



Examining relational digital transformation through the unfolding of local practices of the Finnish taxi industry

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ARTICLE INFO

Keywords:

Digital transformation
Digital platforms
Contextual explanation
Taxi industry
Mobile apps
Practice theory

ABSTRACT

Digital transformation has become a central construct in information systems (IS) research. Current conceptualizations largely attribute transformation to intentionality, focus on transformation within a single organization, or assign technology the role of a disruptive agent of change. Likewise, “digital” tends to be a general category of technology, rather than a specific technology enacted in a time and place. Inspired by Schatzkian practice theory and its site ontology, we suggest a contextual viewpoint on digital transformation and call it “relational digital transformation.” We analyzed the change dynamics in the context of taxi dispatch practice in Finland, studying the changing taxi dispatch platforms over years. We investigated five powerful industry actors: two incumbents, two entrants, and a federation of taxi entrepreneurs. We identified events of change in the material arrangements in sites and explain the changes through the process dynamics in the focal practice. We define relational digital transformation as a process through which practice-arrangement bundles of digital technologies evolve over time. This approach assumes the default nature of an industry is to be found in the changing relations *between* entities rather than in entities themselves. This provides a theoretical extension to the prevailing views of digital transformation in IS literature. It enables studying digital transformation in retrospect without attributing change agency to any entities or technologies *a priori*. We also contribute to practice-theoretical IS literature by demonstrating how the applicability of practice theoretical analysis extends beyond microphenomena to larger industry-level changes.

Introduction

Digital transformation has become an important focus area in information systems (IS) research (Morakanyane et al., 2020; Vial, 2019). It is widely agreed that digital technologies, especially in the form of platform-based businesses, have significant transformative power (Agarwal et al., 2010; Constantinides et al., 2018). Digital platforms may shake entire industries, as demonstrated by the examples of Uber in taxi transportation and Airbnb in hospitality (de Reuver et al., 2018; Stone, 2017). Powerful corporations such as Apple and Google embrace digital technologies in their strategies (Eaton et al., 2015; Karhu et al., 2018). Scholars often view digital transformation as a form of moderate technological determinism, where digital technology is assigned the task of a driving force, as the main agent of change (Vial, 2019).

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<https://doi.org/10.1016/j.jsis.2020.101622>

Received 10 September 2019; Received in revised form 30 July 2020; Accepted 3 August 2020

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Although “digital transformation” is considered a broader concept than the previous “IT-enabled organizational change”, most conceptualizations place this transformation within the boundaries of a single organization (Vial, 2019). Thus, digital transformation research is placed in the tradition that starts with a single organization and views its actions in the larger environment as the organization’s impacts (Bourgeois, 1984). The tradition manifests, for example, in the notion of “digital disruption” that views a single organization’s innovation efforts as the cause of large-scale systemic shocks (Skog et al., 2018). We can see around us, however, that digital transformation occurs in more ways than through one company or one technology. One company is rarely the sole reason for the shaping of an industry. Moreover, digital transformation is not always intentional or planned, but may emerge under ambiguous conditions. To us, it seems that the extant view of digital transformation provides not only a way of seeing but also may prevent seeing the varieties of how transformation occurs.

We suggest that closer integration of the context in the analysis of digital transformation through a practice-relational approach would be beneficial. The practice-relational approach has become prominent since the “practice turn” (Schatzki et al., 2001). Although the practice approach has often been associated with ethnographic accounting of microphenomena (Johnson et al., 2003), the larger purpose of this approach is the primacy of practices over entities (Nicolini, 2013). Bringing practice to the fore requires the rejection of methodological individualism that “seeks explanations of social phenomena purely in terms of actor intentions and motivations” (Chia and Holt, 2006, p. 638). By taking a perspective on change that has a scope broader than a single organization, it is possible to capture large phenomena, such as industry-level change (Nicolini, 2016; Schatzki, 2016). From this backdrop, we pose the following research question: *How does digital transformation unfold at the industry level through local practice-arrangement bundles?*

To address this question, we use the practice-theoretical concept of site (Schatzki, 2002, 2005) in an analysis of the role of digital technologies in the transformation of the Finnish taxi industry and the taxi dispatch practice. We take a practice-relational view of digital transformation and call it “relational digital transformation.” We define it as the process through which the practice-arrangement bundles of digital technologies evolve over time. This approach allows us to focus on the mutual constitution of technology arrangements and practices in the local context of use. The taxi dispatch business is an interesting context to study digital transformation, as taxi dispatching is socially and materially co-constitutive. One cannot dispatch a taxi without a facilitating technology. Likewise, the dispatch technology requires a taxi dispatch practice to provide any benefit.

This study concerns an empirical retrospective study of the changing taxi dispatch industry in technologically advanced Finland over 10 years (2008–2017), including seven years in which taxi platforms with consumer apps have been available in Finland (2011–2017). Finnish taxi dispatch centers operate in a similar way to Uber in that they do not own the cars they dispatch. Likewise, they use dispatch technology that requires no human intervention in matching customers with drivers.

The remainder of this paper is structured as follows. In Section 2, we synthesize the literature on digital transformation and digital platforms in taxi dispatch practice. We also describe the Schatzkian practice-theoretical concept of site. In Section 3, we outline our research design, methodology, the theoretical lens, and key concepts. In Section 4, we present the findings of the study concerning the relational digital transformation of the taxi industry. In Section 5, we conclude by discussing the results, identifying the implications of the results, and presenting suggestions for future research.

Related work

In the following, we synthesize the literature on digital transformation. We then discuss Nordic taxi dispatch SMEs (small and medium-sized enterprises) as operators of platform businesses. Finally, we introduce the practice-theoretical concept of site.

Digital transformation

Socio-technical concerns have constituted the core of IS scholarship throughout the history of the discipline (Sarker et al., 2019). IS research focuses not on digital technologies as such, but on their application and impact in various contexts (Bjørn-Andersen and Clemmensen, 2017; Hirschheim and Klein, 2012). During the last decade, digital transformation has emerged as an important socio-technical concept (Agarwal et al., 2010; Hinings et al., 2018; Osmundsen et al., 2018). Although various conceptualizations of digital transformation exist (Bohnsack et al., 2018; Osmundsen et al., 2018), the concept derives its meaning from the wide agreement that digital technologies offer transformative potential. A review by Osmundsen et al. (2018) reveals that digital transformation sometimes refers to the impact of a specific class of technologies, such as big data or the cloud (Nwankpa and Roumani, 2016), while at other times, the term may refer to any information technology or system that enables change (Heilig et al., 2017). Sometimes, the term refers to transformations in organizations (Heilig et al., 2017), and other times to transformations in society at large (Piccinini et al., 2015).

In the June 2019 special issue of *The Journal of Strategic Information Systems*, Vial (2019) provided a review of the digital transformation literature. He reviewed 282 publications, and based on 23 unique definitions of digital transformation he found in 28 sources, he developed the following conceptual definition: Digital transformation is “a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies” (p. 121). To construct this formulation, he semantically decomposed extant definitions of digital transformation and identified four essential properties:

- (1) Target entity, i.e., the unit of analysis affected by digital transformation
- (2) Scope, i.e., the extent of the changes taking place within the target entity’s properties
- (3) Means, i.e., the technologies involved in creating the change within the target entity

(4) Expected outcome, i.e., the outcome of digital transformation.

When examining this definition, we can problematize (cf. Alvesson and Sandberg, 2011) its two aspects, thereby revealing gaps in the extant digital transformation research. First, digital transformation research is highly invested in intentionality (Vial, 2019). In contrast, we propose looking at intentionality as *immanent* in action, rather than external to it in a representation (cf., Chia and Holt, 2006), providing a means of understanding digital transformation entangled with the impacts of technology. Second, Vial (2019) shows that in extant digital transformation definitions the focus is on the transformation of entities, as most (26 out of 28) are organization-centric.¹ Although the definitions include potential target entities as well, such as “Organization, platform, ecosystem, industry, society,” they still largely remain within the boundaries of an organization. Vial identified that industry and society are seen either as impulses for an organization to innovate (p. 135) or “higher-level” impacts of organizational digital transformation (p. 130), for instance, improved quality of life by healthcare IT. These formulations place the external context as either the input to or the output of the digital transformation, but not as a part of the transformation process itself.

In summary, the definition of digital transformation that Vial extracted from extant research is framed as starting from intentions and then moving toward the future to find hypothetical or actual outcomes provided by technology. We acknowledge that this view does not necessarily reflect digital transformation research in general, as much research on the topic has been conducted without a clear definition of what is meant by “digital transformation” (see Vial, 2019). However, explicit definitions affect how we see the world, what we are looking at when we try to understand the world: “A way of seeing is also a way of not seeing” (Burke, 1935, p. 49). In this paper, we see that digital transformation does not necessarily attribute a clear intention or expected outcome or even have a clear target entity. Instead, digital transformation is a process through which the practice-arrangement bundles (see Section 2.3) of digital technologies evolve over time; we refer to this as relational digital transformation.

Digital platforms in the taxi dispatch practice

IS scholars have investigated digital transformation in industries such as healthcare (Goh et al., 2011), banking (Eastburn and Boland Jr, 2015), camera manufacturing (Lucas and Goh, 2009), retail (Hänninen et al., 2018), and automobiles (Svahn et al., 2017). The taxi industry, the context of this study, has been a much rarer focus in scholarly circles. Previous studies on the taxi industry included stakeholder analyses (Skok and Kobayashi, 2007), performance measures of taxicab services (Skok and Martinez, 2010), organization of taxi work with mobile technologies (Elaluf-Calderwood, 2009), and worker perceptions of ride-hailing (Mäntymäki et al., 2019). Studies have been conducted about government regulation of the taxi market (Salanova et al., 2011), the modeling of different modes of taxi services (Aarhaug and Skollerud, 2014), a demand and supply model to help regulation (Çetin and Eryigit, 2013), and how policy ambiguity gives rise to divergent interpretations of what a taximeter is for (Lanamäki et al., 2019).

Interest in the taxi industry as a research topic has increased significantly since 2013, after transportation network companies (TNCs) such as Uber and Lyft became very popular in many cities. This shift occurred first in cities in the United States and later around the world (Lashinsky, 2017). Many IS researchers have now found TNCs a fruitful research opportunity (e.g., Greenwood and Watal, 2017; Lee et al., 2018; Tan et al., 2017). Recent studies focused on, for example, how the institutional environment is inscribed in taxi apps (Väyrynen et al., 2018), how apps have changed the market for taxi journeys and how this change affects taxi market regulation (Harding et al., 2016), the impact of ridesourcing on the taxi industry (Nie, 2017), the significance of dispatch systems in taxi service performance (Ramezani and Nourinejad, 2017), and how algorithmic management affects taxi driver autonomy (Möhlmann and Zalmanson, 2017). Uzunca et al. (2018) report how Uber experienced different consequences in the Netherlands, the United Kingdom (UK), and Egypt.

The technologically advanced taxi market in the Nordic countries provides a fruitful research setting (Artman and Zällh, 2005; Casey et al., 2017). Many taxi dispatch SMEs in the Nordic countries operate as platform companies. They facilitate a two-sided market (Eisenmann et al., 2006) without owning the taxis (cf. Constantinides et al., 2018). In the Nordic countries, taxi dispatch companies are often the dominant actors in the taxi service industry (see, e.g., Slavnic, 2015, p. 308; van der Heijden and Valiente, 2002). Viewing all taxi dispatch companies as platform companies may not be obvious, because the notion of platforms is often conflated with the idea of the sharing economy (Acquier et al., 2017). However, since the early 1990s, Finnish taxi dispatch SMEs have adopted a platform-like business model as “a strategy for operating multisided platforms and connecting buyers and sellers without controlling or owning the products or services being sold” (Constantinides et al., 2018, p. 388). Until July 2018, all taxis had to have a taximeter integrated in the car that recorded all rides made by the car with detailed information about pickup and drop-off location, price of the ride, etc. Dispatch companies used advanced technology to dispatch a car based on algorithms that took into consideration, for example, the distance of the car from the customer and the time the car had been idle before the order for a ride was received. Although Uber uses more complex algorithms, these Finnish dispatch centers are technologically comparable to Uber-type platforms, as they provide technologically enabled dispatch that does not require human intermediation. Particularly against the backdrop of how Uber has transformed the taxi industry in various places, these locally operating platform SMEs form an interesting context to study a platform’s embeddedness in its context, as, after all, Uber is a taxi dispatcher (Constantiou et al., 2017, p. 233).

For the purposes of this study, we conceptualize a digital platform as a sociotechnical assemblage (de Reuver et al., 2018) that exists for “connecting buyers and sellers without controlling or owning the products or services being sold” (Constantinides et al., 2018, p. 388). This conceptualization includes native platforms (e.g., Uber) and evolving platforms, for example, the ones constructed

¹ Appendix B for Vial (2019), available online at <https://doi.org/10.1016/j.jsis.2019.01.003>.

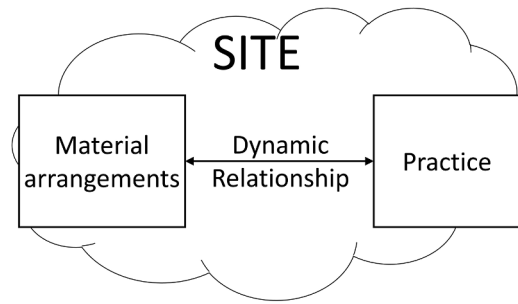


Fig. 1. The Schatzkian framework for this study: the site of the social.

on top of existing dispatch systems (Hein et al., 2019).

To summarize, although the taxi industry has been studied from various angles, many corners have remained unexplored. Studies have been conducted about taxis and about TNCs, but to our knowledge, no studies of incumbent taxi SMEs that operate as platforms have been conducted. Studies about TNCs are mostly conducted in places with a poorly developed taxi industry, such as in most of the United States. Contexts with a technologically advanced taxi industry, like the Nordic countries, have rarely been studied. Longitudinal and cross-contextual studies on SMEs and incumbent taxi dispatch companies are lacking in the literature.

Schatzkian practice theory and site ontology

As the theoretical lens, we draw on Schatzki's (2001) theory of *practice* and the concept of *site* (Schatzki, 2003, 2005). Several IS scholars have approached digital transformation from a practice-theoretical foundation (Chanias et al., 2019; Huang et al., 2014), influenced by the strategy-as-practice stream of research (Arvidsson et al., 2014; Whittington, 2014). These studies usually focus on the transformation of one organization, for example, a financial service provider (Chanias et al., 2019) or a ticketing company (Huang et al., 2014). In these studies, practice theory has allowed the researchers to focus on managerial everyday doings. However, various strategy-as-practice scholars have warned against too micro-detailed analyses of practice (Vaara and Whittington, 2012). The importance of capturing large phenomena has been closely addressed in the broader practice-theoretical literature as well (Nicolini, 2016; Schatzki, 2016). Scholars have argued that practice theory provides a good foundation for relating microprocesses to macro-outcomes (Kouamé and Langley, 2018). In this research, we use the practice lens and site to examine digital transformation as a relational, historically and situationally embedded phenomenon.

Schatzki's site ontology is one of the most prominent orientations within practice theory (Nicolini, 2011) that has been developed during the last few decades (Schatzki et al., 2001). The concept of a site (or a stage or arena) has been used in IS and strategy literature (e.g., strategy sites in Huang et al. (2014); sites of knowing in Nicolini (2011); and stage in Wenzel and Koch (2018)). By *site*, Schatzki (2005) refers to a type of context or a set of phenomena that surrounds or immerses something, the context and the contextualized artifact constituting one another. The site of the social consists of a nexus of practices and material arrangements that are in a dynamic relationship with each other (Fig. 1). Practices are organized human activities. Material arrangements consist of four types of entities—artifacts, human beings, other organisms, and things of nature. In site ontology, the artifact or event is tied to the context, and the nature and identity of the context are tied to the artifact or event (Schatzki, 2005, p. 468). Following the example set by Huang et al. (2014) and Arvidsson and Holmström (2018), we use the concept of site (Nicolini, 2011; Schatzki, 2005) to provide an understanding of the dynamic relationship between digital technology and the taxi dispatch practice.

Research design and methodology

This study was conducted in Finland. According to the Organization for Economic Co-operation and Development (OECD, 2018), Finland is a highly developed country that ranks second in the world in mobile broadband subscriptions per inhabitants and first in mobile data usage. The Finnish taxi service industry is undergoing significant change due to government deregulation. Deregulation has major implications for the competitive setting in the industry.

Research context: The Finnish taxi dispatch industry

The Finnish taxi service industry has an annual turnover of approximately one billion euros. Of that turnover, 40% comes from private consumers, 40% from the public sector, and 20% from corporate customers.² Microenterprises managed by owner-drivers comprise 99% of the sector, with a total of 7600 entrepreneurs and 9600 taxis.³ In Finland, 14,000⁴ people representing 1.77% of the working population get their primary income from driving a taxi.

² Source: <https://www.helsinginuutiset.fi/artikkeli/513464-taksit-saavat-veronmaksajilta-400-miljoonaa-euroa-joka-vuosi-ala-murroksen-edessa>

³ Source: <https://www.helsinginuutiset.fi/artikkeli/513464-taksit-saavat-veronmaksajilta-400-miljoonaa-euroa-joka-vuosi-ala-murroksen-edessa>

⁴ Source: http://www.ammattinetti.fi/ammatti/detail/5/7/430_ammatti;sessionid=9F4F9961C7123AEC79E6612F7DFD4EC7?print=true

Table 1
Summary of the five platforms analyzed in this study.

	Delta Platform	Taxify Platform	Uber Platform	National Platform	Alpha Platform
Launching focal actor	Southern Taxi	Taxify	Uber	Taxi Federation	Southern Taxi
Mobile app for consumers' use	Delta app	Taxify app	Uber app	National app	Alpha app
Finnish dispatch centers involved	Southern Taxi	Northern Taxi	None, worked only with individual drivers	Southern Taxi; Northern Taxi; most other Finnish dispatch centers	Southern Taxi
Drivers	Licensed	Licensed drivers in Northern Taxi operating area; some unlicensed drivers in other areas	Unlicensed	Licensed	Licensed
Geographic coverage	Regional: area in southern Finland	Regional: some areas in northern and central Finland	Regional: southern Finland	National	Regional: area in southern Finland

The Finnish taxi service industry started in 1906 when the first taxi cars started operating in Helsinki, in Oulu, and then elsewhere. Since the 1950s, the industry has organized under regional taxi dispatch centers owned by owner-drivers from the region. At the time of the interviews, in March 2018, 35 such companies were operating in various parts of Finland. The dispatch centers usually do not own cars. The owner-drivers pay the dispatch centers for their service of dispatching rides to the driver. In addition, traditionally the consumer pays a fee to the dispatch center when calling the center to order a ride. Due to historical, technological, and regulatory reasons, these dispatch centers have not had much geographic overlap. Therefore, they are usually regional monopolies. More than 80% of Finnish owner-drivers belong to the national taxi owner's federation (hereafter called the Taxi Federation). If one date needs to be given for the birth of the digital era of the Finnish taxi industry, it would be December 8, 1987. It was then the first information and communication technology (ICT)-based taxi dispatch system was implemented (Mauranen, 1995). Thus, the industry has been adopting ICT solutions for over three decades. Throughout its history, national legislation has strictly regulated the industry.

The present research focuses on a site constituted by the practice of taxi dispatching. We focus on five different taxi organizations that are all engaged in this practice. Two of these organizations are regional incumbent taxi dispatch center companies (Southern Taxi and Northern Taxi, pseudonyms), two are entrants (Uber and Taxify), and one is the Taxi Federation. The organizations are described in more detail in Section 4.1. Central in this study are the five digital platforms used by these focal organizations (see Table 1). All five platforms offer a mobile app for consumers' use, bringing together consumers on one side and one or more types of service providers on the other.

Research approach and data collection

We chose a qualitative interpretive research approach (Klein and Myers, 1999; Walsham, 1995) for this study. This approach has distinct advantages when researchers are investigating contemporary phenomena they do not influence (Yin, 2009). In this study, we investigate the phenomenon of the digital transformation of the taxi dispatch industry and have no control over what happens. This is a retrospective longitudinal case study, taking an interpretive position on retrospective research; "understanding of the present is informed by the construction of past reality" (Cox and Hassard, 2007, p. 488). Halinen and Mainela (2013, p. 200) define longitudinal research as:

"a form of research in which a) data are collected with a temporal orientation on specified structural or processual elements, either continuously or in one or several distinct time periods; b) the subjects or cases analyzed are for some fixed part of the phenomenon the same from one period to the next; and c) the analysis involves comparison of data between periods or integration of data related to past, present and future."

When selecting the case, we applied theoretical sampling (Eisenhardt and Graebner, 2007), the Finnish taxi industry being especially revelatory for studying digital transformation from a practice-relational perspective. The timeframe we were interested in and that we focused on in the data collection was January 2008 through December 2017.

We conducted semi-structured interviews (Myers and Newman, 2007) with 18 interviewees between January and April 2018 (see Table 2). We conducted 10 interviews related to the five focal organizations described in Section 3.1 (Northern Taxi, Southern Taxi, the Taxi Federation, Uber, and Taxify; interviewees 1–11 in Table 2) and seven with other representatives and stakeholders of the Finnish taxi industry. By interviewing actors from other relevant organizations, we limited any bias due to interviewee impression management (Eisenhardt and Graebner, 2007). We applied purposeful sampling (Morse, 1991) to select the interviewees. We first identified the key informants from the focal organizations by doing online research on the organizations and their members. We were able to arrange interviews with all those we had identified as key informants. In addition, we used snowballing; that is, we asked each

Table 2
List of interviewees.

	No.	Title	Organization
Interviewees representing focal organizations	1	Executive manager	Taxi Federation
	2	Executive manager	Taxi Federation
	3	Manager	Taxi Federation
	4	Executive manager	Technology provider for Taxi Federation
	5	Manager	Southern Taxi
	6	Executive manager/Developer	Technology provider for Southern Taxi
	7	Executive manager	Northern Taxi
	8	Executive manager	Northern Taxi
	9	Representative	Uber Finland
	10	Lobbyist	A PR agency
	11	Representative	Taxify
Associated interviewees	12	Executive manager	A regional taxi service association
	13	Executive manager	A regional taxi service company
	14	Executive manager	Transportation service company
	15	Executive manager	A technology provider
	16	Chief of licensing	A public-sector organization
	17	Entrepreneur	A technology provider
	18	Expert	A mobility association

Table 3
Secondary material used in this study.

Data source	Number of data sources	Year(s) + Number of observations
Newspaper articles	31	2014 (7), 2015 (9), 2016 (5), 2017 (7), 2018 (2), 2019 (1)
Press releases/ announcements	2	2017 (2)
Websites	7 (Southern Taxi, Northern Taxi, National App, Taxi Federation, Taxify, Uber, two technology providers)	2017–2019
Legislation document	2	2014 (1), 2017 (1)
App log data	1	2018 (1)

interviewee who else they thought would have information or a different perspective on the topic. We then chose those informants who were able to bring either complementary or very different viewpoints regarding the digital transformation of the Finnish taxi industry (interviewees 12–18 in Table 2).

The interviews lasted between 21 and 143 min, with an average length of 88.4 min. Interview themes included the personal background of the interviewees (and how they became part of the taxi industry), the background of the organization or company they represented, digitalization of the Finnish taxi industry, development of the National Platform and the related National app (specifically whether the organization played a role in the initiation of the idea, development of the application, etc.; when the organization was offered the National app; their thoughts about the National app; effect of the National app on the organization and on taxi drivers; and how they see the future of the National app), the influence of Uber on the Finnish taxi market when it started operations in Finland in 2014, the effect of Taxify when it came to Finland, effects of the coming deregulation of the Finnish taxi market (how the organization prepared and what the organization expects to happen in the Finnish taxi market), and how they see the future of the Finnish taxi industry. In addition, the Southern Taxi representative and the technology provider for Southern Taxi were asked about the development of the Delta Platform and app and the Alpha Platform and app. The interviews were the primary source of data.

To verify the information gained from the interviews, we used publicly accessible information that included newspaper articles, Finnish and European legislation, and official statements of the Taxi Federation. We also received log data on use of the National app, including user numbers, ways of using the application, and statistics about the number of members of the Taxi Federation. This secondary data (see Table 3) was mainly used for data triangulation when establishing the timeline (occurrence and dates of certain events).

Data analysis: using the site lens

In the present study, the Schatzkian practice approach (see Section 2.3) inspired us to study digital transformation of the taxi industry with acknowledgement of the mutual constitution of material arrangements and the focal practice—as relational digital transformation. As scholars such as Leonardi (2013, 2018) have argued, mutual constitution is a challenging starting point to conduct empirical research on change. However, Schatzkian thought guided us in identifying material arrangements in time, and then tracing the local constitutive aspects of practice. In this study, we focus on taxi dispatch platforms as the material arrangements, and their dynamic relationship with the taxi dispatch practice. We acknowledge that there are many other types of material arrangements (e.g., the customers who order taxis, the taxi drivers, the taxi cars, etc.) and practices (e.g., the practice of ordering taxis, the practice of taxi driving, etc.) in the digital transformation of the taxi industry. However, in the present paper we operationalize the digital transformation through the very central elements of dispatch platforms and dispatch practice. The platforms analyzed in the present study are the ones that were relevant from the focal organizations' point of view. The key concepts of the analysis are presented in Table 4.

The data analysis consisted of three steps. Although these steps are presented sequentially, they were intertwined. Step 1 was an iterative process through which we arrived at our conceptualization of the site: material arrangements and practices. In this step,

Table 4
Key concepts of this study.

Key concept	Definition
Site	A bundle of material arrangements and practices that are in a dynamic relationship (Schatzki, 2003, 2005) (see Fig. 1). In the IS literature, the site concept has previously been applied by Huang et al. (2014) and Arvidsson and Holmström (2018).
Material arrangements	"[S]et-ups of material objects. Whenever someone acts and therewith carries on a practice, she does so in a setting that is composed of material entities. The material arrangements amid which humans carry on embrace four types of entity: human beings, artefacts, other organisms, and things." (Schatzki, 2005, p. 472)
Practices	"Embodied, materially mediated arrays of human activities centrally organized around shared practical understanding" (Schatzki, 2001, p. 11)
Platform	A sociotechnical assemblage (de Reuver et al., 2018) that exists for the purpose of "connecting buyers and sellers without controlling or owning the products or services being sold" (Constantinides et al., 2018, p. 388). Building on Schatzki's site ontology, platforms are material arrangements embedded in sites. In the taxi industry, taxi dispatching is often based on a platform model, as the dispatch companies do not own the cars, but connect the customers with the drivers.
Relational digital transformation	Process through which the practice-arrangement bundles of digital technologies evolve over time.

Table 5

Validity and reliability of the longitudinal timeline.

	Street and Ward's (2012) definition	How addressed in this research
Time boundaries validity	"Addresses the issue of whether the beginning and ending points of the total observation window (the 'window' of time between t_0 and t_{end}) have been set in such a way as to capture all significant events or effects that occurred in the process under study." (p. 167)	Beginning point of total observation window: January 2008 (one million 3G phone users in Finland). We see this as a prerequisite for mobile apps to become successful. End point of total observation window: December 2017. This was defined by the retrospective interview phase (January–April 2018).
Time period validity	"[D]eals with the issue of where the observation window is situated". (p. 168)	Beginning point of time period covered: May 2011 when Southern Taxi launched Delta app. Ending point of time period covered: December 2017. This 6.5-year period covers the whole digital transformation period and technical prerequisites from a platform perspective in the Finnish taxi industry.
Time unit validity	"Addresses whether the selected time unit (weeks, months, or years) is appropriately sensitive for capturing changes in the variables it is intended to measure." (p. 167)	Variable observed: different platforms in use Time unit: 1 month (from January 2008–December 2017) A time unit of one month was suitable to capture changes in the platform arrangement.
Timeline reliability	"The degree to which the proper sequence of past events, with the proper surrounding context, can be reproduced." (p. 170)	Two of the authors validated the key events and the sequence of events (e.g., when a new platform was launched or exited the market) triangulating with interviewees' accounts, press releases, and newspaper articles.

discussions within our interdisciplinary research team and analysis of the transcribed interviews were intertwined. Discussions between the two authors who collected the data took place on a weekly and sometimes daily basis, and were prompted and supported by newspaper articles, podcasts, and statistical data the authors found during the five months of data collection. After every interview, these two authors talked about what was surprising, interesting, or how their assumptions about a certain topic were supported or challenged by the content of the interview. In the meetings of the whole research team, in addition to the interviews, we discussed, for example, the current state of understanding of what was going on in the Finnish taxi industry; the role of National Platform and App, Taxify, and Uber; and how everything fits together. In these discussions, we talked about the material arrangements, culminating in digital platforms, and practices. Combined with the ongoing interview data analysis, these discussions resulted in our data-driven conceptualization of what site means in the present study (see Section 4.1, and especially Fig. 3). These discussions resulted in the identification of four aspects of the taxi dispatch practice (consumer behavior, business logic, norms, and technology) as they continuously arose in the interviews and in the supporting data (e.g., newspaper articles) in relation to why a certain platform came into being, changed, or ceased to exist in the Finnish taxi industry (see Section 4.2). We used these data-driven concepts of the five platforms (see Table 1) when we analyzed the transcribed interviews more systematically. The platforms and the four aspects of the taxi dispatch practice characterize the site of investigation, forming different constellations at different points in time.

In step 2, we built on the notion of phase in Huang et al. (2014), era in Friedman and Cornford (1989), and the general idea of periodization in history research (Porra et al., 2014; Rowlinson et al., 2014). We tried several ways of periodizing the timeline of the research into meaningful time units before deciding on a time unit of one month. We followed Street and Ward's (2012) suggestion for how to improve validity and reliability in longitudinal case study timelines (see Table 5). They specifically address positivist case studies; however, we believe their arguments are applicable to this interpretive case study for periodizing, as they (p. 162) define a case study "as the study of a phenomenon in a real-life context or setting that may involve more than one level and unit of analysis (person, group, organization, technology), and where no interventions or controlled observation that involve manipulation are involved." The unit of analysis in this paper is the site, and the site transforms in time as the related practice-arrangement bundles change.

By focusing on timeline validity and reliability, we arrived at the solution of splitting the timeline into eight distinct eras based on the digital platforms currently in use. Era 0 is the timeframe when no digital platforms with apps existed in the Finnish taxi industry. Era 1 to Era 7 are those timeframes in which one or more taxi dispatch platforms with consumer apps existed in the Finnish taxi industry. The appearance of a new digital taxi dispatch platform or the disappearance of an existing one, as well as when a platform's intended nature changed drastically, signified the start of a new era. Other key events, such as key actors joining or leaving a platform; the launch of mobile phones (iPhone, Android, etc.) and mobile app stores (AppStore, Android Market); the founding of different international hailing apps and services (such as Lyft, Uber, and Taxify); and key political decisions regarding the taxi industry (including statements about whether Uber is legal or illegal in Finland and announcements of law changes) were put on this timeline as well. Fig. 2 shows the resulting timeline with the key events. The grey bars show important actions by the five focal organizations. The figure also indicates the timeframes of different eras. Bold event lines indicate the start event of a new era, that is, changes in the digital platforms in use.

Although it was straightforward to locate on the timeline when a platform appeared or disappeared or an actor joined or discontinued collaboration with a platform, it is by no means clear or possible to locate dates or even periods for when a change in the observed unit starts to happen, or when one or more reasons for the change start to affect what happens. Therefore, we want to remind the reader that this case study is interpretive.

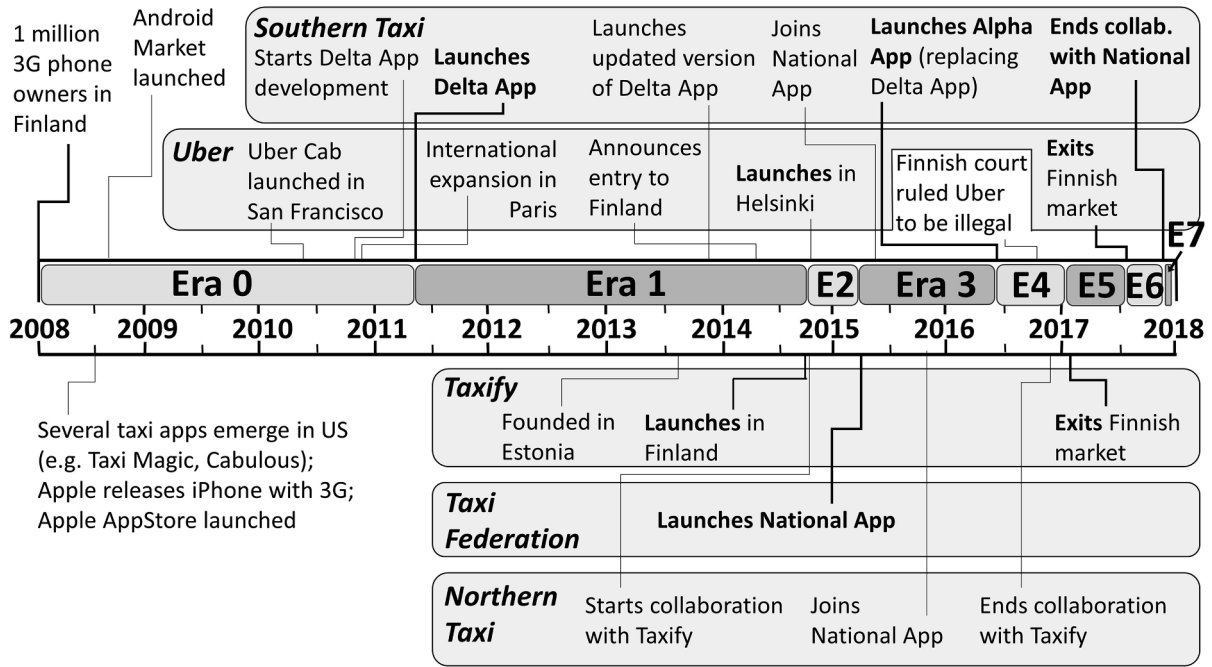


Fig. 2. Timeline with key events.

In step 3, we analyzed and traced explanations for why each new era began. In other words, we explained changes in the site's material arrangements through the changing enactment of the taxi dispatch practice. Applying a site ontology, we focused on uncovering the dynamic relationships between platform arrangements and the taxi dispatch practice.

Findings

In the following, we first describe the central conceptualizations that emerged from the interpretive data analysis, used for analyzing the digital transformation of the taxi industry with a site lens. Then, we provide a rich description of the case of the relational digital transformation of the Finnish taxi industry, looked at through its material arrangements in the form of platforms and their intertwinement with the taxi dispatch practice.

Central conceptualizations for the study of digital transformation of the taxi industry

In the analysis, the material arrangements we focus on is the platform arrangement: the constellation of taxi platforms that were available in the Finnish market at a certain point in time and that were relevant from a strategic point of view for the organizations. From the perspective of a specific organization, different platforms can have a different level of relevance. One platform might be highly relevant for organization A, whereas the platform might be irrelevant for organization B at a certain point in time. The level of relevance a specific platform has for a certain organization can change over time.

The platforms have a constant dynamic relationship with the taxi dispatch practice. We identified four aspects of this practice that were relevant in the context of the relational digital transformation of the taxi industry. The combination of platforms and aspects of

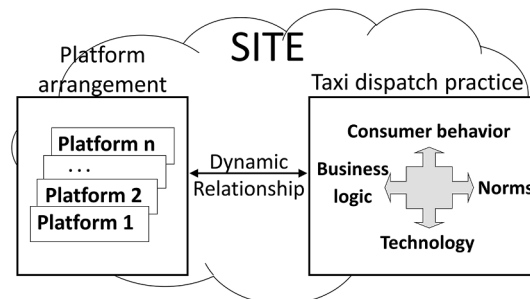


Fig. 3. Illustration of the site that comprises the intertwinement of platform arrangement and the taxi dispatch practice.

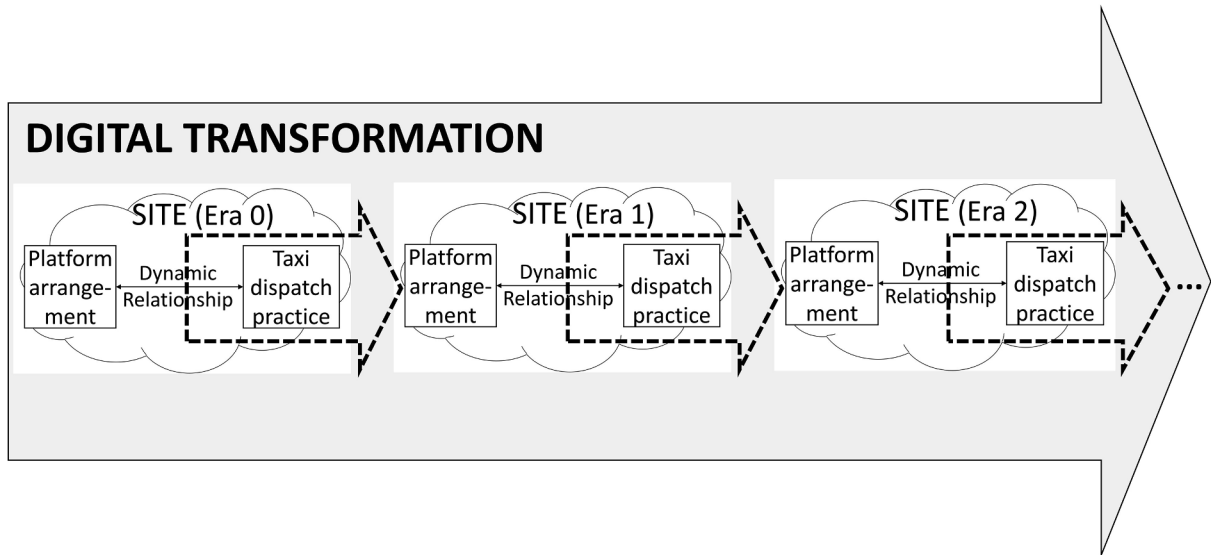


Fig. 4. Digital transformation characterized by the changes in platform arrangement.

the taxi dispatch practice are presented in Fig. 3 in the context of the site.

The consumer behavior aspect concerns consumers' actual or expected behavior (e.g., demand for cars, use of available technology). The business logic aspect is related to the organization's revenue logic (e.g., dispatch centers earn money if consumers call them but not if they order via a mobile app), cost efficiency, and pricing (e.g., in some platform the dispatch organization pays the platform provider, in another the driver pays the dispatch organization when a consumer orders a ride via an app). The norms aspect includes everything from laws and regulations set by the Finnish state to organizational rules (e.g., that dispatch centers did not allow their drivers to use non-proprietary dispatch technologies) to conventions. Finally, the technology aspect includes all things that concern the platform technology but also, more broadly, the possibilities and restrictions that technological development brings with it.

In Fig. 4 we show our data-driven understanding of how the site transforms in terms of changes in the platform arrangement at one point in time to the platform arrangement at another point in time. For analytical purposes, we created snapshots of the platform arrangement to capture the site during continuous change. Each snapshot signifies an era. The eras were identified through major changes in the platform arrangement of the site. This is the anchor point for explaining the changes in platforms and the relational digital transformation of the industry.

In total, we identified eight distinct eras that we define as follows:

- Era 0: No digital platforms with consumer apps available (January 2008 to April 2011)
- Era 1: The first taxi app emerges (May 2011 to October 2014)
- Era 2: Foreign invasion (November 2014 to March 2015)
- Era 3: National unity among incumbents (April 2015 to May 2016)
- Era 4: Southern Taxi's technological update (June 2016 to December 2016)
- Era 5: Taxify leaves Finland after Northern Taxi collaboration ends (January 2017 to July 2017)
- Era 6: Uber exits the Finnish market (August 2017 to October 2017)
- Era 7: End of incumbent unity (November 2017 to December 2017)

In the following, we first describe the main actors and then provide a rich description of the case of the relational digital transformation of the Finnish taxi industry. We describe each of the eight identified eras, examined through the site's platform arrangement and aspects of practice underlying the changes in the platforms.

The main actors

This research focuses on five central taxi dispatch organizations: two regional incumbent taxi dispatch center companies (Southern Taxi and Northern Taxi), two entrants (Uber and Taxify), and the national Taxi Federation. Both incumbents and entrants are engaged in the practice of dispatching taxis by running digital platforms of some kind (Evans and Schmalensee, 2016). The difference is that the entrants have a native platform, while the incumbents' platform is an evolutionary creation on existing dispatch systems (Hein et al., 2019).

Founded in 1989, Southern Taxi is one of the biggest taxi dispatch companies in Finland and in all the Nordic countries. The firm has a cooperative organizational structure, with more than 1200 owner-drivers as the company's owners. The dispatch center

provides services to about 1400 taxis. Its main purpose is to deliver and market taxi dispatch and related services.

As the traditionally dominant regional player in northern Finland, Northern Taxi dispatches rides to more than 300 taxis. A limited liability company, it was founded in 1990 as a successor to a local taxi dispatch association that dated back to 1967. Northern Taxi implemented its first digital dispatch system in 1991. The company fulfills about 800,000 taxi orders each year. It is fully owned by the taxi owner-drivers of the region, and therefore, it is essentially a taxi dispatch cooperative.

Uber Finland is a subsidiary of Uber, the famous and largest TNC in the world (Moon, 2017). The company entered Finland in November 2014, as part of global expansion efforts. This venture capital-fueled international expansion has been described as following the principles of “winner-takes-all,” “blitzscaling,” “growth-over-profits,” and “asking forgiveness rather than permission” (Dudley et al., 2017; Lashinsky, 2017; Sullivan, 2016). Central to Uber’s expansion strategy has been its policy disruption efforts (Biber et al., 2017; Thelen, 2018). In all markets, Uber has aimed to achieve a dual regulatory regime where the firm is not classified as a taxi service (Collier et al., 2018; Dubal, 2017). Uber has tried to achieve a competitive advantage through regulatory capture: Taxis remain under stricter regulatory control, while Uber enjoys lighter regulation under labels such as “transportation network company,” “ridesharing,” or “for-hire vehicles” (Collier et al., 2018). In the United States, Uber’s policy disruption strategy has worked out very well (Spicer et al., 2019). In Europe, however, Uber has encountered more difficulties with winning over the market and national regulations (Thelen, 2018), for example, in France (Martini, 2017) and the Netherlands (Pelzer et al., 2019). During the study analysis period, Uber ceased operating in Finland in August 2017.

Taxify was established in August 2013 and is headquartered in Tallinn, Estonia. Taxify started as a dispatch service for taxi companies and licensed taxi drivers. Over time, the company adopted a TNC identity. It entered the Finnish market in November 2014, one of the first countries to which Taxify expanded. Today, the company operates in tens of European and African countries, in about 150 cities. Taxify ceased its Finnish operations in January 2017. In 2019, the company changed its name to Bolt.

The Taxi Federation is a national non-profit organization of owner-drivers and dispatch centers. The organization’s self-defined purpose is to influence Finnish society for improvement of the conditions under which taxis operate. For example, the organization lobbies for the benefit of its members and tries to ensure high-quality taxi services in Finland. The Taxi Federation supports its entrepreneur members by providing professional assistance in various day-to-day matters including legal advice. One of its goals is to ensure fair competition in the industry, including legal and fiscal compliance of all dispatch organizations, taxi entrepreneurs and drivers. This is reflected in the Federation’s slogan: “One market – one set of rules.” In 2015, it launched a taxi app (National app) that it provided for all member organizations, that is, for all Finnish taxi dispatch firms. The app was integrated with the dispatch platforms of the dispatch firms. Thus, the National Platform is the combination of the National app and all dispatch platforms with which it is integrated.

Era 0: No digital platforms with consumer apps available

Various criteria can be applied for what constitutes origins. As Schatzki (2016, 2019) has articulated, causes can be found behind causes, and again, more causes behind those causes. There is no single big bang moment where all relevant history started, but various paths in the past have led to the present.

For digital dispatch, the origins date back to 1989, to the deployment of the first digital dispatch system in Finland. After that, virtually all Finnish dispatch centers transitioned to a digital system. Before the digital dispatch era, customers pre-ordered a taxi by telephone. The communication between taxis was arranged with FM broadband radio – a technology that was adopted already in the 1950s.⁵

For taxi apps, 2008 was, in many ways, an important year. Finnish mobile phone infrastructure had reached wide enough coverage, and there were enough mobile phone users, for mobile phone services to reach critical mass. In 2008, Finland reached one million 3G mobile phone owners. Internationally, 2008 was also an important year for various enabling technologies. Apple released the AppStore and the 3G iPhone with GPS. Likewise, Android Market (later Google Play) was launched.

It took some time for consumer taxi apps to emerge in Finland. Long before the emergence of Uber, there was a taxi reservation application called Cabforce, but it focused on corporate clients. Outside Finland, various relevant developments occurred concerning taxi apps. For example, short-lived taxi apps such as Taxi Magic and Cabulous emerged in the United States in 2008–2009 (Stone, 2017). Uber was launched in San Francisco as a limousine service in 2010 (Lashinsky, 2017). At the same time, Northern Taxi experimented with technologies such as speech recognition. Ordering cars via text message was possible in many regions in Finland starting in 2010.

The central event regarding Finnish taxi apps occurred in May 2011, with the introduction of the first Finnish taxi app. That event defines the first turning point for the analysis.

Era 1: The first taxi app emerges (May 2011 to October 2014)

In May 2011, Southern Taxi became the first Finnish taxi dispatch company to introduce a mobile phone app (the Delta app) for ordering a taxi. For a long time, this app remained the only one of its kind in Finland. Southern Taxi had started to develop the Delta app in November 2010. The app was born as the idea of an external developer:

⁵ Source: <https://yle.fi/aihe/artikkeli/2006/09/08/tilauskeskukset-ja-ula-uudistivat-taksipalvelut-1950-luvulla>

“I came up with this idea in 2010, when I was still working for Nokia mobile phones. Back then, Symbian GPS phones had arrived, and it became technically possible to convert GPS coordinates into a street address. When I found out that [Southern Taxi] already had an SMS service for taxi ordering, I figured out this is an opportunity to develop an app. I presented the idea to the company, and they liked it. I created the first application for Symbian phones, and it was released in 2011.” (Interviewee 6)

Essentially, the first app provided just a graphical user interface enabling the matching of the user’s location data with the existing Short Message Service (SMS). Thus, this was an incremental innovation through recombination. The app used an SMS-based script to send customer orders to Southern Taxi, and customers had to pay a fee for ordering. The ride was then dispatched to the taxi driver’s terminal device. What was new was that it looked like an actual mobile app, even though the ordering still happened via the SMS protocol.

Three aspects of the taxi dispatch practice affected the launch of the Delta Platform and app: technological development, consumer behavior and business logic. Technological development was a prerequisite for this shift. The availability of smartphones with good data connections and GPS location technology was an important reason behind the development. However, consumer behavior and business logic aspects of the taxi dispatch practice at the time help in understanding why Southern Taxi did not invest many resources in developing the app further into a mobile app. Consumers did not seem very keen on using the SMS-based Delta app. Taxi apps were not common at the time; thus, the strategic importance of the app was uncertain and Southern Taxi did not advertise the app much. Interviewee 3 reported “Use volume was quite modest. Which also stemmed from the situation that [...] we make good products, but the customers [...] don’t realize to use them. When no one thought of telling customers about the products (laughs)”. The Finnish dispatch centers’ business logic was another important factor responsible for the initial slow growth of taxi apps in Finland. Consumer-paid phone calls formed the dispatch centers’ main source of revenue. Thus, the dispatch companies were not eager to promote or proactively develop free taxi ordering channels, such as mobile apps, that would take away from their revenue stream. Today, most, if not all, current taxi apps are free to use to order a taxi.

Era 2: Foreign invasion (November 2014 to March 2015)

A major shift occurred in late 2014. At around that time, two entrants arrived in the Finnish market: Uber from the United States and Taxify from Estonia. We label this era “foreign invasion” to signify that the era was largely characterized by the arrival of these two companies. The platform arrangement changed quite significantly, as only Southern Taxi had a platform with an app in Finland.

Taxify entered the Finnish market in 2014 and searched for collaboration with dispatch centers and individual drivers. In November 2014, Northern Taxi started to collaborate with Taxify. By using the Taxify app, customers could now order Northern Taxi rides without having to pay a separate fee to the Northern Taxi dispatch center. Neither Southern Taxi, with its existing Delta app, nor any other Finnish dispatch organizations wanted to collaborate with Taxify.

Only two weeks after Taxify’s launch Uber Pop was launched in Helsinki. With the arrival of Uber and Taxify, the relational dynamics in the site changed. Uber is usually a competitor to the incumbents in the market of operation it enters. In Finland, Uber targeted only individual drivers and represented direct competition for Southern Taxi. This kind of competition was new in Finland, because the Finnish dispatch centers had clearly assigned geographic areas that they served, and thus, did not compete. At the time, Uber operated only in the geographic area of southern Finland and thus, did not represent direct competition for Northern Taxi. In contrast to Uber, Taxify tried to act as a supplement for existing taxi dispatch centers, a provider of digital technology. For Northern Taxi, Taxify represented a welcome collaborator that helped Northern Taxi enter the era of digital taxi hailing channels.

Two aspects of the taxi dispatch practice affected Northern Taxi’s decision to join forces with Taxify: consumer behavior and business logic. Northern Taxi assumed that the taxi app market would be quickly taken over by major international players. “Northern Taxi’s CEO at the time imagined that Taxify will become a big international brand, that when customers come to Finland from abroad, they already have Taxify installed [on their phones]” (Interviewee 8). For Northern Taxi, Taxify represented an additional channel through which their drivers could get rides and through which customers could order a taxi for free (business logic).

Some dispatch centers reinforced norms that forbade their drivers from driving for Taxify, referring to the contracts that the drivers had signed with the dispatch centers. These contracts stated that drivers were not allowed to use any other ordering apps or systems. The Taxi Federation also discouraged Finnish taxi drivers from using Taxify or Uber: “Well, for Uber it was difficult to find drivers, no one simply dared to, also because of the Taxi Federation. There were threats made, also concerning Taxify, that if some driver uses [the Uber or Taxify technology], and this is noticed, the consequences will be severe. Of course, after that it was difficult to find drivers who would drive for a provider like Uber” (Interviewee 11). The effect these norms set by dispatch centers and the Taxi Federation had on Taxify and Uber was that in places other than the operation area of Northern Taxi, Uber and Taxify drivers were mostly unlicensed drivers: licensed drivers did not want or dare to join these platforms.

Northern Taxi’s decision to collaborate with Taxify also affected aspects of the taxi dispatch practice, specifically norms and business logic. Northern Taxi also had contracts with its drivers that forbade them from using other dispatch technologies, but Northern Taxi gave their drivers explicit permission to use Taxify. Therefore, the arrival of Taxify changed norms, at least in Northern Taxi. The business logic also changed. The decision to collaborate with Taxify moved some expenses for ordering a taxi from the consumer, who historically was the one to pay for ordering, to the taxi drivers and the dispatch organization: Northern Taxi paid a fixed fee per accepted ride to Taxify while the driver who fulfilled the order paid a commission fee to the Northern Taxi Dispatch Center.

Era 3: National unity among incumbents (April 2015 to May 2016)

The third era is characterized by strong collaboration among the incumbents, driven by the threat of entrants. The platform arrangement consisted of Uber, Taxify, and the newly launched National app which was integrated with different Finnish dispatch platforms. This combination of the National app and the different dispatch organizations' dispatch platforms is what we refer to as the National Platform. The change in the platform arrangement was a result of the Taxi Federation launching the National app in April 2015 in three regions in Finland. By May 2015, taxis could be ordered with the National app in more than 40 municipalities. The National app was intended to be integrated with potentially all dispatch centers' platforms in Finland, and thus, work nationwide, so that consumers in Finland could order a taxi with the National app no matter where in Finland they were. The idea of developing the app had been initiated in 2013, and the decision to start developing it was made in 2014. Once the platform was launched, Southern Taxi and Northern Taxi joined the app, as did most of the Finnish taxi dispatch organizations. Customers then quickly started to use the National app.

Two aspects of the taxi dispatch practice affected the Taxi Federation's development and launch of the National app: consumer behavior and technology. The Uber app and the Taxify app were well received by customers in countries in which Uber and Taxify had been launched, and there were clear signs that customers were using mobile taxi hailing apps if they were available: "Everyone knew that Uber and others ... They were already in Finland then. Uber Finland came in 2014. Taxify was another one that came in 2014; it was then in [city in northern Finland]. Those were such signs and signals that people wanted them. And when you think about our operations model, that one must call, and doesn't even always know where to call. Then it was kind of self-evident." (Interviewee 3).

The taxi dispatch practice also helps explain why Northern Taxi and Southern Taxi, as well as most of the other Finnish dispatch organizations, joined the National app. In the investigated timeframe, the business logic of taxi organizations in Finland was such that dispatch centers did not directly compete. Each dispatch center operated in a clearly defined geographic area. Having an app that functioned nationwide thus brought advantages to all dispatch centers without diminishing their revenues. As one of the developers of the National app stated, "[In the National app,] this whole industry has been digitalized nation-wide into an easy-to-use, reliable mobile app." (Interviewee 4)

The change in the platform arrangement through the launch of the National app also affected the taxi dispatch practice, and the business logic aspect at the industry level. Traditionally, taxi dispatch companies had charged the customer for dispatching a taxi to them. However, when the customer ordered a car via the National app, instead of receiving money from the customer for dispatching the order, the dispatch center had to pay a fixed sum for every National app order to the Taxi Foundation's business subsidiary that handled business aspects of the National app.

Era 4: Southern Taxi's technological update (June 2016 to December 2016)

The platform arrangement in Era 4 looks like the previous one. However, a major difference was that Southern Taxi replaced its Delta Platform with the newer, advanced Alpha Platform and Alpha app in June 2016. The previous SMS-based app was discontinued. Consumer behavior helps explain this change. Consumers were now used to mobile apps with which they could order taxis for free and so were critical about having to pay a fee for ordering via an app.

In November 2016, Northern Taxi discontinued collaboration with Taxify.

Era 5: Taxify leaves Finland after Northern taxi collaboration ends (January 2017 to July 2017)

Era 5 is characterized by the platform arrangement consisting of the National Platform, Uber, and Alpha Platform. Northern Taxi's decision to discontinue collaboration with Taxify in November 2016 led to Taxify's exit from the Finnish market altogether in January 2017.

The business logic, and more specifically, the costs connected to different apps, played a role in Northern Taxi's decision to end its collaboration with Taxify after the firm had used the Taxify app and the National app in parallel for almost a year. When the National app was launched in Era 3 and Northern Taxi joined the platform, Taxify was no longer the only mobile channel for ordering rides from Northern Taxi. Taxify was more expensive to use and maintain than the National app and Northern Taxi's expectation that Taxify would become the most frequently used taxi ordering app in Europe (and Finland) had not been fulfilled. National Platform offered national coverage and thus, better fulfilled Northern Taxi's objectives of using an app with use coverage as broad as possible. Norms also played a role in Northern Taxi's decision to end its collaboration with Taxify, and in the later disappearance of Taxify from the market. During police raids in September 2016, some Taxify drivers in areas other than Northern Taxi's operation area were found to be driving illegally. This was the reason that Northern Taxi communicated to the press to justify ending its collaboration with Taxify: "As a company that dispatches taxi rides, we cannot be involved with a company that breaks the taxi law" (press statement by the then CEO of Northern Taxi).

Era 6: Uber exits the Finnish market (August 2017 to October 2017)

Uber quit Finland in August 2017. Therefore, both entrants that entered in late 2014 were out of the market. In Era 6, the platform arrangement consisted of Southern Taxi's Alpha Platform and the National Platform of which Northern Taxi and Southern Taxi were members.

Throughout the Finnish taxi industry, there had been complaints about unfair competition in relation to Uber. Uber was praised by consumers for low prices and the great Uber app, but representatives of the incumbent taxi industry emphasized in the interviews that this low price was possible only because Uber drivers did not pay taxes in Finland (i.e., they did not follow norms). In addition, traditional taxis have car insurance premiums that are four to five times higher than those of other cars (i.e., the private cars used by Uber drivers). The Taxi Federation and Southern Taxi initiated an investigation into Uber Finland, arguing that Uber was using illegal business practices in Finland.

Norms affected Uber's exit and changed the platform arrangement in several ways. The prevailing norms (legislation) were used by the incumbent taxi industry to fight Uber. In September 2016, the Finnish Court of Appeal ruled Uber's practices were illegal in Finland. The police had conducted raids among Uber drivers, and the problems found ranged from driving with a vehicle without insurance to driving a vehicle for which Finnish car taxes had not been paid. More than 200 Uber drivers were rounded up by the police; most of those drivers were foreigners living in Finland. The upcoming change in the legislative norms, which was expected to make Uber legal on the Finnish market, affected Uber's decision to exit the Finnish market in August 2017. The new Finnish transportation law that had been approved in May 2017 and that would become effective on July 1, 2018, would deregulate the Finnish taxi market. When ceasing operations in Finland in August 2017, Uber announced it would return in July 2018 in the expectation that the firm would then be able to operate legally under the new Finnish transportation law.

Era 7: End of incumbent unity (November 2017 to December 2017)

In November 2017, Southern Taxi announced that it would discontinue its collaboration with the National app and that their taxicabs could be ordered only via their Alpha app. This Southern Taxi app had been improved significantly since its launch in June 2016. In Era 7, the app's convenience and features were comparable to the international competition, and perhaps somewhat exceeded it.

Two aspects of the taxi dispatch practice affected Southern Taxi's exit from the National Platform: norms and consumer behavior. With the new Finnish transportation law (i.e., changing legal norms) becoming effective in July 2018, the maximum prices for taxi rides would no longer be set by the Finnish government, the number of taxi permits would no longer be restricted, and taxis would no longer be limited to providing service within a specific geographical area. Because of the coming regulatory changes, fierce competition for customers was expected to take place, especially in the capital of Helsinki and in other large Finnish cities. When Uber exited the market in 2017, they announced they would return in 2018. Southern Taxi felt that they should have tighter control of their own customers, and they could not have this if the app was not in their own hands. Southern Taxi also assumed that consumer behavior would change with the coming deregulation. Southern Taxi justified its exit from the National Platform by citing their customers' discontent with the National Platform service due to long wait times for orders made via the National app in the geographic area where Southern Taxi operates. The company believed that consumers would choose the taxi app with the best features. As the National app did not provide, for example, the option of automatic credit card payment, Southern Taxi decided to focus on its own Alpha app, with which the firm assumed it would achieve a better competitive position. Southern Taxi wanted to own its customers:

"If you have some app [installed on your phone] by which you can get the car and know it works, then of course it locks in the customer [to the taxi company]. And when we have acquired a customer, we hold on to that customer. And a footprint is left by the customer, and we can use that for future marketing. This is highly important, and that's what we strive for. That more rides would come through our dispatch center, because this ties the customer to us." (Interviewee 5)

The technical characteristics of the National App slowed down its development, and this also influenced Southern Taxi's decision to exit the National Platform. In the Finnish taxi dispatch technology market, companies use dispatch technologies from several vendors, such as Semel, DDS, and MTDData. Each vendor's system has different capabilities regarding the data or information they can provide for the National App. One goal for the National app was that it would offer the same user experience to all customers across Finland. Therefore, compromises had to be made in terms of the functionality and features available with the National app. This was the main reason the app had a more limited set of features in comparison to other apps on the market. For example, automatic credit card payment was not available with the National app. Likewise, other apps provided the real-time location of the ordered taxi, while the National app provided only the time estimation of the taxi's arrival. Some advanced features of the National app only worked in some parts of the country.

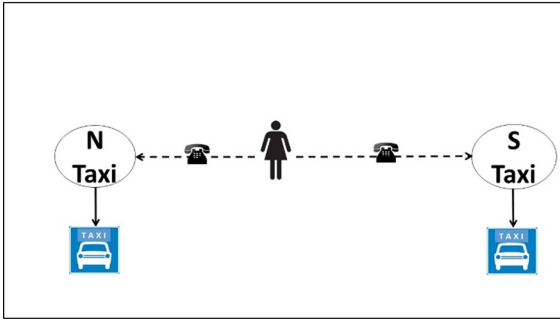
For Northern Taxi, Southern Taxi's discontinuation of collaboration with the National app meant that this app no longer worked in all parts of Finland. This had implications for Northern Taxi and all other dispatch centers that collaborated with the app. It no longer fulfilled its previous promise of "one app for the whole country."

One more observation about the app technology must be made. When the first Finnish taxi app was published in 2011, apps were generally rare and required costly development work. By 2017, the price and availability of apps had changed completely. In many countries, there was now an abundance of taxi apps. One informant described this as follows, showing appreciation for Southern Taxi's app:

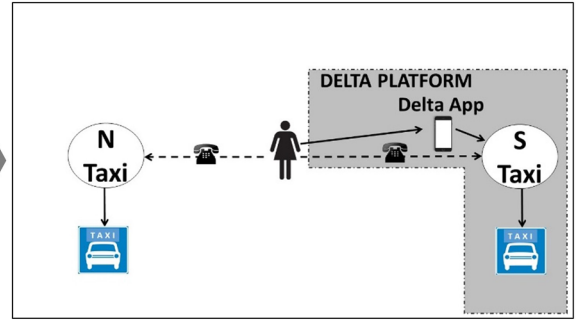
"I heard that every month 20 new taxi apps are released in Poland. And all of those are probably quite good [technically]. But this just shows that in the taxi market, customer satisfaction is not only a matter of technological advancement. It's also about branding and marketing. The [Southern Taxi] app fulfills both requirements. To my knowledge, no other [incumbent's] app provides the digital payment feature in Finland. And with this feature, the [Southern Taxi] app is just brilliant." (Interviewee 1)

Fig. 5 illustratively summarizes the changes in the platform arrangements from Era 0 to Era 7.

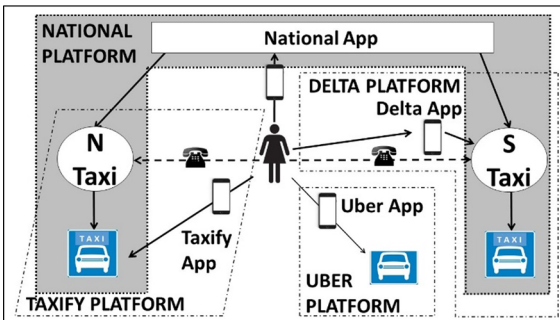
Era 0 (Jan 2008–Apr 2011):
No digital platforms with apps available



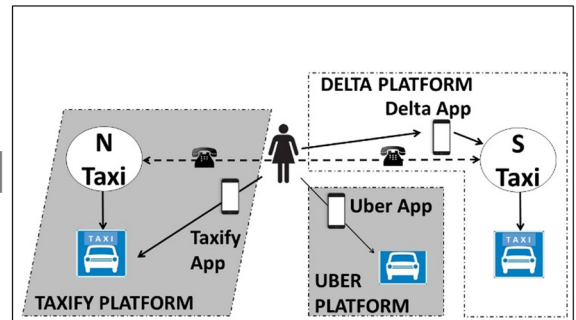
Era 1 (May 2011–Oct 2014):
Delta Platform appears



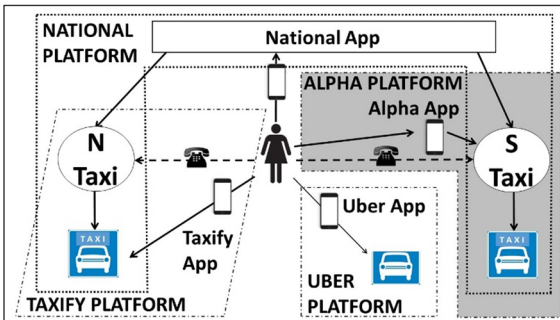
Era 3 (Apr 2015–May 2016):
National Platform appears



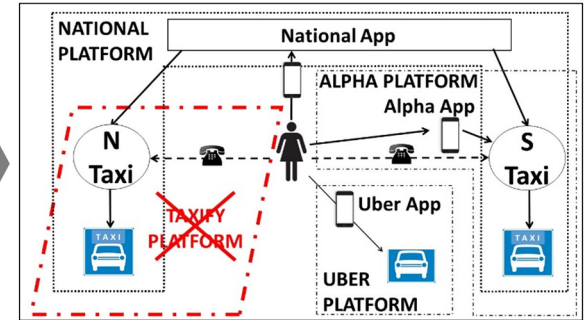
Era 2 (Nov 2014–March 2015):
Taxify Platform and Uber Platform appear



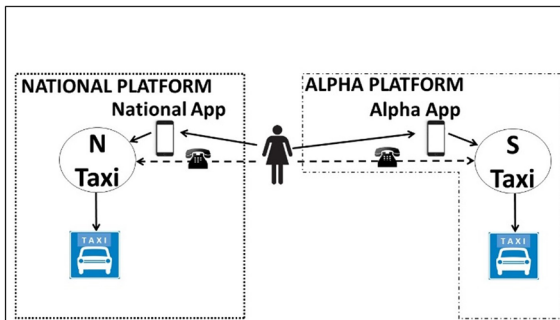
Era 4 (June 2016–Oct 2016):
Delta Platform replaced with Alpha Platform



Era 5 (Nov 2016–Jul 2017):
Northern Taxi exits Taxify; Taxify Platform disappears



Era 7 (Nov 2017–Dec 2017):
Southern Taxi exits National App collaboration



Era 6 (Aug 2017–Oct 2017):
Uber Platform disappears

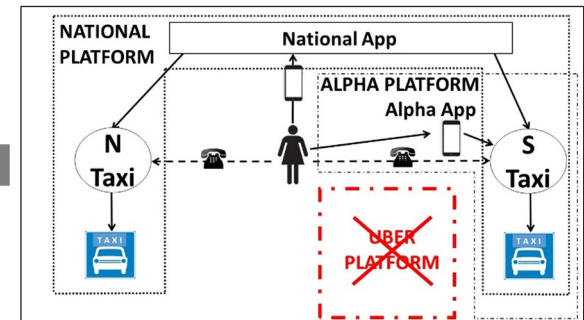


Fig. 5. Platform arrangement eras.

Discussion

Summary of the results

In this article, we aimed to understand the change dynamics in the digital transformation of an industry. Therefore, we asked: “How does digital transformation unfold at the industry level through local practice-arrangement bundles?” We adopted a practice lens (Schatzki, 2001, 2002, 2019), as we wished to study digital transformation emphasizing changing relations rather than pre-defined stable entities (cf. Emirbayer, 1997), focusing on historically and situationally developing practices of the Finnish taxi industry. We chose several central firms engaged in a similar focal practice—the taxi dispatch practice—in the industry. We then identified major events where a significant change had occurred. We focused on changes in the platform arrangement, seeing platform arrangement as an outcome of dynamics caused by evolving practice. We then studied how the four aspects of practice—consumer behavior, norms, technology, and business logic—were intertwined with the platform arrangement, and how these practice aspects also changed over time. As a result, through the analysis, we attempt to provide a practice-relational view of digital transformation. This approach focuses on the mutual constitution of technologies and related practices in their local context of use.

The adopted practice lens combined with a longitudinal approach helped us capture a larger phenomenon (Nicolini, 2016; Schatzki, 2016) and relate microprocesses to macro-outcomes (Kouamé and Langley, 2018). Using a practice-theoretical approach enabled us to examine industry-wide transformation through the changes in taxi dispatch practice and related platform arrangement. Therefore, we contribute to extant research on digital transformation with a theoretical extension of the prevailing views of digital transformation in IS literature by increasing understanding of the contextuality of platforms and their inherent dynamism due to their entwinement with the social practices they are a part of. We refer to this theoretical extension as the concept of *relational digital transformation*. In Fig. 6, we illustrate how in relational digital transformation one looks at the practice-arrangement bundles of digital technologies, and how they change over time.

The practice approach allows studying the dynamic relationship between practices and material arrangements in a whole industry. However, gaining understanding of what factors contribute to the changes is a non-trivial task. Our methodological solution was to apply specific start–end criteria to identify the moments where the material arrangements changed; for example, a moment in time when a company launched a new taxi hailing app. This helped us define the different eras that constitute the larger timeline. Researchers who want to use this approach to study industry-level digital transformation should clearly identify the material arrangements and the practice(s) they are intertwined with; and identify criteria for what distinguishes one era from another.

Relational digital transformation: studying digital platforms in their historical and situational context

Researchers have argued that digital technologies have significant transformative power (Agarwal et al., 2010; Constantinides et al., 2018), often seeing technology as the primary source of transformation (Leonardi, 2012, Chapter 2; Winner, 1977, p. 76). In contrast, we showed that the transformation of the Finnish taxi industry cannot be explained by technology and digital platforms alone: it is not only the digital platforms that transformed the industry. These digital technologies must be seen in the context of the situationally and historically developing practice. Technology does not exist in isolation. Studying digital transformation as relational is a way to capture smaller and larger events: from the launch of a new app to the macro-dynamics of the whole industry change. In line with Schatzkian thought (Schatzki, 2002, 2016, 2019), large changes are explained by smaller constitutive changes. Change is path-dependent: previous events affect what happens later. Several IS research calls have highlighted the lack of longitudinal studies (Dwivedi et al., 2015; Walsham and Sahay, 2005). Longitudinal research is time-intensive, and thus, many scholars avoid it (Van de Ven, 2004). In the study of digital platforms, however, the need to incorporate a longitudinal perspective while maintaining sensitivity to the context is particularly important (de Reuver et al., 2018).

We were able to be particularly attentive to context in this empirical study, by looking at how dispatch practice and the platform arrangement were in a dynamic relationship, and how practice and material arrangements unfold over time. The dynamic relationship between business logic and dispatch practice represents this well. On a large scale, the business logic in the Finnish taxi industry changed significantly over the timespan we investigated, with technology a result of and a cause for change. Traditionally,

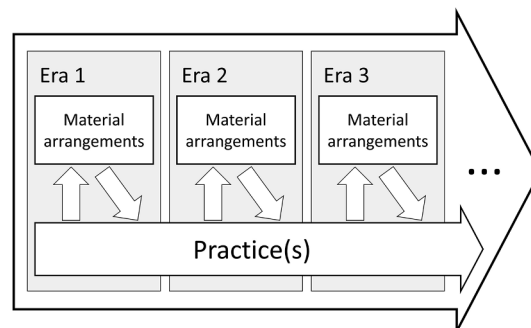


Fig. 6. Relational digital transformation.

consumers had to pay for ordering a taxi, and this business logic was visible in Southern Taxi's first app (the Delta app) in 2011. Changes in the platform arrangement—with the arrival of Taxify and Uber—changed this logic in 2014. When Northern Taxi started to collaborate with Taxify, the costs of ordering a taxi moved from the consumer to the dispatch center and the driver, changing the business logic at the organization level. Soon after that, in 2015 the launch of the National Platform with the National app changed the business logic of the whole industry as almost all Finnish dispatch centers offered the possibility to consumers of ordering a taxi for free. The arrival of Taxify, Uber, and the National Platform affected consumer expectations, and this again affected the platform arrangement: Southern Taxi's business logic had already changed when the National app appeared in 2015, and this business logic was then also adopted in Southern Taxi's technology in the form of the Alpha app in 2016. In other words, the platform arrangement changed in response to a change in the business logic, and the contextual factors in the form of technology maturity, consumer behavior, and competitive situation, changing over time, all affected how the situation unfolded. By looking only at one snapshot in time it would not have been possible to understand the network of events that lead to the outcome.

Another example from the study data that shows how digital platforms are entwined with historically and situationally embedded practices relates to Taxify. A technology (the Taxify Platform) in one context (Northern Taxi's operating area) had a different effect than in another context (Southern Finland's operating area) and developed differently in the different contexts. For Northern Taxi, which did not yet have an app to allow customers to order taxis, Taxify represented a welcome collaborator. For Southern Taxi, which had its own app, Taxify represented a threat. We could ask provocatively whether Southern Taxi would have collaborated with Taxify if Southern Taxi had not already developed its own Delta app. Would Northern Taxi have ended its collaboration with Taxify at the specific time it did, if the National app had not been available at the time, or if they had not collaborated with the National app? Would Southern Taxi have exited the National app, had there not been the coming change in the transportation law lurking just around the corner? We also want to emphasize that not only were the technological artefacts intertwined with aspects of practice, the different aspects of the taxi dispatch practice were also intertwined with each other. In line with calls to increase our sensitivity to the contexts in which IT artifacts are developed and used (Avgerou, 2019; Davison and Martinsons, 2016), we want to emphasize that to get a deeper understanding of phenomena, we need to study them in their context.

Several IS scholars have approached digital transformation from a practice-theoretical foundation (Chanias et al., 2019; Huang et al., 2014), influenced by the strategy-as-practice stream of research (Arvidsson et al., 2014; Whittington, 2014). These studies mostly focused on the transformation of one organization, such as a financial service provider (Chanias et al., 2019) or a ticketing company (Huang et al., 2014). In these studies, practice theory allowed the researchers to focus on managerial everyday doings. However, when studying industry-scale digital transformation, we argue that one must be aware that there are different kinds of material arrangements, and different practices that are in a dynamic relationship and that together impact the transformation. In other words, there are multiple sites (practice-arrangement bundles) that can overlap. For example, a practice such as the taxi dispatch practice is intertwined with the platform arrangement, but also with numerous other material arrangements. These other material arrangements could be, for example, the taximeter technology in the car, or the taxi drivers who drive the cars. Similarly, the platform arrangement is intertwined with more practices than just the taxi dispatch practice. These other practices could be, for example, the practice of ordering taxis or the practice of technologically developing the platform. In the present study, we operationalized the relational digital transformation through only one material arrangement–practice pair (i.e., the platform arrangement–taxi dispatch practice pair). However, we are aware that there are other material arrangements and other practices that are part of the relational digital transformation of the industry, and that would have to be studied to get an even deeper understanding of this transformation.

In relational digital transformation, we assign digital technologies a role in change, but do not give them priority over other causes. This perspective helps provide an understanding of the evolving relations within historically and situationally developing practices. However, it is far from obvious how to conceptualize and operationalize this relationality in empirical research. If technology enables and constrains practices, but practices also affect technology, where should an empirical investigation begin, and where should it end? For instance, Leonardi (2018, pp. 285–286) claims that sociomateriality cannot be studied empirically because it blurs materiality into “people's experiences, goals, norms, or culture in ways that make it difficult to define the technological artifact apart from its context of production or use.”

Intentionality and entity-centrism in digital transformation

Our modeling of relational digital transformation contrasts radically with two aspects of previous digital transformation literature (Vial, 2019): intentionality and entity-centrism. Regarding intentionality vs. emergence, the extant digital transformation research emphasizes intentionality. For example, Vial (2019) provides a definition of digital transformation as a process involving an *aim* to improve an entity (p. 118). Similarly, Andriole (2017, p. 20) characterizes digital transformation as a “planned digital shock.” However, we showed that although some of the actions were the result of intentional strategizing by the actors, the overall transformation also involved outcomes that could not be traced back to actors' intentions. Instead, the transformation was the result of proactive and reactive actions of the actors that gradually changed the taxi dispatch practice and the technology used. For example, Southern Taxi's first app in Era 1 was not a result of strategic decision-making, but it emerged as an idea from an external developer. The app was a front end that allowed a Symbian phone's GPS features to be used to produce an SMS message to order a taxi. At the time in 2011, the incumbent taxi dispatch companies relied heavily on the taxi ordering phone fees they collected from their customers. Thus, back then it made sense to charge a fee for a taxi app reservation. This business model partly contributed to the minimal use of taxi apps among Finnish consumers between 2011 and 2013. However, in Era 2 (late 2014) with the arrival of Uber and Taxify, it became impossible to charge a separate fee for taxi ordering via an app as these new foreign entrants did not charge a

fee. With the arrival of Taxify and Uber, app use increased significantly among consumers and when the National app (Era 3) and Southern Taxi's new app (Era 4) were developed they also featured free ordering of taxis.

According to Vial (2019, p. 118), the purpose of digital transformation is to improve an entity. Most digital transformation studies are organization centric. However, as the present analysis showed, understanding the contextual embeddedness of the technological artefact enables us to understand the dynamics underlying the digital transformation. In Schatzkian practice theory, the site is where entities gain their existence (Schatzki, 2002, 2019). Through the focus on evolving practice, we were able to analyze the situationally and historically embedded dynamics between five organizations during eight eras. This allowed us to acknowledge that change dynamics are at work within and between different organizations concurrently. Had we focused on one company only, for example, Uber as a supposed disruptor or an incumbent as a supposed disruptee, we would have seen the dynamics from a very narrow and one-sided perspective.

Conclusion

We have outlined a longitudinal empirical study of the digital transformation in the Finnish taxi industry. Drawing from Schatzkian practice theory, this study presents a way to investigate the *longue durée* of digital transformation in its context. We call this approach relational digital transformation, which we define as a process through which practice-arrangement bundles of digital technologies evolve over time. This relationality provides a theoretical extension to the prevailing views of digital transformation in IS literature (which emphasize intentionality and entity-centeredness) by increasing understanding of the contextuality of platforms and their inherent dynamism due to their entwinement with the social practices they are a part of. We argue that by approaching digital transformation from a practice-relational viewpoint it is possible to ground the phenomenon to its context: a deeper understanding of the factors that contribute to the change can be achieved and the complex, living process of digital transformation where material arrangements are entwined with historically and situationally embedded practices revealed. With this approach, it is possible to study digital transformation in retrospect without attributing change agency to any entities or technologies a priori. Methodologically, we propose to study digital transformation by starting from outcomes as material arrangements and identifying the relevant material arrangements-practice bundle(s), and then going back to identify the process dynamics that constituted the outcomes. By demonstrating how the applicability of practice theoretical analysis extends beyond mere microphenomena to larger industry-level changes we also contribute to the practice-theoretical IS literature.

This study also has practical implications. The example of Finland showed how a foreign invasion of an industry does not necessarily have to represent a threat. Instead, it can provide a useful collaboration, as Taxify did for Northern Taxi. However, this study also showed how collaborating organizations can fight off (at least for some time) an invader that represents a threat to the institutional environment. This study showed the dynamics between the material arrangements and taxi dispatch practice. In taxi market discourse, there is often a “discourse of inevitability” (Leonardi, 2008) favoring disruptive TNCs over incumbents (Cramer and Krueger, 2016). We showed that although a new entrant may seem to have a temporary technological advantage, established companies are able to compete when they pay attention to the relational dynamics in the shifting environment.

A limitation of this study was that interviews provided the main source of insight, allowing tracing back to understand the past (Langley and Tsoukas, 2010). However, knowing about the market entry of Uber and Taxify, and the changes in the competitive setting, greatly helped us conduct the interviews during 2018. Alternatives to the “tracing back” approach exist: techniques such as “following forward” and “reconstituting the evolving present,” result in different kinds of insights (Langley and Tsoukas, 2010, pp. 12–14) and provide exciting possibilities for us to continue our research. A related limitation is that like Huang et al. (2014), this paper is a zoomed-out analysis (Nicolini, 2013): we were not there in meeting rooms when decisions were made. Other methods such as ethnographic fieldwork might have provided additional detail of the dynamics at play (Barley, 2016). One important aspect of digital transformation this study did not address was the viewpoint of the taxi workers themselves, as this was not the focus of the paper. For future studies, it would be interesting to examine more closely how digital transformation affected the role division and livelihood of those working as drivers. We hope our study inspires other researchers to study digital transformation relationally in its context.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

The first author (AL) and the second author (KV) have contributed equally. They collected all the data and contributed to all phases of the project. The third (SL-S) and the fourth author (MK) have contributed to the data analysis, theory, and writing. We thank the editor-in-chief Guy Gable and the three anonymous reviewers for facilitating a developmental review process. This manuscript was previously under review in the JSIS special issue on “Strategic Perspectives on Digital Work and Organizational Transformation.” We thank the editors of the special issue, especially Mary Beth Watson-Manheim and Joao Baptista, for helping us with paper development. We are grateful to all our informants who have participated in the interviews we conducted for this study. AL and KV would like to thank the Academy of Finland (PROFI4) GenZ short-term research action for providing financial support for

the data collection. KV is grateful to the Jenny and Antti Wihuri Foundation who partly funded this research.

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