Cultivating a Digital Jungle: A Tentative Framework

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Introduction

In their digitalization initiatives, organizations seek to integrate technologies and new practices to improve organizing around information (Vial 2019; Zammuto et al. 2007). A recent industry survey found almost 9/10 organizations are planning, testing, or implementing digitalization initiatives (Fujitsu 2018). It reports that one third of the surveyed organizations already reap benefits from their digitalization. Yet, organizations also face barriers for digitalization such as insufficient skills, lack of a clear vision, and problems to integrate technologies (Center for Creative Leadership 2018). Related, when organizations integrate technologies, their installed-base tends to expand, become increasingly complex impeding their effective use and top-down governance (Ciborra and Hanseth 2000; Constantinides and Barrett 2014; Hanseth and Lyytinen 2010; Zimmer and Niemimaa 2019).

Research inquiring digital infrastructure (DI) evolution has shown how DIs tend to drift from management control. They depict evolutionary traits rather than predefined development trajectories (Constantinides & Barrett, 2014). According to Hanseth and Lyytinen (2010) successful development of DIs requires balancing contradictory requirements of flexibility and control. In this vein, Henfridsson and Bygstad (2013) found that generativity underpins both DI evolution and success. These studies have contributed to scholarly understanding of DI evolution. Existing research, however, has less attended to 'how digitalization contributes to DI evolution'. Considering digitalization initiatives' thrust and momentum and their significant implications on organizations, we find this a timely topic. Furthermore, our research can be seen as a response to calls to study the intersection of digitalization and DIs (e.g., Tilson et al., 2010).

Taking an inductive research approach, our insights led us to question the accepted notion of organizations' digitalization being a concern of organizations utilizing technology to digitalize their organizing (Fitzgerald et al. 2013; Matt et al. 2015; Porter and Heppelmann 2014; Ross et al. 2017; Vial 2019). However, we view organizations' digitalization as institutional ideas about technology and thus, how their institutional ideas about technology shape and transform their organizing rather than technology (e.g., Nielsen et al., 2014). Therefore, we cast the following research question: *how an organization's appropriation of digitalization influences DI evolution?*

Our ethnographic study yields insights into how an organization's appropriation of digitalization contributes to its DI's evolution. Induced from the field, we propose 'digital jungle' as a sensitizing concept for studying and understanding organizational experiences of DIs being an impenetrable thicket of digital technologies stashing its affordances, yet, furnishing undiscovered potentials. Moreover, we develop a tentative framework explaining cultivation of a digital jungle.

Digitalization and digital infrastructure evolution

Information systems scholars have explored DIs for several decades (Ciborra and Hanseth 2000; Star and Ruhleder 1996). DI research builds on the recognition that the effectiveness of a technology is related to the totality of the socio-technical configuration it is part of (Henfridsson and Bygstad 2013). Simply put, a mobile phone was quite limited in terms of its affordances when situated outside its use practices, high-speed wireless connections, applications, etc. Consequently, researchers have turned to the DI concept to discuss the emergent aspects of the mélange of socio-technical arrangements (Henfridsson and Bygstad 2013). Other key aspects of DIs include an installed-base (i.e., DIs are built upon existing infrastructure),

distribution across space and time, complexity, and a shared user-base (Hanseth and Monteiro 1998; Star and Ruhleder 1996).

While a part of the literature has been interested in infrastructures for their instrumental value to innovation (Grisot et al. 2014), remote maintenance and repair (Niemimaa 2016), and digitalization (Tilson et al. 2010), another part has treated *infrastructures* as its phenomenon of interest studying DIs' evolution. DIs evolve as new technologies become either tighter or looser coupled with other existing technologies (Hanseth and Monteiro 1998). Once an infrastructure has been bootstrapped, it tends to evolve along unforeseeable trajectories (Hanseth and Lyytinen 2010). Sir Tim Berners Lee (or anyone of the Internet pioneers) had unlikely foreseen it as into what it evolved. While the Internet transcends a single organization's control, organizational DIs have shown similar evolutionary tendency due to their inherent generativity. Research has identified that too strict control can hamper DIs' success, while too much leeway creates infrastructure drift (Ciborra and Hanseth 2000; Hanseth and Lyytinen 2010).

Constantinides and Barrett (2014) identified two logics through which DIs evolve: top-down and bottom-up. Top-down, organizations seek control over DI evolution. Bottom-up DI evolution emerges from employees' collective actions as organic growth, largely outside management control, expanding DIs to best support their use. In both logics, DIs' complexity grows posing increasing difficulties to their user-base to identify DIs' combinatory affordances for their effective use (Burton-Jones and Volkoff 2017; Zimmer and Niemimaa 2019). An organizations' approach to DI evolution is enclosed in its institutional ideas about technology: following their institutional idea, organizations may seek to control DI evolution or allow it to emerge from grassroot-level (Constantinides and Barrett 2014).

Past research indicates that institutional ideas about technologies can be transformative. Swanson and Ramiller (2008) encapsulated the dynamics of institutional ideas in the concept of *organizing vision*. They, however, are more interested in how new innovative technological ideas travel within institutions and how some flourish while others fail. Another stream of research has been interested in how institutional ideas and (best) practices are translated and translate when they diffuse and become appropriated into organizational context (Nielsen et al. 2014; Niemimaa and Niemimaa 2017; Swanson and Ramiller 2004). While much of the past research treats digitalization largely as an issue of utilizing technology to digitalize organizing (Fitzgerald et al. 2013; Matt et al. 2015), we see benefits of treating digitalization not as a technology imperative, but as a *transformative technological idea*. When digitalization is approached as an institutional idea about technology, the question is not how DIs constrain and enable digitalization (Tilson et al. 2010), but how an organization's institutional idea about technology transforms DIs and organizing more broadly.

Research approach

Our research is an ethnography of a large, globally operating German car manufacturer (Car Inc.) employing more than 280.000 employees (Myers 1999; Van Maanen 2011). The principal researcher entered the field in July 2017. He constructed empirical material via participant observations (Ingold 2014; Van Maanen 2011) and informal interviews which he captured in field notes (Emerson et al. 2001). He also collected organizational documents related to Car Inc.'s digitalization initiatives.

In 2016, Car Inc. initiated an organization-wide change program (to which we refer as PolePosition2020) to drive its digitalization. Essentially, the program involved integration of digital technologies to extend Car Inc.'s DI for collaboration as well as empowerment of Car Inc.'s employees to freely choose the digital technologies essential for their work. Assuming a dual role of researcher/consultant at Car Inc.'s organizational development unit, the principal researcher was able to follow up close and in person (van Maanen, 2011) on Car Inc.'s change program and involved digitalization activities (Rowe, 2012).

Starting, we were broadly interested in organizational transformations implicated by digitalization. However, as we stumbled over a puzzling empirical fact (Ngwenyama & Nielsen, 2014), we became preoccupied with the notion of 'digital jungle'. The concept appeared in organizational documents and organizational members' discussions of Car Inc.'s DI. We thence commenced pursuing empirically questions as what is organizational members' understanding of digital jungle?; how did the digital jungle emerge?; and what contributed to its emergence?

Conceiving the studied phenomena as an organizational infrastructure issue, we turned to respective literature, specifically, to literature on DI evolution. The preliminary analysis thus followed an iterative process of studying empirical material and extant literature alternatingly. Initially, we (too) understood digitalization as inherently related to digital technologies (Fitzgerald et al. 2013; Matt et al. 2015). Through our analysis, however, we arrived at an understanding conceiving the organization's digitalization not as technology enabled but engendered by institutional ideas about technology (Nielsen et al., 2014). Car Inc. faced technological questions, yet, interpretational issues seemed to be more pressing. In its PolePosition2020 program, it first dealt with questions as "what does digitalization mean to us [Car Inc.]?", and "how should we [Car Inc.] understand and implement digitalization?". Thus, Car Inc. addressed questions related to meaning-making of how to locally appropriate digitalization, that is, translate digitalization stories into institutional ideas about technologies that then underlaid its digitalization initiatives.

Car Inc.'s cultivation of a digital jungle

In 2016, Car Inc. initiated PolePosition2020. Car Inc. extended its DI by integrating digital technologies that furnish potentials for collaboration. In October 2018, Car Inc. recognizes that the DI evolved into a 'digital jungle'. Discussing the notion of a 'digital jungle' on Car Inc.'s enterprise social media platform, employees expressed their experience of Car Inc.'s DI elusive since it became overly complex making a clear understanding of which technologies were available and what they could be used for. Simultaneously, they regarded positively the number of procured and provisioned technologies for facilitating collaboration.

> *"A wide range of tools is available throughout the company, facilitating digital cooperation. Some of them function in a variety of application areas, while others are specialized for one specific use case. So far, just a few people have had a clear overview of all of these tools. But now the teams at [the digital unit] have collaborated with [IT] to shed some light on the darkness of the [Car Inc.] tool jungle."* – Enterprise Social Media Post

Reflecting these concerns, we propose a working definition for the digital jungle as *an experience of DI having evolved into an impenetrable technological thicket that stashes its affordances, impairing both its effective use and management, yet, furnishing undiscovered potential.*

Appropriating digitalization

Considering the automotive industry's ongoing disruption, Car Inc.'s management recognized a need to engage in digitalization. New market entries (e.g., Tesla) and Tech-Companies (e.g., Apple, Google and Uber) were comprehended to threaten Car Inc.'s incumbent market position due to their perceived maturity in terms of digitalization. Car Inc.'s management thus initialized PolePosition2020 to digitalize the company's organizing. In PolePosition2020 documents, Car Inc. formulates how it appropriates digitalization translating it into institutional ideas about technology which then underly its change program. These initiatives focus on integrating digital technologies for collaboration and empowering employees to use these technologies. Essential to Car Inc.'s appropriation of digitalization is transforming its organizing of intra- and interunit collaboration by means of technology.

> *"New competitors like Google, Apple and Tesla are penetrating our markets. New generations of employees have new requirements of use as employers and as a team. Speed, innovative power and adaptability are becoming increasingly important. If we want to remain successful, we have to change the way we cooperate."*– PolePosition2020

Integration of technologies

PolePosition2020 entailed increasing integration of digital technologies into Car Inc.'s DI. For example, in 2016, Car Inc.'s board of management approved the introduction of a new enterprise social media platform and an instant messaging service for company owned mobile devices as part of PolePosition2020. They position integrating these technologies as offering employees the 'tools' to engage in new and digital ways of collaboration:

> *"Our core task is to make [Car Inc.'s] employees fit for digital change - especially where digital cooperation is concerned. To this end, we provide them with the 'tools' they need for everyday life. Or how we like to summarize it: We take care of the right 'mindset, skillset & toolset'."* – PolePosition2020

In addition, Car Inc. increasingly pursued similar projects in line with the management's appropriation of digitalization as an institutional idea of increased use of digital technologies for collaboration.

Ease of provisioning of technologies

Owing much to technological advancements such as cloud-computing, provisioning digital technologies is of relative ease. In some instances, new technologies are accessible via a web browser and at low costs (Vial 2019). For instance, at Car Inc., the integration of the enterprise social media platform and instant messaging app was fast. The first was integrated within 1.5 years and the latter only half a year after its approval. The ease of provisioning of technologies lowered the technical and financial barriers to assimilate digital technologies into Car Inc.'s DI. Rather than being properly implemented, the technologies were merely provisioned, that is, made available.

Besides technical ease, PolePosition2020 modified Car Inc.'s policies empowering employees to choose and select their technologies for their work via an internal online shop for IT equipment and software applications.

> *"Until now, many people had to click many checkboxes before you could get an IT device approved for their daily work. […]. The new process addresses these shortcomings: A maximum of two people will be involved in approving your IT order. Low-value consumables and basic equipment such as mice, keyboards, chargers, adapters or bags do not require approval at all."* – PolePosition2020

Fragmentation of functionalities

Integration of technologies increased fragmentation of functionalities. The number of digital technologies offering different or similar functionalities within Car Inc.'s DI surged. These digital technologies include both large-scale information systems (e.g., enterprise social media platform) and small but specified applications (e.g., an agile project management tool). While the first provide a range of functionalities covering a broad spectrum of use cases, the second provide specific functionalities for a particular use case. Thence, for completing complex tasks employees use one but combine several digital technologies furnishing the required functionalities to achieve a particular collaborative task.

Nescience of installed-base

Car Inc.'s employees seem to have little understanding or concern over Car Inc.'s DI's existing installed-base. In need of a digital technology, employees tend to integrate familiar digital technologies rather than to make-sense of and actualize the DI's installed-base. They are and feel empowered to experiment with digital technologies available within our without Car Inc.'s installed-base.

Illustrating, PolePosition2020 integrated an agile project management tool following the Kanban logic. When in need of a respective tool, employees did not consult their internal IT partner or screen Car Inc.'s installed-base but turned toward a familiar and renowned digital technology. In this example, employees started to use a cloud application for agile project management that was without Car Inc.'s installed-base.

On a different occasion, employees inquired for a tool integrating interactive elements in their presentations. Oblivious to the installed-base, their IT partner was unaware of a respective technology available within Car Inc.'s DI. Still in need of a tool, these employees then procured an application without Car Inc.'s DI to later become aware of the solution which was available within the installed-base. Yet, they continued using the application without the installed-base.

Discussion of preliminary findings

Taking an ethnographic approach, we study the evolution of an organization's DI focusing on the role of digitalization. Our preliminary findings indicate, firstly, that Car Inc.'s digitalization is better understood

studying its institutional ideas about technology as outlined in PolePosition2020. Secondly, we inducted the sensitizing concept 'digital jungle' encapsulating organizational experiences of DIs as an impenetrable thicket of digital technologies stashing its affordances from effective use, yet, furnishing undiscovered potentials. Thirdly, we investigated the emergence of Car Inc.'s digital jungle proposing a tentative framework of dynamics which contribute to its DI's evolution into a jungle (see Figure 1). Hence, our study contributes to discussions on digitalization and its influence on DI evolution. Moreover, it portrays how DIs as digital jungles may attenuate organizations' digitalization.

Appropriating digitalization. Engaging in a process of understanding Car Inc.'s digitalization, we conceived that prior to practicing digitalization, an organization appropriates digitalization. Car Inc. first made sense of digitalization translating it into institutional ideas about technology which then underlaid its initiatives meant to digitalize its organizing. This conception alters the widely assumed role of technology as a transformational source in digitalization (Matt et al. 2015; Vial 2019) to an object of which organizations make sense. This sense making, or the sense that is made, in turn, forms the essence for digitalization initiatives transforming organizing. This view sets focus on studying organizations' institutional ideas when studying digitalization. Understanding such institutional ideas allows to draw comparisons between ideas and how these are practiced. Thus, it underlines that digitalization may go zillion ways not because of how technology enables or constrains digitalization but because of how organizations appropriate digitalization.

Conceptualizing digital jungle. We contribute to literature on DI evolution (Constantinides and Barrett 2014; Hanseth and Lyytinen 2010; Henfridsson and Bygstad 2013; Øvrelid and Bygstad 2019; Venters et al. 2014) proposing a sensitizing concept for digitalization's influence on DI evolution (Walsham 2006). Our definition highlights a digital jungle's duality. While organizational members experience it as confusing and overwhelming and impairing effective use of DIs' affordances (Zimmer and Niemimaa 2019), they also connotate it positively as it embodies potentials for actualization toward organizational ends. Similarly, the concept broadens the discussion of DI evolution beyond the managerial matter of DI development also as an issue of effective use. If DI evolution is essential to an organizations' appropriation of digitalization, the latter is particularly relevant.

Framework of digital jungle cultivation. Explaining Car Inc.'s cultivation of a digital jungle, we propose a tentative framework of evolution dynamics. It commences with Car Inc.'s appropriation of digitalization. In essence, this appropriation comprises facilitating collaboration by integrating technologies and empowering employees. Turning this appropriation into practice engendered cultivation of a digital jungle through an interplay of four evolution dynamics as well as top-down and bottom-up DI development: (1) integration of technologies; (2) ease of provisioning of technologies; (3) fragmentation of functionalities; and (4) nescience of installed-base. Forming a tentative framework, these dynamics contribute to our understanding of how digitalization influences DI evolution cultivating a digital jungle (Hanseth and Lyytinen 2010),

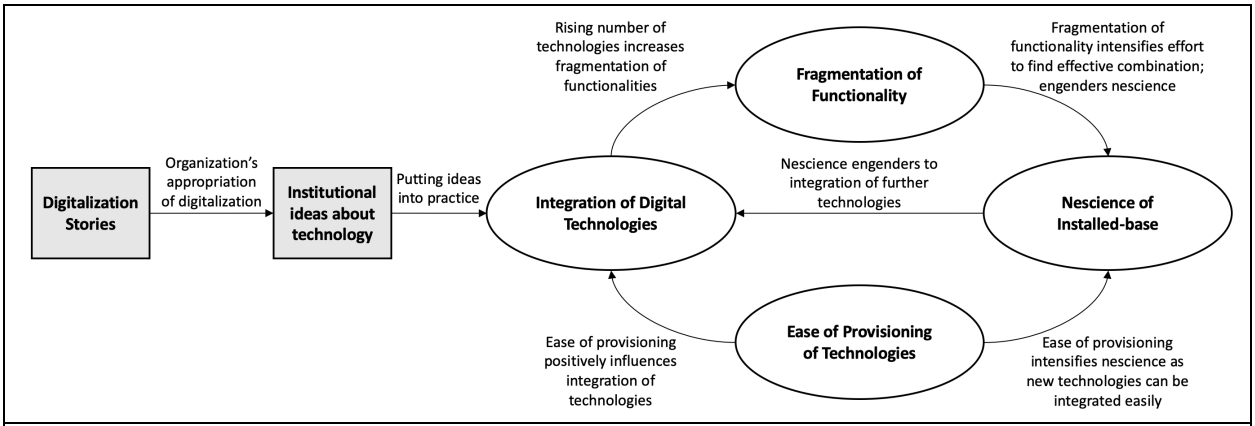

Figure 1: Tentative Framework of Digital Infrastructures' Evolution Dynamics

Through our iterative analysis, we gained confidence on the veracity and truthfulness (Myers, 1999) of the framing of the issue. While our findings shed light on some evolution dynamics, they are still preliminary in their explanation of digital jungle cultivation. Continuing to develop our framework, we plan to expand our empirical material with further interviews for sufficient saturation of empirical material and theoretical constructs (Silverman, 2014). We intend to interview both employees involved in top-down and bottom-up evolution of Car Inc.'s DI as well as employees concerned with its use. We expect further insights into the digital jungle's emergence but also into employees' understanding of the concept itself.

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