

Digital Transformation of a Manufacturing Company in Light of the Digital Innovation Theory

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Abstract

Many product manufacturing companies are investing in innovative uses of digital technologies to improve the value they offer their customers and users of their products. Transforming themselves from a product innovator into a digital innovator is a challenge with multiple interconnected ramifications for the entire company. Analysis of what a heavy-machinery manufacturer learned on its digital transformation journey shed light on how the organization, its approach to customers, and its culture had to change to enable the move from products to digital solutions. This paper examines these changes in light of digital innovation theory, to assess how the executive management team carried the current themes of the theory into practice. It enriches that theory by bringing customer value into the core of the framework and demonstrating how digital innovation theory supports digitality-oriented transformation of a manufacturing company. This paper also provides business executives practical guidance for managing the transformation process.

Keywords: Digital innovation, digital transformation, customer value, organization, executive management.

1. Introduction

Innovation stemming from application of digital technologies is increasingly influencing traditional manufacturing companies. Cars, work equipment, production machinery, and many other physical products now get equipped with digital components that can collect and transmit data, support a product's on-site or remote control, and accordingly change the product's very nature – it is not an isolated instance but a highly connected element. The products not only offer personalized operation and serve as data sources but can be reprogrammed (Yoo et al., 2010). Physical items are growing ever more editable, interactive, reprogrammable, and distributable (Kallinikos et al.,

2013). For product manufacturers, this trend creates impetus to change into a service provider supplying digital solutions – change that requires a method of managing the transformation (Brodeur et al., 2022a).

Under the umbrella of “Industry 4.0” transformation research, one area of study focused on manufacturers’ transformation has explored the factors that are critical for success in this process (Brodeur et al., 2022a). Much of the research has looked at collaboration models for small and medium-sized companies attempting to embark on it (Brodeur et al., 2022b) and at proposed “digitalized business models” (Bouncken et al., 2021). There have been numerous studies on the broad topic of expanding scholarly knowledge of manufacturers’ transformation, as presented in a literature review by Teixeira et al. (Teixeira et al., 2022). Likewise, general research into digital transformation has supplied voluminous guidance for companies’ digitality transition (Gong & Ribiere, 2021).

We analyzed a product company, Ponsse Plc, a global forest-machine manufacturer that diversified its innovation efforts to generate digital solutions for additional types of customers. Applying grounded-theory-based research method (Charmaz, 2006), we interviewed all members of this company’s executive management team and the chair of its board of directors, to generate insight via a very broad research question. We aimed to understand **what the executive team learned from their recent digital transformation efforts in terms of unanticipated challenges and the changes they made to successfully overcome them**. This is aligned with the principle of abstract musing as to “what is going on” when one analyzes a case (Glaser & Strauss, 1967) and describing the content (Paré et al., 2008). We coded the interview data and created concepts via inductive analysis (Charmaz, 2006).

Rather than follow other scholars in using theories of digital transformation, we chose a digital innovation theory as the foundation for analyzing the concepts from our research. Further we selected a very recent

broad review (Hund et al., 2021) of digital innovation research as the framework. Hund et al. analysis cover 227 articles on digital innovation research from eight research fields and represent solid description of current digital innovation research and theory. We connected the concepts from the case study to the definition and research themes of digital innovation identified by Hund et al. Our contribution is in enriching this research framework by bringing customer value into its core and demonstrating that a model anchored in digital innovation theory can guide real-world processes of digital transformation. In this study digital innovation theory is tested (Gregor, 2006) by the findings from the manufacturing company transformation. Case study explains the success of the transformation by causal impacts of the changes that executive management made in the light of the recent framework of the digital innovation research.

The discussion begins by examining how the executive management team transformed the company and recapping the existing research of digital innovation. Then it details our methods and after that presents the findings, related to Ponsse redefining new customer segments and identifying which customers' needs to address, reinforcing the company's cross-function culture, and ultimately redesigning and building out the company's digital capabilities and accountabilities accordingly. We address both the executive team's work – redirecting the company's innovation efforts to generate meaningful digital solutions that meet the needs of a broader set of customers – and connection to digital innovation research. In the final part of the paper, we present contributions to theory and to practice.

2. Background

2.1. A manufacturing company's digital transformation: The case of Ponsse

Ponsse was established in 1970 in Vieremä, Finland, for selling forest machinery, and within 10 years it had gained global standing in the forest-machine and forestry-services sector. At the end of 2021, Ponsse had 2,072 employees and was generating 750 million euros in annual net sales, 80% of which came from exports. The company's operations involved 40 countries, through 12 wholly owned international subsidiaries and 235 international service centers.

In 2021, Ponsse was recognized as Finland's most reputable company across all industry sectors for the fourth consecutive year. Key to Ponsse's reputation was the company's long track record of product

innovation, which Ponsse's top management team - the company chairman and seven other directors - credited to Ponsse's customer centricity: from its beginnings, Ponsse focused on developing a rich understanding of customers' business needs, and engaged with customers to build solutions that addressed those needs.

In parallel with this, the share of Ponsse's total capital expenditure devoted to digital solutions (i.e., the company's digital investments) rose from 7% to 20% between 2014 and 2020; that is, they nearly tripled. These investments went toward three digital solutions: Opti, Manager, and Global. Ponsse introduced Opti in the 1990s, in response to requests from forest-machine operators for more data related to harvesting. Opti was a set of digital tools intended to aid operators in optimizing their machines' maintenance and operating them more efficiently by tracking usage data. At the time, Ponsse's typical customer was an entrepreneurial forest machine operator. In 2014 company's success with Opti had inspired company executives to diversify the company's offerings by creating a new digital solution, Ponsse Manager: forest machine fleet management services. This was for a different type of customer, like owners of larger fleets of four or more machines. After two years of development, the company released Manager, which drew on real-time machine data collected by Opti (geographical coordinates, productivity, fuel consumption, etc.) alongside characteristics of the timber harvested by the machine. These inputs should facilitate fleet management, production logistics, and transportation of the wood.

Soon after the market launch of Manager, Ponsse executives began hearing from customers that users were *not* impressed. There seemed to be a mismatch between Manager's capabilities and its end users' needs, indicating that the company did not have a sufficient grasp on the needs of end users. The company's executive management took the clear potential for negative consequences very seriously. From its investigations of customer concerns related to Manager in 2018, the team identified the source of the company's failure to meet the expectations: Ponsse's capabilities and organizational structure were still aligned with the original customer profile. As the customer base had broadened over time to include owners of larger, more complex fleets and distributors, alongside the entrepreneurial operator with 1–3 machines, profound changes in needs had to be factored in.

After their experience with the initial version of Manager, company executives focused on changing three aspects of the company: target customers, its

work habits, and digital accountabilities and capabilities. They defined company's target customers, specifying whose and what needs to address with digital solutions. Next, they started to create more specialized roles and accountabilities related to digital solutions, and enforced they culture to support transformation and digital capabilities.

Ponsse started implementing these changes in approach in 2019, and a subsequent significant increase in the number of customers, machines, and users connected to the digital services suggested that the changes were having positive effects. The following year saw Ponsse introduce the third digital solution, to address the unique needs of the company's distributors. Ponsse released Global to render distributors' machine maintenance and related services more efficient and valuable by means of predictive-maintenance services for customers.

The developments at Ponsse highlight many of the challenges and obstacles that manufacturing companies face on their journey to become a service provider with digital solutions rather than a provider of products alone. The issues are interwoven with customer experience and value, organization, company culture and leadership approach, capabilities, and (in-house and partners') skills involving data and IT (Holotiuik & Beimborn, 2017). Ponsse management also realized that the nature of the transformation necessitated active engagement by the executive management team, a culture conducive to innovation would prove crucial, and the use of data has important implications for offerings to customers (Gurbaxani & Dunkle, 2019).

Ponsse executives recognized that traditional product innovations differ from the digital innovations which follow a dynamic problem-solving process (von Hippel & von Krogh, 2016) wherein the process and outcomes are tightly integrated (Nambisan et al., 2017), digital innovations are extensive, and malleable, and they rarely follow traditional processes and means of governing product development (Ciriello et al., 2018). We analyzed this case, by our open research question, with grounded theory research approach and finally from the perspective of the definition and themes of digital innovation theory by Hund et al. (2021).

2.2. Research foci and definitions of digital innovation

Hund et al. (2021) defined digital innovation as “creation or adoption, and exploitation of an inherently unbounded, value-adding novelty (e.g., product, service, process, or business model) through the incorporation of digital technology.” The Hund team

developed the conceptual framework depicted in Figure 1 accordingly.

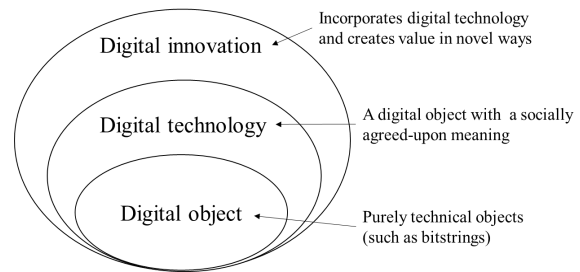


Figure 1. Three-layer conceptualization of digital innovation (adapted from Hund et al., 2021).

In their three-layer model, the innermost layer (representing a technical perspective involving homogenized data) consists of pure data; the second layer (digital technology), expressing a sociotechnical perspective that inherently entails reprogrammability, is use of the data for certain purposes; and the externally facing layer is the final digital solution (digital innovation) creating value in novel ways, not least by way of self-reference, wherein the digital solution is both means and outcome (Yoo et al., 2010).

The model identifies the following key themes of the digital innovation research (Hund et al., 2021):

- **Redefinition of the boundaries** – Digital innovation leads to blurring of the boundaries that delimit products, roles, organizations, and industries. Application of similar digital innovations across industry boundaries leads to industrial convergence.
- **Digital systems** – New boundaries shift the emphasis toward digital platforms, ecosystems, and infrastructure.
- **Digital innovation strategy** – Digital systems require new approaches to strategy, ones that suit a digital context.
- **Organizational determinants** – Digital innovation strategies foster building digital capabilities, organization forms, and digital identity and culture that afford further digital innovation.
- **Arising tensions** – Mutually contradictory concerns draw attention to the need for an organizing logic specific to digital capabilities (as opposed to product-related ones) or manifest the paradoxical requirement of maintaining stability and flexibility at the same time.

Figure 2, based on analyses by the Hund team, outlines these themes and their interconnection.

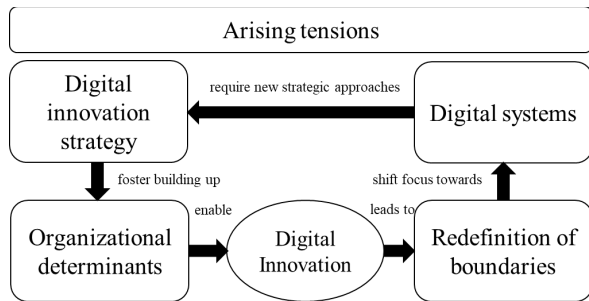


Figure 2. Framework and relations among current themes in digital innovation research (per Hund et al., 2021).

3. Methods

For a single-case study motivated by a desire for high-quality results that enable deeper understanding of the subject (Gustafsson, 2017), we applied a grounded-theory research method (Birks & Mills, 2015; Charmaz, 2006; Glaser & Strauss, 1967) in both collection and analysis of the data. The work was guided also by practices for case-study research in information-systems science (Darke et al., 1998).

Our primary data came from semi-structured personal interviews (8 interviews, lasting 8 h in total) with the chairperson of the board of directors and the members of the executive-management team, who held the following positions: chief executive officer (two interviews), chief financial officer, director of the Digital Services and IT division, director of research and development, director of HR, and service director. The body of data from the interviews was complemented by both internal documentation and publicly available information of the company.

The main database for the coding consisted of 178 quotes from the interviews. Further material supplied by Ponsse consisted of internal accounting figures, statistics for digital solutions' success from the customer standpoint, and documentation of the company-culture program. We gathered data from the company's annual reports and analysts' reports too.

In coding the data, we proceeded from initial codes to focused codes and, finally, theoretical level, with six consolidated concepts that tie in with the changes the executive managers made to overcome challenges amid the company's transformation. For a comprehensive picture of the case, we then mapped all the theoretical codes against the Hund framework and assessed the links that connect digital innovation theory (in thematic terms and generally) with the changes to company practice that fostered Ponsse's transition from product manufacturer to service

provider. Next, we present the results of our analysis with reference to the theoretical framework.

4. Findings

4.1. The coding system and structure

Presenting the results of the coding process, Figure 3 lays out the theoretical codes and concepts that capture the main changes that executive management of the company made to improve the case company's ability to become a provider of digital services to customers. This portion of the paper delves into these changes considering the Hund team's work and connects them to the research themes presented above (as expressed in Figure 2). Before that, however, we must establish a common foundation, by probing what digital innovation is and analyzing the alignment of Ponsse's digital solutions with the most fitting definition.

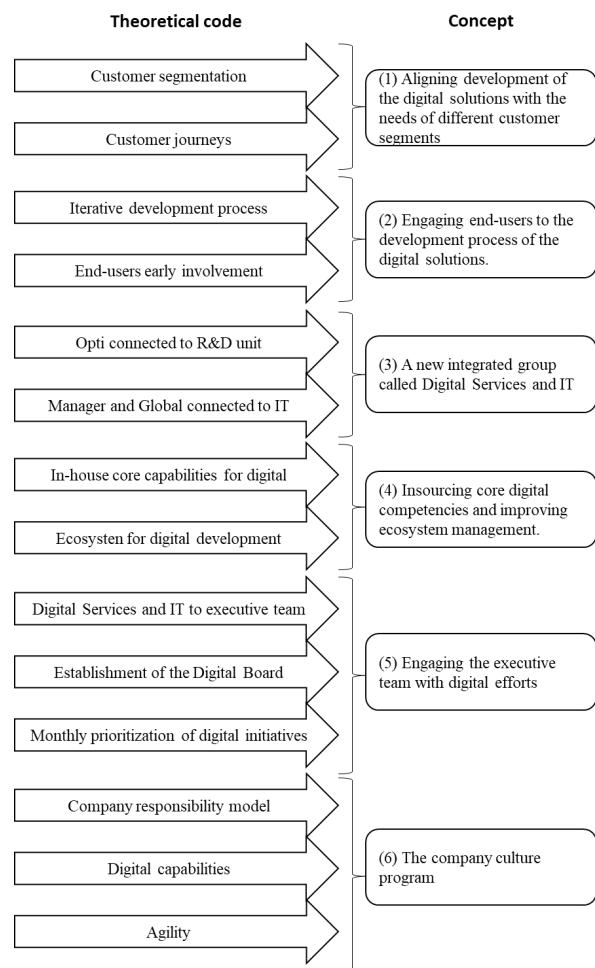


Figure 3. Theoretical codes and concepts.

4.2. Digital innovation

In the three-layer model whereby Hund et al. defined digital innovation, the **digital object** in Ponsse’s case can be characterized as the data gathered from the harvester, which, by presenting details coded as “bitstrings,” lays the foundation for digital objects (Faulkner & Runde, 2019). **Digital technology**, in turn, is use of that object for a particular user-determined purpose (Hund et al., 2021; Yoo et al., 2010). In Ponsse’s case, the technology had two prongs, which we identified as controlling a harvester and managing a fleet of harvesters. Finally, **digital innovation**, “value-adding novelty” by means of digital technology, manifested itself in the digital solutions Opti, for harvester control; Manager, for managing a fleet of the machines from the harvesting companies’ perspective; and Global, to manage servicing and maintenance for a fleet of harvesters. Figure 4 presents the three layers in the Ponsse case.

Ponsse executives learned the importance of the data – bitstrings as the digital object – early on their digital journey, when they were starting to develop the Opti solution. *“As the control system went digital and we had the measurement devices and the sensors to provide the data, the entire investment case for the machine started to change”* (President and CEO).

They also understood that this digital object – data from harvesters – was the foundation of their digital technology. Digital technology is a purpose determined by the users for utilizing the data (Hund et al., 2021). In Ponsse’s case, the purpose was defined thus by the director of Digital Services and IT: *“Basically, customers are looking at the cost per cubic meter to get wood from the forest to the mill. That’s what they are optimizing.”*

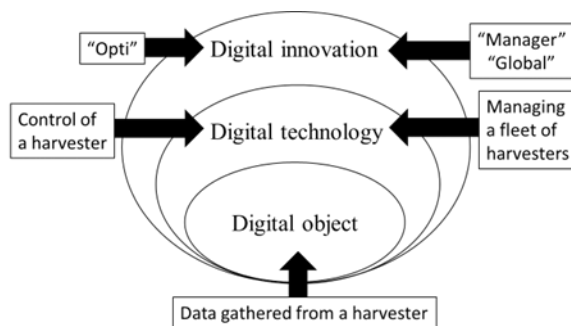


Figure 4. Ponsse digital solutions in the conceptual framing of Hund and colleagues

Digital innovation manifested itself in the Opti solutions, aligned with harvester operators’ purposes, and later Manager and Global, for the new customer categories and end users. The main definition-related

lesson for the executives was bound up with purpose: they did not truly understand customer perceptions of the value that these solutions provide. We address the reasons for this mismatch next, with reference to the theory.

4.3. Redefinition of boundaries

The case study illustrates digital innovation that led to redefinition of boundaries. Ponsse began this process with Opti: convergence of physical and digital material precipitated device convergence (Tilson et al., 2010) and, further, user-experience convergence (Yoo et al., 2012), whereby a harvester operator gained fuller ability to control the machine and obtain data on harvesting productivity, plan logistics, and communicate with the forestry company. This redefinition of boundaries was manageable for Ponsse executives in the early years since the customers were a uniform set of well-understood harvester operators buying a physical product – a machine with a control mechanism.

While Ponsse extended its digital innovation from Opti to Manager and Global, the expanded customer base, with its new customer groups, brought new criteria for assessing the “value-adding novelty” of these digital solutions – criteria unknown to the company. The new digital solutions came up against blurring boundaries in that the data could facilitate handling new use cases for new kinds of customers and end users (Yoo et al., 2010). This was both a challenge and an opportunity. By specifying three solutions, Ponsse came to terms with differences between customer groups and the variety among end users, thus directly addressing the diverse criteria for “value-adding novelty.” This was a vital step in the learning process for the company’s executive managers on their transformation journey: digital innovation must enable novel value creation (Nambisan et al., 2017) from the user standpoint. The director of technology and R&D elaborated in the following words: *“The machines are quite similar, independent of customer, and irrespective of whether the customer is a local father and son or a big industrial customer. But, when it comes to digital solutions, the customer needs differ so much – especially when you compare the local father who has a couple of machines with the big industrial customer that has its own ERP systems and huge operations.”*

Acting, the Ponsse executive-management team (**Change 1**) aligned development of the digital solutions with the needs of different customer segments. The first action was to identify four distinct market segments to guide digital development.

Ponsse’s approach to segmentation is outlined in Figure 5.

CUSTOMER SEGMENT	END USER(S)	FUNCTION	DIGITAL SOLUTION
Entrepreneurs	Harvester operator (1–3 machines)	Operate a machine	Opti
Fleet Loggers	Harvester company owner (4 or more machines)	Manage a fleet of machines	Manager
Forest Companies	Forest company management	Manage all logistics of harvesting	Manager
Ponsse Dealers	Dealer employees	Maintain machines	Global

Figure 5. Ponsse’s revised customer segmentation.

The segmentation exercise clarified whose needs the company was addressing with its digital solutions and whose had been neglected. Once they had categorized the customers and specified which needs to target, the executives worked together to collect customer-related insight. Together, the refined segmentation and enhanced understanding of segments’ varying needs informed a new foundation for building digital solutions – from the customer’s perspective. Insight into customer journeys sharpened the focus on customer-centricity further. Thirdly, that insight was shared openly in a database available company-wide, whereas previously only the R&D division had been granted access to data on customer needs, for product-development purposes. Supporting a common understanding of customer needs across all levels and divisions of the organization, a one-stop source for customer-related information significantly facilitated the processes behind gathering, managing, and sharing data.

Building from here, the company **(2) engaged end-users into the development process for the digital solutions**. Ponsse executives took two steps to deepen their understanding of customers as they developed digital solutions for the fleet-based logging, forestry-company, and dealer markets: 1) co-creating digital solutions by engaging with end users early and often as the development process progressed and 2) taking an iterative approach to developing new digital solutions. The iteration, which incorporated customer feedback after several quick test-and-learn loops, expedited development, as did focusing intently on customer needs via engagement.

4.4. Digital systems

Digital systems comprise of digital platforms, ecosystems, and infrastructure (Hund et al., 2021). In the Ponsse case, redefinition of boundaries, the revised segmentation, and the new customer-interaction model shifted the executives’ focus on the organizational structure and management of the ecosystem. First to undergo change was the

organizational structure (see the discussion of infrastructural change by Tilson et al., 2010, p. 748). Before 2020, the Ponsse R&D division was responsible for developing both the Opti and the Manager digital solutions, while the IT group was responsible for Global. When the executives realized that the needs of the entrepreneur segment – harvester operators – did not correspond to the needs of the company’s other target market segments, they recognized also that the R&D team understood only the needs of the former category. Therefore, that year brought a decision to make the R&D group responsible solely for development of machines’ onboard digitalization. While that group was assigned accountability for the Opti solution, the executives designated **(3) a new group called Digital Services and IT**, responsible for the two solutions aimed at other customer categories. This action in combination with change 2 was consistent with digital innovation’s nature as a dynamic problem-solving process (von Hippel & von Krogh, 2016) of the sort that rarely applies traditional processes and means of product development (Ciriello et al., 2018).

Another component of shifting focus toward digital systems was creation of an ecosystem around the development of digital solutions. Building an ecosystem is essential for digital innovativeness (Selander et al., 2013). To design and build forest machines, Ponsse relied on in-house experts. In contrast, for designing, building, operating, and supporting its digital solutions, the company made use of a network of external service providers – a “partner ecosystem.” The executives learned an important lesson upon recognizing that the ecosystem had grown expensive and complex to manage, mainly because they lacked the required ecosystem-management competencies. As the CFO noted, *“We realized that our competencies for managing partners were not developing as quickly as the partnering was growing.”*

Executives made concerted efforts to **(4) insource core digital competencies and improve ecosystem management**. They ascertained that the company needed a significantly larger team of in-house workers to design, build, run, and support the digital solutions. The executives began hiring people who possessed technical expertise in developing digital solutions, in an iterative, rapid, and cross-function manner. They also decided to reduce the number of subcontractors and external service providers used by Digital Services and IT: *“Our strategy is to have the core capabilities in our own hands while simultaneously networking and building our ecosystem”* (President and CEO).

4.5. Digital innovation strategy

Ponsse's transformation directed investments more to digital services, in contrast against traditional manufacturer-style allocations for product development and production lines, as Figure 6 attests.

While they were aware of this shift's strategic importance, the executive managers had not been involved in the investments related to digital solutions. However, high-level managers' engagement and knowledge of new digital technologies is essential to a digital business strategy's success (Lucas Jr & Goh, 2009). Ponsse executives decided to **(5) engage the executive team with digital efforts**. The team decided to become more involved and to track the deliverables of digital initiatives, for fuller understanding of the business value of each initiative. Thus, with change 5, the management 1) appointed the head of Digital Services and IT to the top-management team; 2) established the Ponsse Digital Product Council (also referred to as the Digital Board) to expand the opportunities for representatives of separate functions to engage with each other and, in the process, learn more from the efforts led by Digital Services and IT; and 3) established monthly priority-setting for digital investments, a process led by the management team and supported by all business units' input.

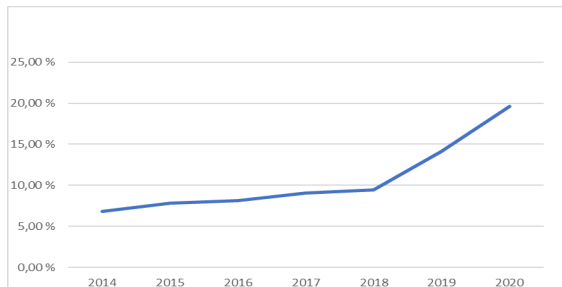


Figure 6. Digital investments relative to all investment.

4.6. Organizational determinants

The final area that executives changed in the company was the culture and approach to digital capabilities. They already made changes to organization, decision making structures and their customer approach. They also realized that to stay competitive in the digital environment they must reorganize and restructure their co-operation with the ecosystem (Svahn, Mathiassen, Lindgren, et al., 2017). To address cultural aspect Ponsse executive team introduced **(6) the company culture program**

called One Ponsse program. Its first stage entailed training all supervisors in a set of principles and practices designed to create a uniform operation culture.

A vital part of this overarching effort was the "responsibility model" developed. These outlined expectations related to three sorts of employee responsibility: social, environmental, and financial. The team made regular updates to program content – from symbolic components (values, principles, etc.) to practical toolkits, such as the One Ponsse booklet as a living document (Asatiani et al., 2021) – to keep operations consistent with acting as a "small and agile company." A digitality-supporting company identity and culture with shared values is critical for improving customer-oriented digital solutions' development (Lokuge et al., 2019).

Recognizing digital-domain capabilities' crucial role for the organization, the executive managers accumulated them by integrating agile work methods (Chan et al., 2019) and cross-function teams into the development work (Lyytinen et al., 2016). The teams crafting digital solutions relied on cross-function application of core Agile tenets. As the director of the combined Digital Services and IT unit explained, *"The guiding idea there has been that we would need cross-function, cross-competency teams. Competence is needed in many areas, and we have seen that individual teams or persons cannot do things on their own in this complex environment; they need support from others."*

4.7 Arising tensions

As fundamental change rippled throughout Ponsse, executives encountered competing concern in what was best from the angle of the concrete product (harvesters) vs. that of digital innovation. Finding balance between traditional product-oriented innovation and digital innovation was crucial (Svahn, Mathiassen, & Lindgren, 2017). The guiding principle for tackling this challenge was articulated in the (6) One Ponsse program: *"Excellent customer experience and seamless organization-wide work, good leadership, go hand in hand."* A key element of One Ponsse was that leaders designed it for reaching the objectives by helping employees operate effectively across the organization's silos, thereby advancing work on both products and digital solutions.

The other competing concern arose in relation to two distinct types of development processes. While the R&D group's solidly arranged product development and the involvement of several executive-team members with relevant decision-making bodies constituted solid foundations, a key question remained: what is the most efficient way to

develop and expand digital solutions? The executive team wanted to learn more about the tradeoffs inherent to these solutions' development. Would it be more important to get a viable product that meets the basic criteria into end users' hands as soon as possible, for gauging its value, or to take time to develop a more feature-rich prototype that is able to scale quickly but might not be deemed sufficiently relevant? Aware that a product-oriented development process with traditional stage gates was ill suited to digital-solution development, the executive team sought balance. Thus, (5) executives' involvement in the digitally related development supported the company's efforts to manage processes for both product development and digital services' fruitful cultivation.

5. Conclusions

The case company found itself in a situation typical of manufacturers of traditional products that face turbulence and disruption accompanying digital innovation. Hence, it provided an ideal setting for examining the value offering's product-to-digital-solution transformation, a *"fundamental change process, enabled by the innovative use of digital technologies accompanied by the strategic leverage of key resources and capabilities, aiming to radically improve an entity and redefine its value proposition for its stakeholders"* (Gong & Ribiere, 2021). Whereas most scholarly inquiry into these challenges is underpinned by Industry 4.0 framings or theory related to digital transformation, we explored Ponsse's rich setting through the lens of grounded theory to enrich scholarship from another angle. Considering the open question of what the executives learned from the challenges of digital innovation and what changes they made in response enabled us to connect our concepts (executive-team actions and changes) with definitions and themes articulated in digital innovation research rather than digital transformation theories.

The results make two valuable contributions to theory. Firstly, our work underscores the importance of the "value-adding novelty" aspect of digital innovation as defined by Hund et al. (2021) and highlights the importance of anchoring digital innovation efforts in the needs of end-users and the organization. Digital offerings add value if they help end users address a need and help the organization advance on one or more strategic objectives. All changes triggered by the executive managers' decisions stemmed from a focus on the customer value of the digital solutions, yet the analyses by Hund et al. do not reflect a research theme akin to "value for customers." Therefore, we recommend incorporating customer value into the theoretical framework for examining digital

innovation. This should assist in filling a research gap identified in several papers, such as publications highlighting digital services' value for customer (Rantala et al., 2019) and a literature review stressing the importance of research into customer value in digital services (Zeithaml et al., 2020). Such attention should usefully augment the picture yielded by studies of services' value for customers from the management perspective (Grönroos, 2017) and of customer-value creation in digital services (Saunila et al., 2017). We recognize that there is research on customer value to business model (Chesbrough, 2010), digital services (Osterwalder et al., 2015), and digital transformation (Ho & Hsu, 2022; Mayer, 2019). However, digital innovation specific research is not covering customer value according to the Hund's findings.

While our study probed customer value mainly in relation to the theme of redefining boundaries, scholars of customer value in digital-innovation settings could flesh out understanding in connection with every theme in Hund's model. We suggest that much can be gained from granting the theme of customer value a central position in the digital innovation research framework, with connections to all the other themes. Figure 7 presents a model revised accordingly.

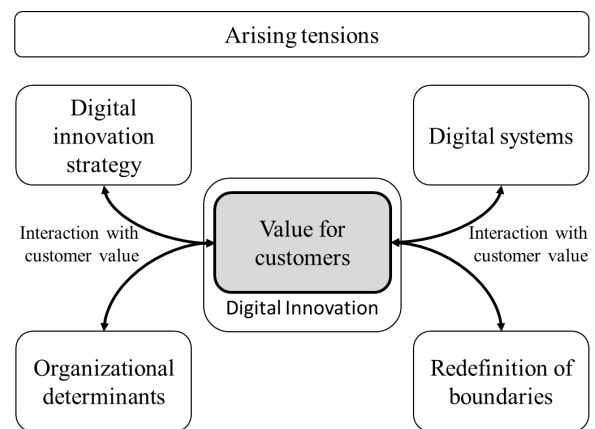


Figure 7. The framework for digital innovation research enriched regarding customer value.

The second theoretical contribution is to digital transformation scholarship. By connecting the actions by the executive-management team (concepts from grounded-theory analysis) to the various themes of digital innovation research and identifying associated elements that guide the transformation as articulated in Figure 8, we demonstrated the utility of digital innovation research's thematic framework for understanding and managing digital transformation.

Innovative application of technologies forms the heart of recent, emerging definitions of digital

transformation (Gong & Ribiere, 2021) and digital innovation (Hund et al., 2021). Drawing attention to the importance of digital technologies for both these areas of research, this foundation offers researchers a starting point for delving further into what digital innovation theory can offer for digital transformation.

Finally, our study opens practical avenues for guiding executives in digital transformation and innovation. Our findings pinpoint digital-innovation-specific actions that supported the efforts of the case company's executive team to improve the digital value offering via 1) better understanding of customer needs, 2) an organization oriented toward digital innovation and making good use of the ecosystem, 3) executive managers' engagement in the digitality endeavor, and 4) a unified culture that prioritizes digital-domain capabilities.

<p>Redefinition of boundaries Convergence Blurring Boundaries</p>	<p>(1) Aligning development of the digital solutions with the needs of different customer segments (2) Engaging end-users into the development process for the digital solutions.</p>
<p>Digital systems Infrastructures Ecosystems</p>	<p>(3) A new integrated group called Digital Services and IT (4) Insourcing core digital competencies and improving ecosystem management.</p>
<p>Digital innovation strategy Digital business strategy</p>	<p>(5) Engaging the executive team with digital efforts</p>
<p>Organizational determinants Culture and identity Digital capabilities</p>	<p>(6) The company culture program</p>
<p>Arising tensions Competing concerns</p>	<p>(5) Engaging the executive team with digital efforts (6) The company culture program</p>

Figure 8. The executive-team actions to manage Ponsse's transformation, situated in terms of digital innovation theory.

Our study was limited by its scope: covering a large topic space, we had to confine ourselves to brief and general analyses of each research theme regarding the case company. Further studies could deepen understanding of how work on each theme of digital innovation research could inform guidance in managing a manufacturing company's journey to becoming a digital service provider. This paper nonetheless provides an overview of what managers – and, hence, scholars – can learn during the transformation process and about the changes made.

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