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PATTERNS OF INTERACTION: MAKING SENSE OF DIGITALIZATION IN INCUMBENT FIRMS

Research paper

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Abstract

Current research on digitalization often takes a strategic or change management perspective. More recently, research has pointed to continuous development as essential in digitally enabled change. However, less is known about how continuous development evolves, and how organizational actors interact during continuous development. Our research questions are: (i) which patterns of interaction can we identify in the continuous development of digitalization, and (ii) how can incumbent firms succeed in digitalization through continuous development?

We conduct a longitudinal case study of a large grid company, and explore their approach to digitalization through continuous development. Applying a sense-making and sense-giving lens, we identify a generic pattern of interaction in continuous digitalization in incumbent firms. Key actors in the pattern are the middle management. We identify two interlinked cycles, one for the top management and one for the operational level. Our model highlights new and surprising insight on sense-making and sense-giving in relation to change and digitalization in incumbent firms.

Keywords: Digitalization, Continuous Development, Incumbent Firms, Sense-making, Sense-giving

1 Introduction

This paper explores digitalization from the perspective of continuous development. Continuous development is a concept and practice from software development, prescribing short cycles of planning, development, and delivery to a customer, gathering feedback and acting on that feedback. Like agile, it was pioneered by start-up firms (Ries, 2011) and Internet-based companies (Iyer & Davenport, 2008). Initially, continuous development focused on software product development. However, some researchers have argued that it could be extended to broader organizational contexts, such as digitalization (Bussgang & Clemens, 2018).

The literature on digitalization has provided new insights on strategy (Bharadwaj, El Sawy, Pavlou, & Venkatraman, 2013) and change management (Parviainen, Tihinen, Kääriäinen, & Teppola, 2017). In our research, we argue that continuous development is a fruitful approach – a way of thinking – to digitalization, also in incumbent firms. Continuous development is characterised by short cycles of development, implementation, and learning. It focuses on bringing valuable features to users or customers on demand or will, in patterns or series, with the aim of achieving continuous flow, and in significantly shorter cycles than traditional lead times (Rodríguez et al., 2017).

There are several reasons for exploring continuous development in digitalization:

- New insights on digitalization (Osmundsen, Iden, & Bygstad, 2018a, 2018b; Yoo et al., 2010) have important implications for how it is planned and implemented. In particular, the value of strategy has decreased, simply because we know too little about the future. This has changed the focus from planning to learning and adaptation.

- Many organizations have been deeply influenced by the agile approach, and are using the ideas in new areas (Aghina et al., 2017). There is potential for continuous development to achieve the same width (Bussgang & Clemens, 2018).
- Continuous development has become a key approach for start-ups around the globe (Ries, 2011)

We explore the phenomenon in the context of incumbent firms. Digitalization in incumbent firms is different and more challenging than in born-digital firms such as Google and Netflix (Svahn, Mathiassen, & Lindgren, 2017). While born-digital firms can exploit network effects for fast growth (Parker, Van Alstyne, & Choudary, 2016), incumbent firms evolve slower, and have to combine digital and physical elements when digitalizing. How is this accomplished? We explore how continuous development could be a fruitful approach to digitalization in incumbent firms, and ask the research questions, (i) *which patterns of interaction can we identify in the continuous development of digitalization*, and (ii) *how can incumbent firms succeed in digitalization through continuous development*?

Our empirical approach is a case study of a grid company, where we aim to understand the ‘nuts and bolts’ of continuous development in an incumbent firm. We proceed by reviewing relevant literature on continuous development. Our theoretical lens is the sense-making and sense-giving perspective. After presenting our method and case, we present our findings on the case organization’s approach to digitalization through continuous development, and the interactions between organizational levels that have fuelled this continuous development. In the discussion, we highlight a generic pattern of interaction on continuous development in incumbent firms. We identify two interlinked cycles, one for the top management and one for the operational level. Our model provides new and surprising insight on sense-making and sense-giving processes related to digitally enabled change in incumbent firms.

2 Continuous Development

The concept and practice of continuous development has its roots from software development. Due to rapid technological development and globalization, organizations have over time shifted from being stable, into *emergent organizations* - continuously adapting to changes in their environments (Truex, Baskerville, & Klein, 1999). This development has led to changes in how software development is practiced (Rodríguez et al., 2017). Traditional approaches to software development, seeking to create stable information systems (IS) with low maintenance and long life spans, hinders emergent organizations in adapting to changing environments (Bello, Sorrentino, & Virili, 2002; Truex et al., 1999). Instead, organizations should establish more flexible development environments, and use IS to support and promote organizational change (Truex et al., 1999).

As a response, *agile software development* emerged in 2001 (Rodríguez et al., 2017). The main goal of agile software development was to improve organizations’ capability to adapt to changes in the environment and customer needs. A more recent trend within software development, is *continuous development* – characterized by rapid and continuous software engineering (Rodríguez et al., 2017). This approach builds on an organizational capability to develop, release, and learn from software on a continuous basis. As such, continuous development extends the agile perspective, by moving from cyclic to continuous value delivery (Rodríguez et al., 2017). Continuous development involves making updates to IS continuously, piece-by-piece, and thereby enabling quick releases to customers after testing (Bussgang & Clemens, 2018). Three characteristics can be brought forward for continuous development. First, the focus is on continuously evolving software by frequently deploying new versions. Second, customers and their data play a central role throughout the development process. Third, development is focused on testing new ideas together with customers, to drive customer satisfaction and, consequently, revenue growth (Bosch, 2012). Accordingly, customer input becomes a main driver for innovation in continuous development (Rodríguez et al., 2017).

On the extreme end of emergent organizations, we find organizations such as start-ups and Internet-based companies. As these organizations constantly need to adapt to shifting environments and keep up with the fast pace of digital technology evolution, they rely on continuous development of their

products and services to stay relevant and competitive. According to the seminal book of Ries (2011), start-ups should work in short cycles, in a process that dramatically shortens the time for a new product to reach a market. Key elements are focusing on a minimum viable product, systematically learning from user feedback in developing new and frequent versions, and ‘pivoting’ (changing direction) when needed. To accomplish this, many start-ups focus on continuous development. So do Internet-based companies. Google, for instance, has invested heavily in platform infrastructure to accelerate continuous development (Iyer & Davenport, 2008). Google’s approach to continuous development involves launching prototypes and adjustments on their platform frequently to get users’ responses. If users are enthusiastic, development continues as an iterative process between Google and its users. As such, the users become an important contributor to the continuous development (Iyer & Davenport, 2008). On a similar vein, Facebook shifted from an agile software development methodology to continuous development in 2017. As a result, deployment time for software changes was reduced from 14 hours in 2016, to two hours in 2018 (Bussgang & Clemens, 2018).

As with agile, although continuous development started out as a software development practice, implementing the perspective throughout the organization, can lead to strategic benefits (Bussgang & Clemens, 2018). Agile has over the years evolved to embrace the entire organization – so-called *agile organizations*, moving away from software development and the IT department, and affecting business aspects such as strategy, structure, processes, people, and technology (Aghina et al., 2017). Bussgang and Clemens (2018) argue that continuous development is the *new agile*, and that continuous development has potential to change organizations, just as agile did. Diffusing continuous development as a practice throughout the entire organization, would make room for more experimentation and innovation, and enable the organization to more quickly respond to changes in customer needs and requirements (Bussgang & Clemens, 2018; Rodríguez et al., 2017).

Following Bussgang and Clemens (2018), we believe that continuous development could be an appropriate way for organizations to embrace digitalization. Digitalization can be understood as a process of leveraging digital technology to alter one or several socio-technical structures (Osmundsen et al., 2018a; Yoo et al., 2010). Accordingly, digitalization could involve applying digital technology to improve processes, change work practices, or on a larger scale – completely alter the way business is conducted, i.e. *digital transformation* (Osmundsen et al., 2018a). Digital technology, often referred to as *Industry 4.0* technology (Lasi, Fettke, Kemper, Feld, & Hoffmann, 2014), is evolving in a rapid pace. At the same time, organizations’ environments are becoming increasingly unstable, with changes in both the competitive landscape and in the expectations of customers and end-users (Osmundsen et al., 2018a). Digitalization efforts should reflect the non-stable prospects of the organization and be under constant development, rather than tied down by predetermined and soon-to-be outdated specifications.

3 Theoretical Lens: Sense-making and Sense-giving

In order to expand the concept of continuous development into a more general organizational context, following Bussgang and colleagues (2017), we need to understand the interactions between various organizational levels during continuous development. Or more specifically, how do actors of different organizational levels experience and make sense of the digitalization process, in order to interact constructively?

The concept of sense-making has pervaded much of organizational literature since the late 1960s. It was not until the 1990s however, sense-making evolved as a broader and more independent research stream (Maitlis & Christianson, 2014). According to Weick (1995), sense-making is a process by which individuals engage in retrospective and prospective thinking to interpret the reality. Maitlis and Christianson (2014) found that sense-making in organizations usually occurs when individuals experience a “violation of their expectations, or when they encounter an ambiguous event or issue that is of some significance to them” (p.77).

A popular research context to apply sense-making, has been the context of change intervention. Accordingly, sense-making may be triggered by change processes affecting the organizational identity or culture, or change processes transforming the organizational structure and disturbing the existing understandings of the organization (Maitlis & Christianson, 2014). As such, individuals engage in sense-making in response to change processes and leaders' sense-giving of the process. Sense-giving (Gioia & Chittipeddi, 1991) regards a process where individuals (leaders in this case) attempt to influence others' sense-making (Maitlis & Christianson, 2014). This implies that leaders try to influence the meaning construction of others toward their preferred reality through communication and actions (Gioia & Chittipeddi, 1991). Within the IS field, sense-making and sense-giving has often been applied to understand the social aspects of technology implementation (Jensen et al., 2009) and IT adaptation (Henfridsson, 1999). In the context of technology implementation, users typically engage in sense-making processes to develop assumptions, expectations, and knowledge of the technology, which in turn shape how they interact with the technology (Orlikowski & Gash, 1993). This sense-making process is triggered by the changes inferred by the technology implementation, such as interruptions to individuals' current projects or ways of working (Jensen et al., 2009). While users try to make sense of the new technology and its implications, other organizational actors, typically managers, engage in sense-giving.

Leaders have received particular attention in research on organizational sense-giving, as leaders engage in sense-giving during strategic change (Gioia & Chittipeddi, 1991; Maitlis & Lawrence, 2007). However, other studies have acknowledged that other stakeholders and organizational members also can exert sense-giving. For instance, prior research has found that middle managers can gain top management attention and considerably shape the interpretations of leaders through sense-giving efforts (Maitlis, 2005). Board-directors have also shown to engage in sense-giving in shaping both the content and process of company strategies (Maitlis & Lawrence, 2007). There is less evidence of sense-giving on lower organizational levels than the middle management. The general employee is primarily considered as a receiver of sense-giving, who enacts in sense-making to interpret the reality and clarify the situation. This is also reflected in the sequential and reciprocal model of sense-making and sense-giving of Gioia and Chittipeddi (1991), where sense-giving is presented as a bottom-down process, and sense-making as a bottom-up process. In our case, however, we find the tables are turned as to which actors are giving and making sense in a continuous development approach to digitalization.

In this study, we apply a sense-making and sense-giving lens to understand how different organizational actors in an incumbent firm make and give sense of a digitalization process. This lens is particularly useful for our study for a variety of reasons. First, because the sense-making and sense-giving perspective focuses on how and why different actors construct interpretations and try to affect other actors' interpretations, while seeking to create order (Lewis, Mathiassen, & Rai, 2011; Weick, 1995). Second, new technology can have several alternative interpretations and is, therefore, subject to misunderstandings. Different organizational actors (e.g., managers, developers, and users) interpret new technology differently, based on their underlying assumptions, expectations, and knowledge about the technology (Orlikowski & Gash, 1993). Accordingly, understanding how different organizational actors make sense of the new technology is essential to understanding the digitalization process. Third, the idea of sense-making and sense-giving has proved to be valuable for understanding organizational communication (Cooren, 2004). Finally, sense-making and sense-giving are inherently temporal phenomena (Lewis et al., 2011; Weick, 1995), which allows us to study the digitalization process and continuous development over time.

4 Methods and Case

Insight to answer the research questions was derived from a longitudinal case study at a Norwegian grid company, referred to as 'GridCo'. A case study involves studying a case within a real-life, contemporary context over time, through detailed, in-depth data collection from multiple sources of information (Creswell, 2012). The research was longitudinal, in that one of the authors has spent 1-3

days per week with the company, from autumn 2018 until spring 2020. Such rich access to the case organization has enabled the researchers to develop deep understanding of the organization and its approaches to digitalization.

We have relied on three main sources of data in our research: interviews, observations, and archival documents. First, we conducted semi-structured interviews with 45 participants in different positions and departments in the company. Each interview lasted between 30 minutes and 2 hours, and was recorded and transcribed. An overview of the interviewees and their respective organizational level is presented in table 1. For the purpose of this paper, we have divided the interviewees to belong to one of three organizational levels; top management, middle management, and the operational level.

Organizational level	Description	No. of respondents
Top management	Managers at the top levels in the organization	4
Middle management / IT	Middle managers and representatives from the IT-function, including roles engaged in the specific digitalization effort studied in the case	13
Operational	Employees who work in the processes directly affected by the digitalization effort, including roles such as electricians, electric power engineers, work planners, job allocators, and project managers.	28

Table 1. Interviewees and organizational level

Second, observations have been another important source of data, and enabled us to see view the organization from an insider perspective (Jorgensen, 1989). By spending 1-3 days a week with the case organization, we have been able to conduct rich observations through overseeing discussions, working side-by-side with different employees, participating in lunch-talks, and attending several formal and informal meetings. Observations were documented in field notes, and constitute a valuable data source and a foundation for data analysis and further data collection.

Third, our study included extensive amounts of archival data, which have been accessed through the organization's document archive system, Microsoft Teams, and other information systems in the company.

To analyze our data, we were inspired by the 'ladder of analytical abstraction' (Carney, 1990; Miles, Huberman, & Saldaña, 1994), and worked in three phases. In phase one we focused on summarizing and coding the data, and sketching the chronology of the digitalization effort. In the second phase, we identified themes and trends in the data, where the idea of sense-making and sense-giving evolved as a relevant lens for understanding digitalization through continuous development. In the third phase, we aimed at delineating the deep structure of the case and identifying patterns and explanations (Bygstad & Munkvold, 2007; Carney, 1990; Miles et al., 1994). In this step, we were able to identify a generic interaction pattern between organizational levels during the course of the continuous development.

4.1 Case

GridCo is a Norwegian grid company, whose main tasks revolve around building, operating, and maintaining the regional and local distribution network in a specific geographic area in Norway. Grid companies ensure electricity is provided to their customers, both private households and industry customers. As it is not economically justifiable to build grid networks next to each other, each grid company in Norway holds natural monopoly position based on their geographical area of operation. However, development in the sector is challenging the traditional role and monopoly position of the grid companies. Enabled by digital technology and trends such as electrification, self-generation, and local energy solutions (micro-grids), the entire system for producing and distributing energy is changing. At the same time, new competitors, ranging from larger enterprises and non-industry entrants to smaller start-up companies, are entering the energy sector. Additionally, in the Norwegian context in particu-

lar, regulatory actors are introducing regulations and guidelines that may change the dynamics in the industry, leading the players toward cooperation, changed roles, new business models, and new ways to approach end users. GridCo realizes that it needs to digitally transform to leverage the digital development, prepare the organization for the future, and stay relevant and competitive. In this paper, we dig deeper into one digitalization effort that has contributed to the digital transformation at GridCo, namely the development and implementation of ‘OPRA’.

GridCo has approximately 400 employees, with over half of them working directly in serving the company’s obligation to provide electricity to customers. This involves both personnel working ‘inside’ in planning and administrating the work to be executed, and personnel working ‘outside’, electricians, physically executing the work. The fieldwork conducted by the electricians is “*rather rough, mechanic work*” (Interviewee 13), and involves physical, manual execution. As one respondent commented, “*You can talk about digitalization and robotization, and the like, but our grid system is how it is. Some of it was built over 100 years ago, and still exists. So, we need to be there physically to execute the work (...). Someone still has to do the physical job—we can’t escape that*” (Interviewee 7).

The electricians’ work is mainly driven by customer inquiries. An inquiry regarding a fault on the grid, or need for electricity to a different or new location, triggers a job to be executed. Inquiries can come from several different instances, depending on the type of customer and job. One challenge at GridCo was the lack of structure and standardization in receiving and handling customer inquiries. The way inquiries from different sources were treated varied from one receiver to the next. Moreover, there was a lack of structure and standardization in the entire process of planning, executing, and documenting the work to be executed to fulfill the customer needs. Different individuals had their ‘own ways’ of working, and the common operating methods included limited recording and poor documentation. Additionally, the information systems supporting the processes were not well integrated, which led to employees having to move back and forth between different systems and applications, and duplication of work and information. As a result, many avoided the information systems entirely. Accordingly, the company had limited insight into and control of their core business.

Today, the situation is entirely different. Through continuous development, GridCo has developed and implemented workflow system, ‘OPRA’, automating and digitalizing the entire workflow and processes occurring prior to and after the physical execution. OPRA encompasses the entire workflow – from a customer inquiry is received, to the work is planned, executed, and eventually documented. Managers and employees today refer to OPRA as a revolution. However, the journey to get to this point has not been easy.

5 Findings

Our data analysis revealed two key findings:

- Digitalization at GridCo is characterized by continuous development
- The continuous development was fueled and reinforced by interactions between the different organizational levels

In the next sections, we first present a chronology of decisive events in the continuous development of the digitalization effort OPRA (figure 1), before we explore interactions between different organizational levels that have been crucial in reinforcing the continuous development.

5.1 Continuous development at GridCo

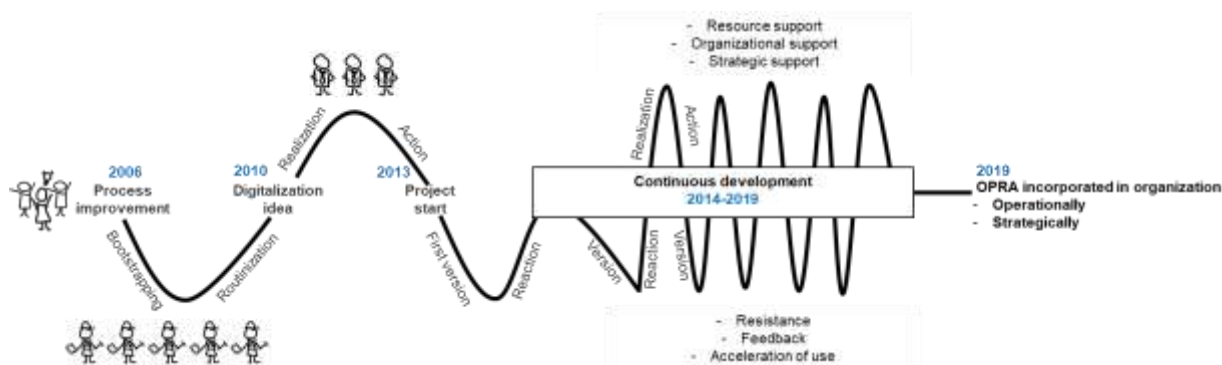


Figure 1. Chronology of the evolution of OPRA

In **2006**, a middle manager in charge of a department with 40 electricians, decided to take action to optimize and standardize their work routines in the department. Her aim was to ensure that the electricians worked as efficiently as possible. To do so, there was a need for better control of and insight into the core business: *“The entire time I had a plan to improve [our services]. And if I were to do that [...] I needed to know my production! I had to know what the electricians were capable of doing within a workday”* (Interviewee 45).

Gradually, the department started making better use of the existing information systems, standardizing and optimizing the workflow and processes supporting the operations in the department. This implied a bootstrapping approach, starting with the simplest tasks first, and engaging the most motivated electricians first. However, the electricians were not thrilled about the changes. *“In the beginning they were furious, because they thought this was incredibly useless. They were used to doing things as they pleased, and this [new way of working] was so cumbersome and silly”* (Interviewee 45). Over time, however, as the new routines became established in the department, the attitudes turned to the positive.

The efforts made in the department to standardize and optimize the way of working, were successful. However, the information systems which supported the workflow were still not working optimal, and were not well integrated. Further, the efforts only regarded one department and a small percentage of all employees, and affected only a portion of the processes at GridCo. Building on the experiences from her own department, the middle manager saw the potential of increasing the scale and scope to include the entire organization. In **2010**, she presented an idea to the top management: to develop and implement a system that would digitalize the overall work processes at GridCo related to the planning, resource allocation, and documentation of work orders to be executed. The intention was that the system would ensure sufficient job instructions and necessary documentation following the work orders, enable interaction between systems, and enable process support through mobile devices (iPads). It would also affect the roles involved in the work processes, and how they interacted with one another. In other words, the system would support and digitalize processes in the entire value chain of GridCo, from customer inquiry to customer satisfaction.

However, the idea received limited support from the top management, and frankly, the employees at the operational level were not pleased with the idea either: *“The system was neither wanted by the management or the electricians. ‘Why do we need it? We should just continue doing our job’”* (Interviewee 2). According to interviewees, the perception was that the top management did not share the same understanding of the situation, and hence, did not see the value of such a system: *“As a company we should have control of our production. And I don’t really think the management understood that, why we needed that he he he”* (Interviewee 45). *“The challenge has been getting the management to understand what this was all about, because they were completely absent”* (Interviewee 19). At the same time, digitalization was still at an immature level in the organization: *“Digitalization and talking about digitalization in this company was still very new and unfamiliar. Very unfamiliar”* (Interviewee

45). The environment and competitive landscape of GridCo and other grid companies in Norway had been stable for decades, and hence, digitalization had not yet been on the agenda for these companies.

Together with a handful of ambassadors, the middle manager worked on framing the idea and its potential to convince the top management to get on board. In **2013**, the top management eventually gave their ‘Go’ for the development of the system, termed ‘OPRA’, to begin. A project team (referred to as ‘OPRA team’ herein) and mandate was established for the development of OPRA to start. The OPRA team consisted of middle manager roles with tight connections to the IT-function at GridCo. When the core of the solution was in place, a bootstrapping approach was applied for implementation of the first services in OPRA. The OPRA team first targeted employee groups and services “*where tasks were simple and of large volume*” (Interviewee 45). The tasks of a limited number of employees were embedded into OPRA. These employees were offered extensive training, and were closely followed up by the OPRA team. The employees were not pleased about having to work in OPRA to start out, because they “*liked it better the way things were before, on paper*” (Interviewee 7). As one manager commented, “*people are very used to doing things their own way. And when there’s a new system which they don’t really have control over, it’s not easy for them to get rid of old habits*” (Interviewee 3). However, as these employees started understanding OPRA, they also started seeing its value, and the OPRA team began to notice less resistance from the employees.

Based on feedback from the users, the OPRA team, with help from the IT-function, made necessary adjustments to OPRA to accommodate needs and reduce frustrations among the users on the operational level. From **2014** and onwards, the continuous development of OPRA proceeded, additional services were added to the solution, and more and more employees adopted the solution. The continuous development of OPRA could be described as a self-reinforcing process, with at least two mechanisms fueling the continued development: (a) feedback and reactions from the operational level, and (b) top management actions.

First, together with the IT-function, the OPRA team adjusted the solution and released new versions of OPRA every second week, based on feedback and reactions from the users. To start out, the reactions from the users were mainly negative, characterized by frustration and resistance. However, through training and adjusting the solution based on feedback from users, the resistance weakened. Further, with OPRA constantly improving to meet the needs of the users and adding functionality, the number of employees adopting OPRA continued to increase, which again led to feedback from a broader user-base to support the continued development.

To illustrate with an example, one major change to the solution was the transition from laptops to iPads. In the beginning, electricians could access OPRA on both laptops and iPads. In January 2017, the OPRA team decided to gather all laptops, and roll out iPads and the pertaining mobile version of OPRA to all electricians. The transition from laptops to iPads proved to be more challenging than first anticipated. The mobile solution had several errors, as pointed out by one of the interviewees: “*everything did not necessarily work exactly as it was supposed to in the beginning. So that was kind of a brutal start*” (Interviewee 1). This generated frustration among the electricians: “*It was kind of like when they first made up their mind, an iPad was handed out to all of us: ‘Now you have to use OPRA on the iPad!’ But it didn’t work! And that led to many detours around OPRA. Because our work had to proceed anyway, right? And I think that led to detours for a long time [after the problems were solved], longer than necessary. Because people didn’t trust the solution, and didn’t like using it*” (Interviewee 18). At the same time, many electricians had limited experience in using iPads in general, especially some of the more senior workers: “*Some of them managed, but others couldn’t even turn it on. [...] There are different generations, right. When you’re 60 years old and are handed an iPad, it’s kind of like ‘what is this thing?’*” (Interviewee 25). Although the iPads generated resistance and frustration among employees on the operational level, these attitudes faded out as the employees over time came to understand both how to use OPRA on the iPads, and the benefits of the mobile solution: “*Many were frustrated in the beginning. Yes, people weren’t very pleased with it. But that has changed. They have seen the benefits of it. I think it’s like a maturation process*” (Interviewee 24). Important initiatives from the OPRA team that contributed to cease the resistance include appropriate

training, as well as taking the needs and requests of the electricians into account to continuously improve the solution. As one electrician pointed out: *“I was not happy with the iPad or OPRA. But things are different today. Now I see the value in it. [...] Things have turned! He he. And I’ve realized that it’s not a problem to learn new technology, so I’m not reluctant to digitalization anymore. Everything can be taught”* (Interviewee 9).

Second, as OPRA continued to grow in functionality and users, the top management started realizing the potential value of OPRA for the business. Consequently, top management gradually expressed their support for the solution through specific actions, allowing for the continuous development of OPRA to flourish. Examples of such reinforcing actions include appointing IT-resources dedicated to OPRA, re-boosting a process-based mind-set in the organization, establishing an organizational unit to manage the continued development and implementation of OPRA, and dedicating increasing focus to OPRA and digitalization in the business strategy.

In 2019, when interviewing both employees and managers at GridCo, it is clear that the resistance towards OPRA is close to eliminated. Top management now refer to OPRA as ‘revolutionary’, in that it has increased standardization and efficiency along the entire value chain, and that they now have data-based insight into the business. OPRA is seen as a backbone for the larger digital transformation at GridCo, and has gained strategic anchoring in the organization. Additional units of the organization acknowledge the benefits of OPRA and want to take part in the success. The following years already include plans of additional integration of OPRA, to add more services and expand the reach of OPRA.

The employees at the operational level also see the value of OPRA more clearly now. In fact, they are requesting more services to be offered through OPRA: *“Now it’s more the case that the electricians are asking for when they will get the rest [...] Because they are irritated that they don’t get everything on their iPads”* (Interviewee 45). The issues and problems with OPRA as a solution and the iPad as a tool have gradually been solved over time, through user-based continuous development, and training. Even the most resistant employees have shifted: *“To be honest, I was very skeptical as to whether it was going to work. I was a bit opposed to it, thinking they were moving a bit too fast forward. But, I have to say, the team working with the OPRA solution, they have done a fantastic job. It works. So I’ll be the first to admit that I was wrong there, he he he!”* (Interviewee 21). The electricians are now both mastering OPRA and the iPad, and *“do not want to go back to anything else now that it works”* (Interviewee 7). OPRA and the iPads have eased the administrative workload of the electricians, and now the perception is that *“they have realized that they cannot do without it”* (Interviewee 19).

As such, OPRA is not merely a new IT-solution. According to several respondents, the value of OPRA does not lie in the solution itself, but in the change of mind-set and way of working, with a focus on documentation, standardization, and digitalization. As one interviewee pointed out, *“our largest benefit from this, is that the company as a whole has understood that in order to move forward, we actually have to think ‘digitalization’”* (Interviewee 45).

5.2 Interaction between organizational levels

The continuous development of OPRA was fuelled by actions of different stakeholders. In this section, we explore how different organizational levels have interacted, which in turn has reinforced the evolution and continuous development of OPRA. The middle management level are involved in all interactions. Middle management has played a crucial role in the continuous development of OPRA in at least two ways. First, by ensuring users’ needs are met. Through taking into account the demands and needs of the operational employees, they have ensured that OPRA would simplify the electricians’ workday rather than just represent ‘yet another system’. Second, they act as a bridge between the top management and operational employees, in translating needs and demands from to and from both parties, developing a common understanding, and reducing gaps between different perspectives.

5.2.1 Interactions between operational level and middle management level

The OPRA team release new versions of OPRA on a continuous basis, with added or adjusted features. The operational employees got to experience using each new version, and evaluated its usefulness and ease of use. They considered whether previous problems had been solved, if new problems had occurred, and evaluated whether the new version added value to their daily work. Some employees struggled with managing OPRA. One respondent commented, *“With OPRA, you just had to learn the new functionality. [...] But there was a lot [of new things] at once. I don’t think everybody was keeping up”* (Interviewee 25). Moreover, the employees’ experiences varied: *“I think it varied a lot. Some were very into it and wanted to learn. Others... [...] I think it had a lot to do with their willingness. I dived into it, he he he. Because it was new and exciting”* (Interviewee 23).

Once the employees had experienced using the new version of OPRA, they had some sort of reaction. If their experience was bad, they reacted with resistance. If their experience was good, they were more likely to continue to use OPRA, convince peers of also applying OPRA more extensively, and search for new ways to further improve the solution. Either way, they expressed their opinion of the new version, mainly through feedback to the OPRA team at the middle management level. One employee commented: *“We have seen that giving feedback works. They adjust according to our needs. And that makes me believe that we get a solution that we get much more ownership to. You get a solution that does what you need it to do, and not only a solution that is forced on us”* (Interviewee 3).

5.2.2 Interactions between top management level and middle management level

As explained earlier, the top management were not very convinced of the idea of OPRA at first. Despite their lack of confidence in the project in the beginning, the top management never stopped the continued development of OPRA. As one of the interviewees pointed out, *“There was some resistance from the top levels as well, so there was no guarantee that OPRA would succeed. However, the management have given us leeway. So, we had permission. It was never stopped. And one ever said ‘no, now we can’t afford developing anything else, this is enough’. So, management never stopped it. But they maybe didn’t cheer very much either, at least for a while”* (Interviewee 45).

As more users adopted OPRA, the organizational benefits of OPRA became more visible to the top management. Implementing OPRA has eventually reduced the time operational level employees spend on administration, solving inconsistencies in work orders, and trips back and forth to the office. According to an internal audit report, the time spent on documentation and administration of a typical job was reduced from 22 days in 2014, to 3 days in 2018. Moreover, interviewees report benefits from OPRA such as increased transparency, standardization, and efficiency. The OPRA team on the middle management level continuously strived to make the benefits of OPRA more apparent for the top management, in order to achieve necessary support. Over time, top management have gradually realized the valuable and positive effects of OPRA.

Once the top management have realized the benefits of OPRA, they have gradually increased their support in OPRA, through providing resources to reinforce the continued development. The top management have shown their support through continuing and extending monetary resources to the project, as well as providing organizational support. Moreover, support from the top management is expressed through an increased focus on OPRA and digitalization on a strategic level.

6 Discussion

We return here to our research questions:

- (i) *which patterns of interaction can we identify in the continuous development of digitalization, and*
- (ii) *how can incumbent firms succeed in digitalization through continuous development?*

6.1 Pattern of interaction

We can identify two ideal-typical positions in the digitalization research; a top-down view and a bottom-up view. The top-down view regards digitalization as a strategic effort, while the bottom-up view focuses on bootstrapping and user-driven innovation. The continuous development view challenges both positions, because it requires both a strategic anchoring, while it at the same time is dependent on user-driven innovation.

In this paper, we have identified an interaction pattern, with two interlinked cycles, fuelling and reinforcing the continuous development of OPRA (figure 2). The first cycle is on the top management level, and the second on the operational level.

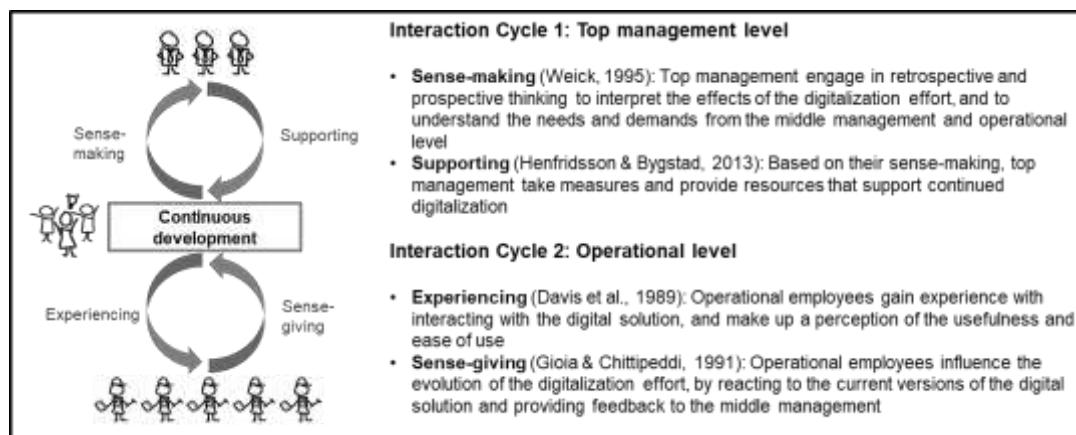


Figure 2. Interaction pattern

In the first interaction cycle, we identified two interaction mechanisms unfolding; *sense-making* and *resource support*. The top management are making sense of the digitalization effort, and gradually increasing their understanding of the middle managements' arguments for continuing to digitalize, as well as the needs and requirements of the operational employees. In other words, sense-making (Weick, 1995) in this context regards the process where top management engage in retrospective and prospective thinking to interpret the effects of the digitalization effort and to understand the needs and demands from the middle management and operational level. Once the top management have made sense of the situation, they act accordingly in providing resources to improve and extend the digital solution (Henfridsson & Bygstad, 2013), and as such support continued digitalization.

In the second interaction cycle, the two interaction mechanisms we identified were *experience* and *sense-giving*. The operational employees gain experience with the digital solution, and make up a perception of the usefulness and ease of use (Davis, Bagozzi, & Warshaw, 1989) of the solution. The operational employees then engage in sense-giving, to attempt to affect the sense-making at higher levels, and steer the continuous development of the digitalization effort in the direction that suits their needs. In other words, sense-giving (Gioia & Chittipeddi, 1991) in this context regards the process where operational employees influence the middle- and top managements' perceptions of the digitalization effort, through feedback and other reactions.

Our model (figure 2) presents a nuanced picture of the digitalization process, indicating that taking a continuous development approach to digitalization is neither a top-down nor a bottom-up approach, but rather a combination of the two. As such, digitalization evolves through continuous interactions between different organizational levels. Placed in the middle of the model, are the middle managers, indicating that middle managers play a key role in digitalization through continuous development in incumbent firms. In our case, the role of the middle management has particularly revolved around fronting needs of the users, and bridging gaps between top management and operational levels. As such, GridCo has engaged in a tuning process of accommodating needs and relieving resistance

(Svahn et al., 2017) towards the changes following the digitalization. What is surprising in our case is that it was the middle management, rather than the top management, who managed this tuning process.

Our model also challenges the established view on sense-making in organizations, which assumes that managers conduct the sense-giving, and that sense-making, on the receiving end, is a bottom-up process. Our model indicates that the employees at the operational level can engage in sense-giving, which in turn has the top management level exert sense-making to understand the situation and take appropriate actions. This is possible because of the particular characteristics of continuous development (Bosch, 2012):

- new versions are released frequently, on a continuous basis
- users play a central role throughout the entire development process
- ideas are tested together with users to drive user-satisfaction

We find that the high degree of user involvement in the continuous development approach to digitalization, results in a shift in the directions of who is giving and making sense.

6.2 Digitalization in incumbent firms

Digitalization in incumbent firms is different from digitalization in born-digital firms. Incumbent firms face challenges such as competing concerns related to existing vs. requisite capabilities, product vs. process innovation, internal vs. external collaboration, and controlled vs. flexible governance (Svahn et al., 2017). For incumbent firms, it can be challenging to let go of existing legacy systems, processes, and cultures (Sebastian et al., 2017), and traditional ways of working.

Moreover, incumbent firms have to combine digital and physical elements when digitalizing. For companies like GridCo, who operate complex physical assets that are dependent on a field force to run the business, digitalization becomes particularly challenging. Consequently, and as our case illustrates, digitalization revolves around combining existing physical constructions, manual work routines, social interactions, and digital elements. Further, in incumbent firms with a large field force of employees, the distance between the top management and operational level becomes increasingly apparent when digitalizing. Top management do not have any direct experience with the effects of digitalization for the operational employees – how one would experience having to incorporate digital tools in the daily work, when hanging from a pole, or digging a ditch. Consequently, it can be challenging for managers to incorporate the direct needs of the operational employees when digitalizing.

How can incumbent firms succeed in digitalization under such conditions? We argue that continuous development is a fruitful approach for incumbent firms to embrace digitalization, for several reasons.

First, continuous development involves frequent releases of new versions (Bosch, 2012). Taking on a continuous development approach to digitalization enables organizations to constantly take the experiences and challenges met during the process into consideration, and make appropriate adjustments. As our case illustrated, experience from the operational environment serve as input to further improvement of the digitalization effort. The ability to adjust the approach to digitalization quickly, is essential in emergent organizations (Truex et al., 1999), and even more so in today's digital era.

Second, with the continuous development perspective, the users play a central role in the entire process (Bosch, 2012). A common reason for IT implementation failures is often that the end-user has not been involved or in focus enough during the development of the solution (Marchand & Peppard, 2008; Markus, 2004). Actively involving the users in the digitalization process, increases the probability of the digitalization to actually accommodate the users' needs. In our case, we illustrate how user involvement through continuous development with constant feedback on new versions and updates, helped shape the digitalization to better accommodate the operational employees. As a result, OPRA has evolved to a digital solution that simplifies the users' workday and meets the needs of employees.

Third, and related to the second, continuous development allows for testing new solutions with the users before fully deploying (Bosch, 2012). In our case, operational employees got to test versions of

OPRA, and based on their experience give feedback to the middle management on what to improve with the solution. As such, the resistance towards OPRA decreased over time, as the solution was constantly improved based on the users' feedback.

We also want to highlight the essential role of middle management in continuous development approaches to digitalization. This is in line with research on the middle managers role in digitalization in general (Paavola, Hallikainen, & Elbanna, 2017). In our case, we illustrate how the middle managers play a crucial role in initiating, driving, and eventually succeeding in digitalization. This was accomplished through advocating the users' needs, and bridging the gap and reducing the distance between top management and operational employees. An internal audit report from 2018 also highlights the importance of the middle management for the success of OPRA: *"There has been a determination to persevere that has been crucial for the realization of OPRA despite the strong resistance [...]. The driving force, and most important success factor, seems to have been the 'OPRA team's' firm conviction that it was essential to measure and make the work processes more efficient"* (personal communication, 11.05.2018). Incumbent firms should embrace this, and prepare and encourage middle managers to take on larger roles in digitalization. Without the middle management on board, incumbent firms risk them becoming the strongest opponents of the digitalization (Svahn et al., 2017).

7 Concluding Remarks

Digitalization has become a necessity for incumbent firms to stay relevant and competitive. However, the conditions for incumbent firms to embrace digitalization are challenging. In this paper, we illustrate how a continuous development approach to digitalization can be a solution. Our case company is GridCo, an incumbent firm with complex physical assets and a large field-force of operational employees. We explore the digitalization effort 'OPRA', which has evolved from a 'silly idea' to be recognized as a revolution in improving efficiency on work processes and changing the mind-set and way of working in the organization. The OPRA project has been a success, and it was driven by continuous development. Taking a continuous development approach has enabled the organization to overcome some of the obstacles incumbent firms meet when digitalizing, and in particular ensured that digitalization supported the needs of the end-users.

We identified an interaction pattern with two interlinked cycles that fueled the continuous digitalization at GridCo. Our model depicts a nuanced picture of the traditional views on digitalization, and challenges the established perspective on sense-making and sense-making mechanisms. In contrast to the traditional view, we find that in a continuous development approach to digitalization, it is actually the operational level enacting in sense-giving, whereas the top management level enact in sense-making. Our research contributes to prevailing research on both digitalization and sense-making and sense-giving, in providing a new perspective when taking a continuous development approach to technology-driven change. We also highlight the crucial role of the middle-management in initiating and driving digitalization, fronting the end-user, and bridging gaps. Finally, our research contributes to expanding the concept of continuous development into a more general organizational context.

Our study is limited to one case organization, and our findings should be further investigated in other case settings. Our research paves the way to further research to uncover interaction patterns during digitalization efforts in incumbent firms, and to further explore the continuous development approach to digitalization.

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