, 2015), as a system with the "capacity to efficiently change to serve new purposes and emerging possibilities" (p. 473)? Taking such a perspective would mean not primarily depicting Uber's evolution as specific manifestations and forms in time (i.e., first taxi, then eats, then freights, etcetera) [10], but to more focus on its sociotechnical essence and thus the continuous becoming of Uber (Simondon, 2017; 2020). Thus, an evolutionary perspective would approach the platform as a kind of metastable, complex, historical system, and where this history in turn becomes the basis for its continued development. I therefore came to search for a way of writing that could describe the platform not as a thing that changes from time to time, but more as an artifact on the move; an artifact with a "memory", potential future, moving along an evolutionary trajectory. Thus, imagining the platform as a sociotechnical assemblage that maneuvers and operates within a space of possibilities, and where the ability to navigate this space depends on, for example, technological capabilities achieved, and strategic decisions made. Consequently, an idea of a sociotechnical system open to change, in both directions and forms, started to emerge. A system which develops in a space of possibilities, where engineered technology and the imagination of how that technology can be (re)used and further developed in turn expands (or in the case of lack of imagination, shrinks) said space. But where its evolutionary trajectory is also contingent on (strategic) choices made. So, the

10 Such an analysis could certainly be of interest and help to understand what Uber had materialized as (up to that point) but could not say much about its essence and thus what it might become. Therefore, such a perspective would focus on actualized forms but not so much on potential forms.

main challenge of the paper became to search for a language that could describe how digital technology (and the capacity to engineer it) enables certain types of strategic orientations and organizational formations (e.g., digital platforms). Or a bit more specifically, to look for the sociotechnical mechanisms underlying Uber's development as a digital platform and try to conceptualize them.

This paper shows how fundamental this thesis's core concepts – digital materiality and discourse – can be when trying to understand and explain technological change. Fundamental, but in a sense also relative, because it is so much about perspectives and framings, or perhaps rather worldviews (Reimer & Johnston, 2019; Davis & DeWitt, 2022). On the one hand, how does one perceive Uber? As a taxi company or as something more, something else? But it also concerns which perspective the researcher attributes to Uber in how they perceive, develop, and maintain technology.

Thus, there are several different discursive dimensions at play here. It is about the capacity and analytical ability of the researcher to determine and convey what can be called a correct level of technical sophistication of the phenomenon. But it is also about the discursive system (or worldview) that the phenomenon itself has created and exists in. That is, how the phenomenon has built up its conceptual universe over time (both material and discursive) – and then how the researcher chooses to interpret the situation. For example, one could choose to see Uber as a taxi company that is revolutionizing the taxi market with their technology (and stay there), or one could choose to see them as a computational fabric of sorts – originating in taxi but now emerging as an infrastructural layer within the wider field of transportation (and maybe in the future, beyond).

In writing the article we came to align to the later perspective, since it gave us the possibility to explain why digital platforms seems to drift across markets. Seen from this computational perspective, Uber does not primarily revolutionize the essence of taxi, which is still about people driving cars and transporting other people between destinations. Rather, what Uber has done is that they have identified certain (computational) inefficient steps in the process that constitutes taxi as a service, where their technology (such as matching, routing, mapping, and pricing) can be wedged in to make a difference.

The main contribution of the paper is to suggest that Uber emerges as an infrastructural layer that replaces computationally inefficient steps in the field of transportation. Thus, Uber appears to be not just a taxi company, but more of a computational fabric with features that can be applied and reused in markets where similar structural problems exist.

CHAPTER 6
DISCUSSION

Information Systems are becoming increasingly difficult to separate and study in isolation (Ågerfalk, 2020). Hence, in a growingly computationally rendered society (Kallinikos, 2009; Baskerville et al., 2020), it becomes increasingly difficult to determine *where* computation takes place. Thinking of computed experiences as siloed occurrences – that the complete execution of applications takes place at a specific location such as on a phone, on a laptop, or on a server – can lead to a somewhat simplistic explanation of the digital realm, I think. Such a demarcation cannot really capture and explain the intricate processes and information flows that today's information systems contribute to (Baskerville et al., 2020).

Instead, computed experiences are probably better understood as assembled ones – orchestrated and stitched together at runtime by algorithms (Alaimo & Kallinikos, 2022). In this paradigm (Narayan, 2022), digital platforms materialize as factories of sorts with their capacity of distributed and externalized computing. To understand computational experiences within this more distributed paradigm, it can be beneficial to think in relational terms (Faraj & Leonardi, 2022): That a perceived digital

artifact (e.g., platform) emerges as a result of an orchestrated, distributed network of computations (Kallinikos et al., 2013); and that this artifact is open to change as these relationships, over time, can change. So even if a user gets the feeling that a system, program, or application is running on a specific resource (and only there), we need to go beyond our perceptions and consider whether this is true or not. Often this sense of a monolithic system can instead be explained as distributed computing resources linked together and orchestrated at runtime.

At first glance, this may seem to be just a matter of engineering and how to build computational systems in new ways, but it has much broader implications than that I would argue (Davis & Dewitt, 2022). Just as the Industrial Revolution introduced new technologies, and where these technologies in turn challenged many of the norms and ways of doing things at the time, digital platforms challenge incumbents, institutions, and societies: As we use and rely on their computing power, they in turn become powerful actors in a digitalized society (Rahman & Tehlen, 2019). So, by reflecting on, for example, where computation occur, we can begin to understand and discuss topics such as: who dictates the terms of how computation is distributed, under what conditions and for what purposes. Thinking about digital platforms in this way can stimulate new perspectives on organizations (Faraj & Pachidi, 2021; Faraj & Leonardi, 2022), but also contribute to the understanding of how these platforms affect individuals and society at large (Van Dijck, 2021; Flyverbom, 2022).

In what follows, I discuss some of the recurring topics and concepts of this thesis and how I think they can help us understand this situation we find ourselves in.

6.1 REFLECTIONS ON THE USE OF DISCOURSE THEORY

Although I only applied discourse theory more specifically in one of the papers (3), its theoretical foundations and ideas permeate the thesis. And given that I have already previously applied and used this theory formation (Gustavsson, 2017) it has over time become a natural way of thinking about how meaning making occurs and is maintained. Consequently, I

have thought quite a lot about how discourse theory and the concept of discourse can contribute to the work of understanding and explaining the role of digital technology in the meaning making process; thoughts that I intend to share and ventilate here, and as a starting point for the discussion I use Kallinikos (2012, p. 80-81) where he writes:

> [S]oftware makes the semiotic medium of the sign fundamental, universal, and pervasive "stuff" of social life [...]. [Where a] serious implication is the profusion of sign tokens of every kind and the impressive expansion of a complex and, crucially, steadily accruing techno-cognitive net spun by data items and the cognitive patterns (knowledge and information) underlying them.

This quote points to two interesting phenomena in relation to discourse theory: (1) Considering today's increasingly widespread digital technology, from a communication perspective it can be argued that the 'world' is shrinking. Thus, where geographical distance was once a limiting factor, today's software connects people in an unprecedented way – but where language, or 'the sign', is still the currency of communication. (2) By suggesting the 'techno-cognitive net', Kallinikos alludes to, at least in my reading, the fusion that occurs between humans and machines and where the sign appears as the substance that holds this 'steadily accruing' assemblage together. And here, between the lines, a fundamental difference emerges in comparison with previous technologies: that people and various expressions of digital technology come together in a kind of recursive and reciprocal felt (at least from the human side) togetherness. On the one hand, human and technology develop in tandem (hence reciprocal), but this development takes place in layers (hence recursive) where the layers themselves form the breeding ground for further development. I therefore see an opportunity to supplement the concept of discourse in relation to digital technology, where my intuition is that this increased sense of entanglement between discourse and digital materiality can be found in a perceived but difficult to expressed abstraction (or perhaps more appropriately in this case, a sense of transcendence) occurring from the physical to the digital:

> Digital technology has, through this multiplicity of layers, mostly removed any meaningful physical constraints from a broad class of engineered systems. Each layer of models confirms with an established paradigm, a way of modelling and abstracting an engineered design. Innovation, therefore, is less limited to physics of the technology than by our imagination and ability to assimilate new paradigms. [...] [Hence] paradigms play a central role in digital technology because without them, no human could possibly comprehend the complexity of the systems we routinely build today. But these paradigms are human constructions, governed by culture and language. (Lee, 2017, p. xiii).

Here Lee (2017) understands a paradigm as a bounded space of discursive (cultural) artifacts that encompasses, comprehends, and thus makes specific material (technological) artifacts meaningful (cf. Kallinikos, 2002). It is no coincidence that Lee uses the term 'paradigm', he is of course referring to the term as described by Kuhn (2012). And like Kuhn, Lee sees that a paradigm can be understood as a confined space of meaning. A paradigm thus defines a conceptual space that, on the one hand, enables for understanding technology (within a paradigm), while at the same time may limit the possibility of imagining what technology could be (outside a paradigm). But while the scientific paradigms (according to Kuhn) are relatively stable over time, the technological ones are more frequently changing (according to Lee). And this is where I see that my use of discourse has great similarities with the reasoning about 'paradigms' advanced by Lee (2017), where conceptual worlds materialize around digital technology (Reimer & Johnston, 2019).

For example: At the end of the 20th century, the floppy disk was the prevailing storage medium. As the floppy became established as a meaningful (material) artifact in people's minds, it came to occupy a position in discourse of how to understand the relationship between computers, storage media, and data transmission. This conceptual sedimentation was reflected both in the tangible realm where computers often had floppy drives pre-assembled, as well as in the symbolic realm where the floppy as a symbol came to be equated with the notion of 'saving' in many applications (e.g., word processors). Now, it's been a long time since we used floppies to save and transfer data, consequently the 'floppy' has lost much

of its discursive value. Nevertheless, applications may still use floppy as the symbol for saving, but for those of us who were not around in the days of the diskettes, that symbol probably looks more like a squiggle than anything else. Hence, if you show this square piece of plastic to someone who does not have the 'floppy' incorporated into their conceptual universe, it remains just a square piece of plastic. Similarly, the CD's discursive value has been devalued (or maybe revalued): from previously being articulated as a popular, flexible, and efficient storage medium, to now being understood primarily as a reflector hanging from trees or balconies to scare birds away from fruits, flowers, and seeds. Thus, technologies, and our understanding of them, emerge as systems of meanings – i.e., discourses – through time (Reimer & Johnston, 2019). Discourses that, as they settle and become sedimented, appear as taken-for-granted 'truths' about how to understand technology and technological change. Thus, over time, we tend to perceive established technologies not as the inventions/innovations they once were, but rather as obvious constituents of our everyday lives.

In this thesis discourse theory have been used to understand how an organization enter an already existing institutional field and through digital technology challenge the current, discursive regime (paper 3). But also, the very idea of discourse has been helpful in thinking and investigating how organizations understand, frame, and thereby make their technological endeavors comprehensible (paper 2 and 5). It can thus be said that discourse theory has been used to expose and investigate meaning systems, but from two different perspectives:

(1) By establishing a kind of macro, systems perspective, discourse is used to understand and explain a wider, institutional field (taxi, transport; paper 3), i.e., a collection of laws, norms and rules that speak to a specific structure of meaning. More specifically, I examined how different discursive regimes negotiated and understood (digital) technology, and where the analysis shows that the degree of understanding of digital technology plays a decisive role in what possibilities (or limitations) one sees in the technology. Hence, competence and knowledge derived from a dated way of perceiving technology (i.e., an old paradigm) can be a limiting factor because one's conceptual understanding of technology's possibilities (and potential drawbacks) is the basis of how one imagines technology and what it can become. Since discourse theory adopts a performativity perspective

to form an understanding of how things are, an important part of the discourse analytical puzzle is to find out how 'things' are (continuously) being done – how 'things' are enacted, and over time, how 'things' solidifies as a kind of discursive materiality; a materiality which in turn enables for institutions and institutionalized behavior to emerge. For example, in the article about Uber's entry into the Swedish taxi market, we analyzed how Uber understands and makes its digital technology meaningful. We did this to then be able to compare with how technology has been perceived within the discourse that we in the paper call "The Swedish taxi market". Therefore, our aim became to investigate the merging of, what we called, two discursive regimes and how a vacuum of meaning emerged when a new phenomenon was articulated into discourse. The void arose because the phenomenon could not be made comprehensible within the prevailing meaning system, but instead opened to uncertainty and interpretations.

(2) The idea of discourse is used as an enabler to think about how a specific organization works with meaning-making and technology (Bazerman, 1999). It is important to point out that I am not looking to investigate what other stakeholders say about the company per se but interested in how the company understands and communicates itself and thus how it emerges as a discursive system: for example, how they present themselves, what view they have of the world, and how they perceive, understand, and use digital technology. I find this approach fruitful because it gets at why different organizations perceive, approach, and think about digital technology in different ways; ways of thinking that may later collide with other discursive systems when, for example, an organization approaches new institutional fields (i.e., when they need to consider other specific, as well as more general and overarching, discourses; see point 1 above). In this vein, paper 2 can be said to outline a "Microsoft Azure" discourse. That is, the paper is entirely based on data from the Microsoft Azure engineering blog, a blog which conveys information about the cloud service and how it has evolved. While it can of course be argued that the characteristics of Microsoft Azure are, at a higher level, consistent with other cloud platforms (such as Google Cloud and AWS), there are engineering as well as strategic considerations made that probably qualify Microsoft Azure as a unique platform among other unique platforms – and thus a discourse in its own right, at least in this thesis (Williams & Pollock, 2011).

6.2 THEORIZING DIGITAL PLATFORMS

> *To the degree that function is a modality of meaning, a particular way through which beliefs or inventions are expressed with respects to technological objects, it could be seen as predominantly nonmaterial. Such a position does not assert that meaning is unrelated to contextual or material conditions and even less that it is deprived from material consequences. But it does assert that the ontology of meaning is predominantly immaterial. In other words, there is difference between ideas and things and something important is lost when this difference is glossed over.* – (Kallinikos, 2012, p. 67)

What is a digital platform? Is it just an idea in our minds or a thing existing in the world? To help answer that question, let us first consider: What is a chair? Unless we are already sitting on a chair or have one close by that we can study in detail, we can just close our eyes and evoke the image of a chair. The chair thus seems to exist both inside and outside of us, both as a 'thing' in the world, as well as an 'idea about a thing' in our minds. Right now, I am sitting writing this passage on a chair made of white painted wood. It looks like an ordinary chair; it has four legs and a back, on the seat there is a cushion to make the experience more comfortable. It is not a monolith cut from a compact piece of matter (e.g., a trunk), but consists of smaller parts that converge into a chair – e.g., a whole formed by the parts that make it possible. If we think for a second about some of the functions that the chair can be said to offer, it of course invites to sit, but can also be used as a kind of ladder if you need to reach for something on a shelf or in a cupboard. In addition, it functions (together with three other chairs and a table) as part of a larger assemblage, the 'dining room furniture'.

And when I let my hand run along its surface, feel the contours and roughness of the wood, perceive the whiteness, I recognize the chair as a 'thing' in the world. It thus bears clear signs of existing on its own. At the same time, I realize that the 'chair', as it appears to me (in my mind), is a taken-for-granted idea (my idea) of a thing in the world. Accordingly, while perceiving and categorizing matter shaped as a chair, it is the idea of a 'chair' that makes the thing meaningful. Thus, the idea of a chair speaks

to how one understands and uses the chair, both as an individual artifact but also in relation to other artifacts, perceived and categorized in the surrounding environment (for example, 'the chair should be pushed under the table, not under the dishwasher', 'the seat cushion should be put on the chair, not on the cup'). Consequently, the chair becomes articulated as a meaningful thing in the world (Laclau & Mouffe, 2001; Searle, 2010).

As Kallinikos (2012) alludes to in the opening quote (and as I have tried to illustrate with the example of the chair) we can assume that the 'thing' and the 'idea about a thing' are two separate entities in the meaning-making process, but that we often experience them as one, instant occurrence. Therefore, we may be intuitively led to believe that phenomena in the world are universally understood. However, meaning making is not universal but multifaceted (Laclau & Mouffe, 2001; Bazerman, 1999); depending on, for example, knowledge, experience, upbringing, education, and culture, 'things' in the world are made meaningful in various ways. Hence, "[t]here is no reason whatever to believe [...] that the world comes neatly carved up into categories or that the categories of our mind are the categories of the world" (Lakoff & Johnson, 1999, p. 22).

For example, while a particular digital artifact (e.g., a cloud platform) may appear alien to those who have never been really exposed to its form and functions, the same artifact may materialize as a fundamental enabler of entrepreneurial endeavor and innovation to those who can (conceptually) comprehend its nature and properties (or at least parts of it). Hence, the same artifact but different (imagined) opportunities. Therefore, it is crucial not to approach digital materiality – in its various guises and forms – as things understood equally by all, but as phenomena negotiated and comprehended in the minds of individuals, as well as across individuals and groups: "Thus, the theoretical focus shifts away from the actor or the object towards an expanded view of the interaction with the object." (Faraj & Azad, 2012, p.255)

If we continue and ponder what a digital platform is, another question surfaces: How do we actually *perceive* a digital platform? That is, much of people's ability to build mental models of a 'reality' is enabled by a capacity to register an external 'something', to be able to navigate and imagine through sense data (such as smell, taste, sight, hearing, touch). We can thus imagine a child who, that through countless acquaintances with

things in the world (such as chairs, tables, spoons, and teddy bears), builds ideas about these very things by touching, smelling, tasting, and seeing them. As the child grows and begins to learn about things like whales, cathedrals, and continental plates, its world of ideas expands and enables an understanding of a 'reality' not yet (physically) encountered. In addition, the child learns about things that exist only in the world of ideas but appear as 'things' in the world such as 'marriage', 'money', 'business', 'taxes' and 'nation states' (Searle, 2010). Nevertheless, "[t]he gap between the discursive and the Real makes the discursive particular, even though it sometimes claims to be universal" (Carpentier, 2017, p. 75). This suggests that we as humans, in order to understand the material and discursive reality that surrounds us, are shaped to (intuitively) think in a way that conflates these domains. But it is important to emphasize that we are not talking about different realities here, but rather that we are building for an understanding of how one, universal (material) reality can be perceived, understood, and explained so differently (discursively). Thus, "we have to avoid postulating different ontological realms, a mental and a physical, or worse yet, a mental, a physical, and a social. We are just talking about one reality, and we have to explain how the human reality fits into that one reality" (Searle, 2010, p. ix-x).

This reasoning connects to the overarching research question of the thesis, and the challenges we face when trying to answer it: *How can we understand and articulate digital platforms as constituents of a digitalized society?* Or perhaps: How do we build relationships between digital things and ideas about digital things (i.e., 'digital platforms')? Or perhaps even more specifically: Can (do) we understand the digital as part of Searle's single reality and not as an additional ontological realm? To answer these questions, we need frameworks that can help us have discussions about what digital artifacts are (their materialities), and how they are further understood and communicated (their representations in discourse). Ultimately, I think these questions relate to the idea of 'alienation' as put forward by the French philosopher Gilbert Simondon (2017) in his *On the Mode of Existence of Technical Objects* (an idea highly relevant, perhaps even fundamental, for this thesis); here, Simondon noted an imbalance between culture and technology:

> The most powerful cause of alienation in the contemporary world resides in this misunderstanding of the machine, which is not an alienation caused by the machine, but by the non-knowledge of its nature and its essence, by way of its absence from the world of significations, and its omission from the table of values and concepts that makes up culture. (Simondon, 2017, p. 16)

To remedy this alienation, Simondon sought a (philosophical) framework that could understand and explain technology, technological change, and its consequences for society. Similarly, my primary aim with this thesis has been to understand digital technology in general, but digital platforms more specifically – how they develop and influence. It is my belief that we – through a better understanding of how various representations of the digital manifest, evolve and become entangled in society – can prevent a potential technological alienation (understood in a Simondonian way)[11].

For example, many people can handle smartphones and the apps that come with them. They know how to use laptops and tablets. In other words, they possess the skills that have almost become a prerequisite for coping with our existence in an increasingly digitalized everyday life. But this everyday encounter with technology is only the tip of an ever-growing digital iceberg. In a sense, as everyday users we confront digital technology at the edges of its existence, we operate on the periphery, while the central parts (what we conceptualize in the literature as infrastructures and platforms) are shaped, reshaped and scaled in ways that we often are unaware of (Kallinikos, 2004).

Hence, when we as users perceive a change in terms of technology, it is usually because new functionality has been added (or removed), or the user interface has changed in some way, e.g., new buttons have been added (or removed). But whether the provider of any of our apps utilizes a cloud platform, and if so which and what services, and furthermore where this cloud platform's data center is located, and how the data my application uses travels etcetera, may not be something we immediately think of (or even want to think of). Therefore, if digital platforms are studied solely

11 This approach does not primarily require technical competence, but rather a willingness to imagine what a society built on these conditions might look like.

from the perspective of apps and applications, there is a risk that the whole story cannot be told, as this perspective does not really get to the technologies, and the technological change that take place behind the curtain of the app so to speak. To understand digital platforms, we must also be able to get behind these front-end interfaces and contemplate the complex machinery of which they are a part.

Such a focus moves away from a perspective of platforms as quite fixed 'things' that can be relatively easily categorized (for example: "Uber is a taxi company"), to an understanding of platforms as evolving artifacts both in terms of technology (e.g., computational capabilities, scalability, connectivity, reach), but also in terms of the discursive (e.g., strategy, business models, identity).

Traditionally, information systems have assumed a supporting role for a company's core business (e.g., car manufacturers, food chains, banks, etc.), where they often assist in the ongoing effort to streamline and rationalize business-related processes (Baskerville et al., 2020). Over time, these systems have developed to today constitute a critical resource in many incumbents' operations, where the systems functionality and availability are now considered fundamental. Still, these incumbents mostly do what they always have done – car manufacturers focus on making cars, ball bearing manufacturers still make ball bearings[12]. But if you instead look at the major, digital platforms and ask the question: What is their core business? What do they excel at? For example: What is Uber? Initially, the platform was developed to solve a specific problem (transportation, taxi) in a specific, geographical location (San Francisco). Yet over time Uber has evolved, but into what? If we consider that Uber is sliding across different markets in the transport sector; if we take into account the various technologies that Uber designs, manages and develops to run its business (everything from AI to complex IT infrastructures); if we think about the global reach that networks enable: Then, what is it? I would argue that Uber, like many other platforms, has come to develop scalable, powerful,

12 I admit that this is a bit of a simplification, and that many incumbents are working on developing alternative services and products in the wake of the digitalization. But I still think it is relevant to talk about these incumbents having a core business that, in a way, highlights what they mainly focus on.

and general-purpose computational capabilities, along with a capacity to collect, store and make sense of data in unprecedented amounts. If one defines and understand them in this way, one realizes that they do not use technology to support some other core business. Rather, digital technology, and the capacity to master and engineer it, *is* their core business (c.f. Faraj & Pachidi, 2021; Baskerville et al., 2020).

While traditional companies need to build factories, offices, and stores around the world as they grow, it's more about *digital* scaling for these companies (Huang et al., 2017), i.e., they do not primarily need to be physically close to potential customers, but ensure that their services work in the parts of the world they intend to operate in. If we return to Uber as an example, their general computational functions have allowed them to scale horizontally in the transport sector (i.e., Eats and Freights), and it can thus be said that their resources, expenses, investments, and development occurs in the cloud, metaphorically speaking. Thus, these platforms seem to slide across market boundaries in ways we may not be used to (Nambisan, 2017). They appear as elusive creations in the making (Kallinikos, et al., 2013; Zittrain, 2008), which in turn makes them difficult to categorize and thus analyze in their entirety.

For example, if we only consider Uber as a taxi company, we will miss what it is as a whole, why it has evolved as it did, and especially what it may become in the future. That being said, I do not mean to neglect the problems that these platforms can create when they enter new markets. Rather, I want to point out that an understanding of how they work and operate can help in building understanding and intuitions of why things happen. The perspective presented here thus perceives these platform-based organizations as primarily technological, where their core business is the creation, shaping, and development of technology (Huang et al., 2021). Technology that they then, for example, can inject into inefficient parts of markets where it makes a difference. Seen from this perspective, one conjecture why a digital platform may challenge incumbents in an existing market may be due to that market's inherent inefficiency from a computational point of view.

6.3 PLATFORMIZATION REVISITED

A key issue this thesis tries to address is how to understand and depict the fluid and versatile nature of digital platforms. As "[a] new breed of ontologically ambivalent artifacts is developing adjacent to the static and self-sufficient population of objects and technologies [...]" (Kallinikos et al., 2013, p. 367) to which we may be accustomed, we may need new ways and means to be able to grasp and explain these artifacts. Quite early on it became clear that I needed a concept that would extend beyond the platform concept per se and that could enable a more process-based approach to how platforms stabilize over time. Hence, I had the feeling that language was playing tricks on me and that the term 'digital platform' in some sense depicted the artifact as quite static and finished, and thus failed to illuminate the potentials for motion and change that existed at its core (Huang et al., 2021). I thus came to search for a language that would allow me to write about a digital platform not as a stable entity, fixed and finished, but rather as an assembled thing in motion; a thing not complete but in evolution (Faraj & Leonardi, 2022).

In this search for a suitable concept, there were a few things that needed to be considered: First, how can I understand and theorize a digital platform as a phenomenon that changes over time? A question that in turn raises other questions, such as: What do I consider a process to be and thus how it can be understood? Do I sympathize with a strong or weak process ontology (Cloutier & Langley, 2020)? And how does this attitude in turn affect the process theorizing styles I choose? The concept I chose to try to address these issues became *platformization* (e.g., Helmond, 2015; Bygstad & Hanseth, 2018). You are always looking for precise and concise ways to describe what you want to explain, and it was Van Dijck (2021) who really put into words my intuition – how I have come to think about platformization: "Therefore, we propose to move away from imagining platforms as distinct entities [...] toward envisioning *platformization* as an evolving dynamic process, propelled by human and nonhuman actors" (p. 2804; italics in original)

In what follows, I reflect on how my thoughts on the concept have developed during the thesis work.

6.3.1 TOWARDS A DEVELOPED PERSPECTIVE OF PLATFORMIZATION

I first came across the notion of platformization when I read Helmond's (2015) paper "The platformization of the web: Making web data platform ready" and there was something about the concept that caught my attention right from the start. It seemed to connote a motion, that 'something' is being platformized. The motion that Helmond (2015) seek to convey is how a platform extends beyond its digital border, collects data, and makes it platform ready. In my reading of Helmond (2015), platformization here connotes how a field/market is being structured around a platform; how a field/market can become platformized and thus affected by platform logics (i.e., network effects) if the platform grows strong. This feeling of motion, I realized, would be something for me to build on.

At the beginning, I saw platformization as a concept that would manage two dimensions: One dimension that I thought of as *sociotechnical*, i.e., how a platform manifests itself in a digital, material realm as well as in a world of ideas (pronounced in the theoretical framework of paper 2). This dimension is consistent with a sociomaterial view which recognizes the social and technology as relational and reciprocal greats yet not constitutively entangled (Kallinikos, 2012). A position that acknowledges "[...] that the two phenomena are empirically distinct, but mutually implicated" (Putnam, 2015, p. 706). I thus tried to employ a language that presented their relationship as closely linked and interdependent, almost symbiotic.

The second dimension concerns the *temporal*, i.e., how the platform develops over time. And here I came to realize that the notion 'process' is quite complicated in itself: First one must think of what one thinks qualifies as a process and why, and then how one needs to convey and account for it in a credible way. The first question is ontological and concerns where you are on the continuum between weak and strong process ontology (Cloutier & Langley, 2020). Where I am on this continuum limits/enables me to think about what can actually be considered a process (and not), what I am looking for (and not), but above all it has bearing on the language I use in describing, and the way I theorize, on *what* it is that is actually changing (Cecez-Kecmanovic, 2016).

More lately another dimension (discernible in paper 2 but pronounced in paper 5) has been added to my thinking. A dimension that I think is becoming increasingly important to explore in order to build an understanding of the elusive nature of platforms, how platforms manifest as entities that extends into the digital sphere. I think of it as a *spatial* dimension that focuses on what can be regarded as the inside of a platform, its core, (Huang et al., 2021) and what can be regarded as an outside. That "the technical object exists at the interface of two different worlds: the world of its own internal requirements and the world in which it is used" (Dumouchel, 1992, p. 418). Hence, an idea of a *digital border*, where what counts as inside and outside – and how these zones are managed by the platform-based organization – influences the platform's further development and future growth. For example, economic theories which explains platforms (e.g., network effects, externalities) often presupposes the platform operating in a specific market. In such cases the inside of the platform – the core – does not matter so much, the important thing is what happens on all sides of the platform so to speak. Therefore, theorizing on the inside of the platform may not have been that interesting or even necessary. It is enough to more implicitly state that development and transformation is taking place at the core, but one can be allowed to abstract away the technology since it does not really matter to what you want to explain (e.g., 'transactions', 'matchmaking'). But a burgeoning stream of research has raised the question of what makes digital companies unique in that they can slide across traditional market boundaries with relative simplicity, and sometimes perhaps even mutate into new shapes and forms. This stream has come to be interested on the inside as well, and thus emphasizes the core, the technological capabilities that make these drifts and mutations possible, as important avenues of research (e.g., Huang et al., 2021; Lehman & Recker, 2022).

6.3.2 PLATFORMIZATION (RE)DEFINED

Over time, and which is perhaps clearest in the last paper, these dimension merge into a fuller understanding of platformization which connotes:

(1) *A sociotechnical aspect*: That these types of major digital platforms (van der Aalst et al., 2019), are creations where humans and machines work closely together and in some sense merge in a continuous work to develop the platform (Faraj & Pachidi, 2021; Lyytinen et al., 2021). Creations where strategy, visions, intentions, and goals, are intertwined with technology (Rahman & Thelen, 2019; Faraj & Leonardi, 2022). And as these platforms make use of and deliver increasingly sophisticated and potent computational capabilities – such as AI and machine learning – I think this aspect will turn into a kind of symbiotic conundrum: On the one hand, it is about how a platform's constituents (humans and machines) are organized to realize the platform, but it is also about how the platform integrates with its surrounding environment in order to thrive and grow. Thus, talking about these platforms as delivering purely neutral technology is difficult. That is, given that these platforms offer technology for people and organizations to use in their everyday lives, notions such as 'ethics' and 'politics' follow in their wake as they spread and become entangled with prevailing discursive systems—discursive systems with pre-existing norms, rules, and regulations (Flyverbom, 2022).

(2) *A temporal aspect*: That platformization is an ongoing process. And this, in turn, concerns the notion of time. Hence, instead of primarily thinking of time as clock time (linear and measurable), this aspect suggests time as experienced (Cecez-Kecmanovic, 2016). That is, to think of a platform as an artifact with a past (a kind of memory), operating in the present, as it is becoming its future. This conceptualization recognizes digital platforms as assembled artifacts that evolve. For example, how digital platforms are constantly looking to further platformize existing markets in which they operate, but also that they may be looking for new markets (in which their technology can fit and make a difference) to platformize. Additionally, how the sociotechnical organization of the platform itself, its core (Huang et al., 2021), is an ongoing work as well; partly by improving and streamlining the computational functionalities which the platform already possesses, but also by inventing and engineering new, novel ones.

(3) *A spatial aspect*: That there is an inside and an outside to a digital platform. This aspect emphasizes a relational view on technology (Faraj & Leonardi, 2022). This way of thinking opens up for explanations of

scenarios where, for example, an organization's collective computing capacity does not exist within its traditional organizational boundaries. That is, in today's digital landscape, an organization may depend for its existence on certain computing capabilities provided by one or more platform providers[13]. This spatial aspect thus suggests a kind of symbiotic view on digital platforms and their surroundings: On the one hand, digital platform capabilities can be used as resources in various customer-related sociotechnical assemblages. But also, how the platforms themselves can utilize computing resources from other platforms to enable their own development (Van Dijck, 2021; Narayan, 2022). This points to how digital platforms gets woven into an intricate sociotechnical web consisting of its users, but also the organizations, institutions and infrastructures that make their existence possible. In this reasoning, one can imagine an inside and an outside of a digital platform. Hence, an idea of a digital border that fluctuates over time, and which speaks of two zones that platform-based organizations must handle and relate to. This reasoning also foregrounds the somewhat ambivalent ontology of digital platforms (Kallinikos et al., 2013): That we can think of platforms as having a border, but not in the sense of an inherent border that delimits the platform as a self-evident, stable, and complete entity. Rather, the notion 'digital border' here reflects a conceptual demarcation between a changing inside and outside. This border should therefore not be perceived as definite but always tentative.

One can of course devote to examining one of these three dimensions in isolation given one's analytical focus. However, if one is to understand and think about digital platforms as ever-evolving digital structures, how they function in the world and how they integrate with societies, I think it is beneficial to integrate these three dimensions into a broader framework. Hence, *platformization*: An idea of the digital platform as a creation with a past, present, and potential future, which can take on different forms and functions as it becomes entangled in, and thus tries to become a self-evident component of, various discursive systems. An idea with a strong emphasis on the continuous *becoming* of a platform.

13 This scenario links back to the discussion that it can be important to be able to determine *where* computing takes place for various, strategical reasons.

6.4 DIGITALIZATION AND SOCIETY

> *Legal intervention in the current ecosystem is complicated, particularly due to the slippery ontology and unruly status of intermediary platforms. They constitute a vague and impermeable layer due to their "in betweenness", a liminal position pertaining both to their functionality and to the status of their operators, commonly called "information companies" or "tech firms."* – (Van Dijck, 2021, p. 2810)

My interest and motivation for doing this thesis has been to try to understand how society is digitalized, and how this digitalization then unfolds within specific discursive systems. But to make this a reasonably feasible task, I set up fences within which I could move and where the explicit empirical phenomenon to be researched existed. Thus, my primary focus came to concern digital platforms – how they evolve and are made increasingly comprehensible – and where the different papers serve as explorations of distinct settings in a digitalized contemporary age; settings which speaks of interesting and undertheorized empirical phenomena. For example, one paper (1) discusses how digital materiality opens new landscapes of opportunities for entrepreneurs, and whether this fact, in turn, affects theories on entrepreneurship. Another paper (3) takes a more discursive angle and examine how two, separate systems of meaning cultivated different views of what (digital) technology is and how it should operate, and what effects these separate views can have when trying to understand how a future technological artifact is expected to operate. Much of the research has thus concerned and focused on the understanding of digital technologies and technological change in the present, not that much how things may look like in one, three or even five years from now. But as I now approach the end of the thesis work, I thought I would allow myself to contemplate, and even speculate, a bit on the future of a society that is becoming increasingly digitalized. Hence, I conclude this thesis with a more essay-like reflection.

6.4.1 A CLOUDY PRESENT[14]

It is probably no exaggeration to suggest that most of what that occurs in the contemporary digital realm touches or is touched by something that could be described and understood as a platform. Either we can reason and discuss about that 'something' as if it were a platform in itself; or we can descend in levels of abstraction and study specific parts of that 'something', and try to understand how they together form a common whole; or we can see how specific platforms becomes sub-components of a further and broader 'something' which in turn could be understood as, yes you guessed it – a platform. Therefore, notions such as recursion, layers, and orders of magnitude are key to be able to navigate the digital realm and thus successfully contain and outline the empirical phenomena one intends to research.

So, to complement existing research on platforms, which for example has focused on social media platforms and their impact, or how we can understand platform dynamics and impact on established markets and industries through different economic theories (such as "matchmaking" and "multisided markets"), I chose to address and ponder the looming issue of how some platforms, almost invisibly I would argue, has come to function as significant and increasingly essential parts of an increasingly computed society. In this concluding section I specifically acknowledge the cloud platform as a somewhat neglected but fundamental piece of the puzzle (Narayan, 2022). Neglected in the sense that most of contemporary research revolves around platforms that could be labeled as 'social media' or platforms belonging to and operating within the so-called gig economy. Fundamental in that much of what happens and takes place in today's digital realm, to varying degrees, is realized through the capacities these platforms offer (Van Dijck, 2021). They offer "a variety of cloud-based computing services, and in doing so interrupt existing models of corpo-

14 In the following, I reflect on the digital platform, and more specifically the phenomenon that we colloquially call cloud platform, but I think that what is discussed is applicable to the broader discourse on digitalization. The digital platform, for me, is a theoretical construct (under continuous negotiation) that may change both in name and meaning over time (which will be discussed). What is more enduring is the existence of digital generative systems (Zittrain, 2008), and our capacity to spot, manage and make sense of them.

rate computing" (Narayan, 2022, p. 917). Cloud platforms thus appear as basic building blocks of the digital society; building blocks that enables the realization of many of the platforms, applications and services which meet us in our everyday life.

I have been looking for a metaphor or simile that can help in building an intuition of the transient formation that a cloud platform really is. To say that something is a 'cloud platform', and just stop there, sometimes feels too thin, too bland when one wants to paint with a bit more detailed and granular brush. I guess that if one work with and/or study a cloud platform for a longer period of time – and thus experience how it unfolds firsthand so to speak – one builds an intuition, a form of practical knowledge, about the phenomenon per se. But when trying to put into words this intuition, to depict the volatility and motion that would give the desired sense of liveliness, a struggle arises to find an appropriate language. And I have come to realize that the problem lies in conceptualizing the cloud platform as a "thing", and only that; a stable thing with given characteristics and features[15]. I thus recognized the limiting factor in the search for an appropriate metaphor was to consider the cloud platform as a "thing" when rather it may be more fruitful to perceive it as an ongoing process of technological development and change on a scale that we have difficulty grasping and thus conceptualize. Or perhaps even more to the point: It is both a thing and a process, both a being and a becoming, all depending on one's ontological stance and analytical perspective. To substantiate this thought and more concretely point to what is at stake when discussing the importance of cloud platforms as constituents in a digitalized society I quote Smith and Browne (2019) at length where they, in turn, reflect on the notion that "a data center is never done" (p. xix):

15 Of course, one can consider the cloud platform a 'thing', a given thing at a specific moment in time, but that particular way of looking at the world – where things appear discrete and fixed – I think comes quite naturally to us and therefore needs to be challenged (or perhaps more correctly – complemented) so that we can fully appreciate how formations of digital materiality can solidify, reshape and change over time (Kallinikos et al., 2013).

> In many ways, the modern data center sits at the center of the new digital era that the world has entered. Its massive accumulation of data, storage and computing power has created an unprecedented platform for progress across the economies of the world. And it has unleashed many of the most challenging issues of our time. How do we strike the right balance between public safety, individual convenience, and personal privacy in this era? How do we protect ourselves from cyberattacks that are using this technology to disrupt our countries, businesses, or personal lives? How do we manage the economic effects that are now rippling across our communities? Are we creating a world that will have jobs for our children? Are we creating a world that we can even control? *The answers to these questions need to start with a better appreciation for how technology is changing, based in part on understanding how it has changed in the past.* (Smith & Browne, 2019, p. xix; my emphasis)

Through the assumption of life as a process, researchers (e.g., Lee, 2020; Van Dijck, 2021; Yoo, 2012) have toyed with the idea of what could happen, in terms of insights, if one approaches and ponders complex digital systems as living beings[16]. In our specific case, a question then could be: What could be gained by considering a cloud platform as a "living" thing? As I see it, it can make us think of and theorize about concepts like 'evolution' and 'adaptation' in novel, exciting and challenging ways[17]. Because, sometimes when you reflect on these vast and complex systems, which seem to grow organically, you almost get the feeling of a teleological mechanism that drives the system towards a specific form (Dumouchel,

16 Of course, these authors do not mean that the systems should be considered living in a strict sense, but rather that the approach should be considered as a creative way to challenge and stimulate one's thinking about what such a system actually can (and cannot) be.

17 From a pragmatic and practical perspective, one could for example start to think of these systems as if they could become ill if they are not cared for, managed and cultivated, in a responsible way; already Zittrain (2008) predicted that spread of malicious code, misuse, or even unintended (and, I would also like to add, ignorant) use of generative systems could have catastrophic consequences and would thus become one of the great issues to handle in order to succeed in maintaining a healthy and vibrant Internet going forward. Such questions remain and become increasingly pressing as we, more and more, rely on complex digital systems (evermore interconnected and entwined) and their reliable functioning for our everyday lives.

1992). For example, one could ask: Will the cloud platform ever become complete? And if so, does it have a goal? If one were to try to answer these questions by using existing theories on platforms, one could for example turn to the concept of 'innovation platform' – a platform which provides modules for further innovation by third parties (Cusumano et al., 2019). Briefly, the concept explains the (economic) incentives that drives a platform owner to provide technology for others to use. While it certainly makes perfect sense to explain the economic dynamics related to a cloud platform, I believe that these complex systems need various, complementary, explanatory models if we are to understand their full imprint in a digitalized society. Hence, while economics, to be sure, is a fundamental driver of their very existence, I would suggest that their material presence (both physical and digital), and increased entanglement with society at large, means that they are being woven into the tapestry of our everyday existence in peculiar, performative ways – ways not completely understood and accounted for in theory. For example, if we want to try to understand how platforms influence, evolve and sometimes even morph due to their sociotechnical capacities, other types of theories and theorizing can come in handy.

To be able to grasp the cloud platform and its imprint in an increasingly digitalized everyday life, we need thus not only to be able to understand and explain the economic dynamics, but also to ponder and seek answers to the more sociotechnical aspects of its essence. The interesting, yet insidious, thing about these types of platforms is that we, I feel, are beginning to think of and reason about them (and hence use them) as eternal, fundamental and ubiquitous infrastructures. Infrastructures we increasingly rely on to build our digitalized society. But the challenge for us to deal with going forward is the realization that they do not exist, first and foremost, as a kind of public domain that will be here forever, no matter what. They are businesses, and as such they are driven by market forces and ultimately their survival (and in a sense, the stability of our society as we rely on them) depends on how well they succeed as actors in the markets in which they operate (Rahman & Thelen, 2019). Somewhat simplified, it can be said that much of our digital age is realized with the help of these potent, constantly evolving platforms whom in turn are developed, controlled, and maintained by market forces – a kind of Zittrainian generative dilemma.

Given this, an interesting thought experiment might be to contemplate and consider what would happen if, for example, Microsoft Azure (or for that matter, Google Cloud or Amazon Web Services) were to disappear from one day to the other: What would happen to individuals, companies and communities that rely on their technologies? For me, it is impossible to even try to imagine how entangled these platforms are into the fabric of today's societies; a reflection that leads me to wonder how dependent we actually are on these platforms. A fascinating aspect of these platforms is that they seem to performatively emerge as infrastructures of our everyday lives through a kind of a bottom-up mechanism as we begin and continue to use them, individual by individual, business by business (Plantin et al., 2018; Monteiro et al., 2013). Thus, they grow strong in silence.

6.4.2 DIGITAL PLATFORMS AT THE LIMIT OF DISCOURSE

Outside my window at the university, Sweden's tallest building is being built. It is fascinating how a landscape that previously consisted of fairly ordinary houses and buildings is now radically changed by a skyscraper that stretches some hundred meters into the sky. Fascinating, almost bordering on the absurd. If I walk up to the window, I see workers moving about the construction site, elevators that are constantly traveling up and down, cranes of gigantic proportions twisting over the building and the surrounding neighborhood. I can thus form an idea of how the work is progressing, both in terms of the purely material as the building reaches ever closer to the sky, but also the more engineering part of it all – the seemingly messy, but certainly extremely orchestrated, collection of people and various machines that are working together to make this 'thing' possible. So, while I'm not a professional construction worker or engineer I can still, on a basic level, form an idea of – and thus appreciate and be impressed by – the complex engineering that, together with the intense and enormous labor, makes this building possible to realize. And I would probably recognize, and thus be able to comprehend, what is happening – who does what and why – if I came across similar construction sites in New York, Oslo, or Berlin. In short, engineering in the tangible realm – as fantastic and complex as it may seem – can still be understood in a relatively superficial way, I think. But what about artifacts in the digital realm?

Can we understand them as constructions and thus form ideas, albeit shallow ones, of the engineering and work needed to bring them into existence? As an illustrative example, let us consider the cloud platform.

The fascinating thing about cloud platforms is that some of them have grown into engineered, digital behemoths of a scale and scope that is hard to fathom. In my thesis I have focused on Microsoft Azure, and in what follows I thought I would try to be a little more concrete and investigate whether we can form an idea about this platform, find a metaphor that could help building an intuition of this 'thing' as an engineered construction. I'll start with some numbers: At the time of writing, Azure consists of over 200 data centers located in different parts of the world, linked via an interconnected network. Running on top of this so-called global infrastructure is then the services and products that together make up the platform which is Azure. At the time of writing, Microsoft offers almost 300 so-called 'products' that range from services categorized as diverse as *AI & Machine Learning* (e.g., 'bot services', 'cognitive services', and 'speech translation'), and *Analytics* (e.g., 'data explorer', 'data factory', and 'data lake storage'), to *Compute* (e.g., 'virtual machines', 'kubernets services', and 'quantum'). These are just a selection of all the products which constitutes the platform; products which may remain over time, but where some may be withdrawn if the product is deemed obsolete, while new ones are added as technology advances – hence, a 'Cloud' that never appears complete but always in the making.

I have thus searched for an appropriate metaphor[18] that would encompass and help to explain both the more tangible and large-scale infrastruc-

18 In some sense, it became a kind of a supplementary exercise to the task I intended to solve in the article "Platformization of a Cloud Service". There, I tried to develop a conceptual apparatus at a high level of abstraction. An apparatus that allowed me to reason about the cloud platform as a 'thing'. And while I am satisfied with the outcome, I recognize that the abstraction peeled away a lot of the complex machinery which helps one imagine and appreciate these platforms as the engineering behemoths they really are. Somehow, I think that the theorizing in that paper on the one hand contributes to the understanding of these types of platforms as important contemporary actors, but at the same time I somewhat neglected (due to the high level of abstraction) the enormous engineering efforts required to build, develop, and maintain them. To be honest, I can feel that it is generally difficult to handle and account for the engineering part in theorizing; theory often assumes, I feel, a sort of universal existence of digital artifacts – but they are made by someone, somewhere at some time.

ture of interconnected data centers, as well as the diversified amount of software that runs on top of it. As an example, I have considered the mycelium as an interesting candidate. A vast, wide, yet connected collective that together forms an interdependent and communicating whole. Here the data centers would correspond to the fungi protruding from the ground and the mycelium would then describe the interconnection that enables communication and exchange of information between them. *But*, I can sometimes object to myself, *maybe this just serves as an apt metaphor for how the cloud platform extends into the tangible world? Does that really say anything about what is happening in the digital realm?* As I consider this objection, and ultimately agree with it, I suddenly find myself on the brink of a conceptual frontier to what I currently can (and cannot) describe. A frontier that opens like a chasm and runs between a rather well-defined landscape of accessible language and a vast and fuzzy space where intuitions and feelings, not yet encapsulated in language, exist. And it is then and there – standing at that brink – that that a quote from the book *Transductions: bodies and machines at speed* by Adrian Mackenzie (2002, p. 213) comes to mind. That "[t]he emphasis on subordinating technology to signification, especially to linguistic signification, and the goal of symbolizing technology within culture does not take into account the ways in which technical mediations might resist signification."

Here Mackenzie reminds us that despite our desire to categorize and make technology comprehensible, we need to remain humble and consider that there may be technological mediations that cannot (so far) be grasped purely linguistically – at least not within our current structure of meaning. In a way, technology sometimes seems to overflow what is yet possible to signify. But I don't read Mackenzie as saying that there are things in the digital realm that cannot be described, rather that we as actors always operate within existing discursive systems of concepts and meanings, and it is these systems that have limitations in giving us conditions to express and understand. Given that technical processes are sources of contingencies, they may affect our prevalent systems of meaning (in this thesis understood as discourse) in various ways. Either by for example developing and bringing more functionality or complexity and thus, in a sense, overflowing what is already signified, but also by appearing in completely new guises and forms that we have not previously witnessed.

And here, at the limit of discourse, we have a choice to either incorporate what we perceive into an already existing discursive space of well-known concepts and theories or try to widen our theoretical horizon and seek to find a new language to describe what we experience.

6.4.3 DIGITAL PLATFORMS AS OBSCURE ZONES

So, what will a future in a digital society look like? What will it entail? Of course, it is very difficult, if not impossible, to predict. But I think a lot will be about trying to solve generative dilemmas, in whatever form they may arise, and thus develop abilities and capacities to cope with the latent power of digital technology. As Zittrain (2008) pointed out, solutions to the generative dilemmas we may face are likely to be found as much in the institutional and societal realm as in the technological. But to reach these solutions, we must first be able to comprehend and make sense of an ever-changing, morphing digital society.

So, for the sake of this thesis, let us return to the notion of 'Digital Platform' and ask: What exactly is it? Could we ever claim that such a concept is semantically filled? I do not think so. And I would almost like to say that it might be a fallacy to even think it is possible. Of course, we know a lot about digital platforms today and there have been many important contributions in this area of research; for example: how platforms work on and affect markets, how platforms change strategic thinking, how platforms act as enablers of innovation and creators of (more) frictionless transactions. And the list goes on. But, and as I hope this thesis attests, there is still much work to be done in trying to understand and explain how they, as sociotechnical artifacts, integrate and entangle with individuals, societies, and states in increasingly complex ways. And in doing so, they tend to challenge existing norms, regulations, and institutions at all levels of society.

Unlike the building that rises outside my window – which will remain precisely a building throughout its lifespan – we know that digital technology is generative at its core (Zittrain, 2008), ambivalent to its nature (Kallinikos et al., 2013) and that artifacts and systems built with this technology tend to drift (Ciborra & Hanseth, 1998). So, the million kronor question then becomes: Does our conceptualization of the 'digital plat-

form' reflect or allow for potential drift? Does it need to? What I think I am getting at here is a potential issue of being arrested in a theoretical worldview that does not really reflect the reality it is trying to convey. As an example, take Uber: A digital platform that has obviously transformed over its lifespan, challenging societies, institutions, and norms in many of the places where the platform has been introduced. Hence, the digital platform that is Uber has proved that it can drift, that it can change direction and transcend markets, and further change its scale and scope right under our noses. Still, we can of course explain many of Uber's effects in terms of the theories attributed to the digital platforms, such as 'matchmaking', 'network effects', and 'multisided markets'. But it is becoming more and more obvious that if we are to really understand these major digital platforms as actors in a digitalized society, and how they affect the same, we need to realize that these theories do not paint a unified picture of the digital platform, but merely specific perspectives. To be able to describe, understand and account for the drift that seems to follow in the wake of digitalization, we must also be perceptive to the workings of digital technology and its ambivalent nature (Kallinikos et al., 2013). Of course, we can always, on a fairly high level, claim that digital technology is transformative since we see evidence for such a claim daily. But if we really want to comprehend how digital technology makes this transformation possible, we need first to understand, and be able to explain, what the digital brings to the table (Yoo, 2013). And therein lies an obvious challenge eloquently put forward by the French philosopher of technology Gilbert Simondon (2017, p. 257), as he reflects on "the very foundation of the communication between man and machine". He writes:

> In order for information to be exchanged, man must possess within himself a technical culture, which is to say an ensemble of forms that, upon encountering the forms contributed by the machine, will be able to elicit meaning. The machine remains one of the obscure zones of our civilization, at all social levels.

6.4.4 AN EVEN CLOUDIER FUTURE

The phenomena we today define as digital platforms are here to stay, at least for a while, but our description and explanation of the same will probably shift and expand as we add new layers of understanding. More specifically, I think that the platforms addressed in this concluding section – the cloud platforms (Narayan, 2022) – will play an increasingly central role going forward. And as discussed, our ability to manage this future, to deal with the generative dilemmas that follow in the wake of platforms, "will rest on social and legal innovation as much as on technical innovation [...]" (Zittrain, 2008, p. 61). Thus, to be able to navigate and manage a digital society the conceptual understanding of technology – what it 'is', can 'achieve' and 'become' (the discursive aspect) – will be as important as the technology itself (the material aspect). In addition, I think we need to build intuitions and explanations about how digital platforms, in various ways, seems to infiltrate the social. I use the word 'infiltrate' in the sense that our dependence on these platforms grows gradually, almost imperceptibly, and thus I doubt that we[19] on a macro level can estimate how dependent we are.

Perhaps I attribute this phenomenon too much importance, but at the same time I cannot ignore that we seem to be building an increasingly complex and interdependent, almost symbiotic, sociotechnical mesh here. A puzzling mesh, hard to grasp, where we become dependent on and tied to platforms, and they to us. In this mesh, cloud platforms emerge as "invisible" (infra)structures (Plantin et al., 2018). And as Star and Ruhleder (1996) reminds us, infrastructures become visible if/when they break down. But unlike infrastructures appearing in the tangible realm, where we have learned to perceive and form an idea of how they are integrated into the fabric of society, I wonder if we can form ideas about how digital platforms extend and operates as infrastructures. Such an idea would, for example, reflect on a kind of looming generative dilemma (Zittrain, 2008): As we build an increasingly complex digital society, we gradually rely on platforms without perhaps even realizing it. Thus, if/when these platforms fail, their infrastructural properties will be exposed – but maybe

19 Here 'we' should be understood as a collective term for individuals, organizations, and societies.

only then. Certainly, specific individuals and organizations can estimate their dependence on different platforms, but at the macro level it is probably more difficult to assess any sort of aggregated platform dependence.

Kallinikos and colleagues (2013) state that digital artifacts have different characteristics than traditional artifacts, and that one needs to perceive them not as static and closed, but rather as distributed and evolving. But I think we have a hard time internalizing such an intuition, it just doesn't come natural to us. For example, as digital platforms are increasingly used, they performatively gain a fundamental position in society. And as their significance increases, we may no longer be able to consider them simply as "enablers that empower people" or "unparalleled forces of innovation" but also as necessary and critical building blocks of an emerging digital society. Therefore, perhaps we should start asking questions such as**:** What would happen if they disappeared? Do we have a contingency plan for something like that? Given that we are on a journey of seemingly continuous digitalization, could we imagine a future without them? These thoughts bring us back to Zittrain's (2008) generative dilemma and challenge us to consider: How do we reap the benefits of digital platforms while mitigating and managing the problems that follow in their wake? How do we find a balance?

CHAPTER 7
CONCLUSION

As guises and forms of digital technology spread across the globe a kind of dematerialized materiality is emerging – a digital materiality – which has consequences. For example, while digital technologies enable a culture of participation and engagement by lowering barriers for entrepreneurs and innovators, a relatively small number of digital platforms has emerged as dominant actors delivering these technologies. Dominant actors with a lot of power in their hands. How to deal with this generative dilemma is probably one of the most pressing and challenging questions of our time.

To be able to speak to this situation – to be able to explain how digital platforms challenges existing cultures, institutions, norms, and ways of thinking – this thesis departed from an assumption that we must first pay attention to, understand, and explain their various modes of existence. This intention was operationalized based on the idea that if we are to understand how digital platforms affects society, a more platform-centric perspective needs to be explored and theorized.

A platform-centric perspective emphasizes the importance of understanding and investigating digital platforms as phenomena that operate at

a macro level. As our reliance on digital platforms increases, they may grow to become fundamental constituents of a digitalized society. Digital platforms should therefore not only be understood as things that are used, but also that they can performatively (as we iteratively continue to use them) become a structure that we depend on.

The thesis also grappled more broadly with how to make sense of digital technology in continuous flux. By reflecting on, for example, where distributed computation occurs, we can begin to understand how assemblages in the digital realm emerges, function and evolves (e.g., platformization). Thinking about digital platforms in this way can stimulate new perspectives on organizations, industries, and the scope of the firm.

In summary, this thesis contributes to the knowledge of digital platforms by developing the notion of platformization, but also to a burgeoning body of research that sees a need to rethink and reconceptualize digital technology. Further, it contributes by showing how through an amalgam of discourse and digital materiality we can understand digital platforms, as well as digital artefacts more generally.

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