

RECONFIGURING ASSETS FOR DIGITAL SERVICITIZATION: INTERPLAY AND CAPABILITY ENHANCING PRACTICES

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ABSTRACT

This paper investigates how manufacturing companies reconfigure their assets in their digital servitization journey (transition from selling products to selling product-service-software offerings). By studying five leading manufacturers for a longer time-period (2010-2018), we found that depending on their previous role of being whether system sellers or system integrators, their capability development practices differed: system sellers used practices emphasizing control (e.g., insourcing, acquisitions) whereas system integrators stressed practices that enabled flexibility (e.g., outsourcing, alliances). Based on these findings, manufacturers should establish their vision as provider of smart, connected solutions, and develop associated capabilities and practices that support this vision achievement.

INTRODUCTION

Manufacturing companies have started to develop and sell product-service-software offerings to their industrial clients in order to strategically differentiate from their competitors by locking them out and gain financial benefits by locking-in their customers (Luoto *et al.*, 2017). This transition requires new capabilities (Ulaga and Reinartz, 2011), practices (Kohtamäki *et al.*, 2021) and routines (Huikkola *et al.*, 2021) from manufacturers because digitalization megatrend shapes their competitive landscape (Porter & Heppelmann, 2014), business models (Sjodin *et al.*, 2020), and clock speeds (Immelt, 2017). Traditional manufacturers such as GE, Caterpillar, and KONE have made their solutions connected to other systems through contemporary technologies such as Internet of Things (IoT) and Artificial Intelligence (AI). This connectivity has fundamentally changed their internal capabilities as solutions do not operate in a vacuum anymore (Hasselblatt *et al.*, 2018). Manufacturers thus need to understand better not only how hardware, services and software converge but how to make more out of their clients' businesses (Keränen *et al.*, 2021). Internally, manufacturers need to develop capabilities and routines that enable their synergetic development in a faster manner (Huikkola *et al.*, 2021) and externally, manufacturers need to become their clients' strategic partners (Korkeamäki *et al.*, 2020) and develop new alliances (Bustinza *et al.*, 2021; Immelt, 2017) when providing them. However, little is known how manufacturers exercise their dynamic capabilities and what types of practices they employ when becoming "smart" manufacturers providing highly connected solution offerings.

This study aims to fulfil this gap by addressing to the following research question: "How different types of manufacturers shape and renew their organizational capabilities and practices when starting to provide product-service-software offerings?" By investigating altogether five manufacturers over a longer time-period (2010-2018) and interviewing 67 senior managers, this study contributes to the digital servitization literature by shedding light on how different types of manufacturers (system sellers/system integrators) reconfigure their capabilities when starting to provide new, smart connected offerings to their clients. The contributions of this study are two-fold: depending on their solution provider type (system seller vs. system integrator), our study sheds light on that 1) manufacturers emphasize different reconfiguring modes non-sequentially and 2) they employ different capability enhancing practices stemming from their path-dependency.

THEORETICAL BACKGROUND

Digital servitization through smart connected offerings

Digital servitization is part of servitization research stream, which studies firm's strategic transition from selling pure products to selling services (Vandermerwe and Rada 1988). Digital servitization emphasizes the role of digital tools and technologies such as IoT and AI (Langley *et al.*, 2021) in this shift from product-focused mindset towards service-based mindset (Töytäri *et al.*, 2018). In practice, this strategic transition means that firms start to develop, sell, and deliver new types of smart solutions that enable connectivity to other systems (Porter and Heppelmann, 2014). For suppliers, these new connected solution offerings provide opportunities for strategic differentiation and enable them to gain financial benefits through increased customer lock-in (Korkeamäki *et al.*, 2021). For customers, these new types of smart solution offerings help to decrease their transaction and total costs (Huikkola *et al.*, 2020; Reinartz and Ulaga 2008). Provision of these smart, connected solutions requires development of different capabilities across the boundaries (Bigdeli *et al.*, 2021; Huikkola *et al.*, 2021; Salonen and Jaakkola, 2015).

(Dynamic) capabilities in digital servitization

Capability theory is a dominant lens among servitization scholars to study how firms servitize (Raddats *et al.*, 2019). The extant servitization studies have found that different capabilities are required not only among focal companies (Ulaga and Reinartz, 2011) but also across the boundaries (Coreynen *et al.*, 2017) and dyadic relationships (Töytäri *et al.*, 2018). Among focal companies, studies have identified the need to develop capabilities and routines to sell value (Schaarschmidt *et al.*, 2021; Keränen *et al.*, 2021; Töytäri *et al.*, 2018), engage in collaborations with other knowledge-intensive business service (KIBS) firms (Bustinza *et al.*, 2021; Huikkola and Kohtamäki 2017) and develop solution development processes that synchronize products, services and software parallel development (Hsuan *et al.*, 2021; Huikkola *et al.*, 2021). Previous servitization studies (e.g., Coreynen *et al.*, 2021; Huikkola *et al.*, 2016; Kindström *et al.*, 2013) have utilized dynamic capability approach to understand how manufacturers recreate and renew their capabilities when they servitize.

METHODOLOGY AND DATA

Comparative case study method of five manufacturers was employed (Eisenhardt 2021) to study how manufacturers reconfigured their assets to become smart system providers. Comparative case study is a suitable method when studying different patterns across different types of firms (Brax and Jonsson 2009; Salonen and Jaakkola 2015). The selected manufacturers operated in different industrial sectors and they manufactured and serviced different types of industrial equipment mainly in B2B markets. Three of the selected manufacturers were vertically integrated system sellers and two of the chosen manufacturers were vertically disintegrated system integrators (Davies *et al.*, 2007). Service sales ranged from 37 per cent to 50 per cent of their total revenues, which is in line with existing quantitative servitization studies matching to a threshold value (20-30 per cent of the revenues) identified to create shareholder value (Fang *et al.*, 2008). The studied manufacturers were purposefully selected (Eisenhardt 2021) because all of them are a) technological forerunners in their industries, b) they have invested heavily in smart solution development for a longer time-period and c) we had good access to these companies because of our geographic location and research collaboration initiatives. All of the selected companies were public listed, thus allowing researchers to obtain extensive secondary data in addition to primary interview data of 67 senior managers. The study is longitudinal as we were able to study manufacturers in-depth over a longer time-period, from 2010 to 2018. This time period is interesting as the digitalization started to affect manufacturers competitive landscape and business strategies remarkably. Longitudinal studies are encouraged in studies focusing on dynamic capabilities (Danneels 2011) as they enable researchers to go beyond the current situation and avoid typical problems related to use of cross-sectional data. Table 1 shows the sample used for the research purposes.

Table 1: Sample description

	Case A	Case B	Case C	Case D	Case E
Revenue (€)	3000M€	5000M€	3300M€	9000M€	1300M€
Service share of revenues (%)	38%	50%	37%	47%	39%
Industry	Heavy industry	Energy	Paper & Pulp	Construction and real-estate	Mining
Firm type	System seller	System seller	System seller	System integrator	System integrator

Interview data (number of interviewees)	13	16	15	7	16
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We followed an abductive reasoning process in our analyses (Dubois and Gadde 2002). We first analyzed cases separately and followed a within-case analysis (Huberman and Miles 1994) by constructing the data into five individual case stories to understand which resource reconfiguring modes and practices manufacturers employed in order to become providers of smart, connected solutions. After obtaining an in-depth understanding of each case, we undertook a cross-case analysis to identify differences and patterns across the cases (Eisenhardt 2021) and utilized tables and charts to code and structure emerging themes found in the data.

FINDINGS

Creation of new assets

Mode of creating new capabilities refers to a process how established firms acquire or train new capabilities and competencies in-house (Danneels 2011). In practice, this mode accords with manufacturer's capability to hire new employees and managers (e.g., those with software competencies such as data analytics or coders) or train their existing employees and managers to cope with digitalization initiatives. Both system sellers and system integrators followed similar logic here as both types of solution providers highlighted the need to recruit competent managers to effectively manage and coordinate digitalization initiatives. However, vertically integrated system sellers insourced much of this software work whereas system integrators outsourced majority of this "hands-on" coding and digital development.

In executive board level issues, both types of companies established whether Chief Digital Officer (CDO) or Chief Information Officer (CIO) positions to legitimize the role of software within the company. To illustrate how the strategic importance of digitalization has affected studied companies, in 2010, only one firm (Case A) of the sample had executive in their executive board responsible for IT development. By 2018, all but one (Case E) had a CIO/CDO as part of their executive boards. In a similar vein, in 2010, none of the studied firms had digitalization-related must-win-battles (MWB) to prioritize their digitalization initiatives whereas in 2018, all of the studied firms had IoT or digitalization as their core MWB. Structurally, Case B even established a separate digital development unit to facilitate software development and show the strategic urgency to both internal and external stakeholders.

Leveraging existing assets

Leveraging existing capabilities accords with firm's ability to make use of their assets to several purposes (Prahalad and Hamel 1990). For instance, manufacturers can leverage their intellectual assets (e.g., brand, databases of clients), human assets (e.g., technicians competencies) and external assets (e.g., supplier network, distribution channels) to several solution offerings. Major reasons for leveraging manufacturers existing capabilities were related to an increased share of customer wallets, customer profitability and increased clock speed. Key barriers to leveraging their extant capabilities were related to the balancing between "strategic fit" and "strategic stretch." Hence, firms face a dilemma how much to invest in explorative and exploitative activities as falling into "exploration trap" means that firm is spending too much on activities outside their core business. "Exploitation trap", however, refers to a situation where firm is overinvesting in its current business development, forgetting the need to change (Sirén *et al.*, 2012). Typically, firms find themselves in balancing between exploitative and explorative activities.

In our sample, studied manufacturers were able to leverage their installed base of equipment by starting to sell retrofitting and modernization services to them. Moreover, the studied case firms were able to increase their customer's share of wallet by starting to provide more comprehensive solutions such as operations & maintenance (O&M) solutions to them. One driver behind this initiative was that they saw that spare part business service will face more severe competition in the future (e.g., through pirate spare parts and new technologies such as 3D printing). However, based on the findings, it seems that vertically integrated system sellers were the ones expanding to total services such as O&M solutions whereas vertically disintegrated system integrators focused on narrower product-service-software offerings. Hence, system sellers were

emphasizing client's decreased transaction costs by serving them under one roof and system integrators emphasized that client purchases dedicated solutions from the "best" provider.

Accessing external assets

This mode accords with firm's ability to "morphing" through external assets. There are basically two distinct approaches to access external resources, whether through 1) acquisitions (control benefits) or 2) alliances (flexibility benefits; see Danneels 2011). Sometimes there is a thin line between acquisitions and alliances (Dyer *et al.*, 2004). In our data, manufacturers employed both mergers and acquisitions (M&As) and strategic alliances. Especially vertically integrated system sellers employed M&As when getting access to core technologies such as IoT. On the other hand, vertically disintegrated system sellers, non-surprisingly, formulated strategic alliances for instance with global ICT-companies to complement their both assets in an optimal way.

Both archetypes of system providers started to collaborate with start-ups and research institutes such as universities in order to gain new ideas and facilitate ecosystem-level renewal. Those system sellers who started to provide total solutions to their clients also started to collaborate with peripheral companies such as banks, (pension) insurance companies, and other financial institutions/investors to provide these comprehensive agreements that many times included performance- or outcome-based contracts.

Releasing existing assets

This mode involves shedding or dropping capabilities for instance through divestments, business closures, and lay-offs (Moliterno and Wiersema 2007). Also routine-based issues are covered in this mode such as organizational unlearning (Tsang and Zahra 2008). The key drivers behind this mode are related to resource trade-offs: firms need to release their existing assets to develop, acquire and build new capabilities and to reduce operational and transaction costs. The key rigidities are related to fears of losing control, business cannibalization, identity change, and the difficulty of evaluating opportunity costs regarding the made trade-offs.

All of the studied firms released their assets along the way to develop new capabilities. Most typically, manufacturers dropped their manufacturing resources (e.g., production plants and personnel), streamlined their offerings (e.g., erased standard products), and compressed their supplier network in order to acquire digitalization-based assets (e.g., coders, data analytics, KIBS acquisitions). In our sample, system sellers released their existing assets to insource new capabilities and achieve better control. System integrators, on the other hand, released resources in order to manage better their external assets. Table 2 outlines the major differences on how resources are deployed between system sellers and integrators.

Table 2: Key reconfiguration modes and practices between different types of solution providers

	(Smart) system sellers	(Smart) system integrators
Creating new assets	Focus on hiring people to manage (internal) digital activities	Focus on hiring people to manage (external) digital activities
Leveraging existing assets	Leveraging assets to provide total solutions to their clients (focus on decreasing client's transaction costs)	Leveraging capabilities to provide "best" solutions to their clients (focus on being best choice for the client)
Accessing external assets	Emphasis on M&As	Emphasis on strategic alliances
Releasing existing assets	Releasing assets to get control to key future assets	Releasing assets to manage better and more effectively their external assets needed in new strategic domain

DISCUSSION AND CONCLUSIONS

Theoretical contributions

The contributions of this study are two-fold. Depending on their solution provider type (system seller vs. system integrator), our study sheds light on that 1) manufacturers emphasize different reconfiguring modes non-sequentially and 2) they employ different capability enhancing practices stemming from their path-dependency.

As a first contribution, our study contributes to the existing digital servitization literature (Gebauer *et al.*, 2020; Kohtamäki *et al.*, 2019; Paschou *et al.*, 2020; Sklyar *et al.*, 2019; Tronvoll *et al.*, 2020) by studying how manufacturers reconfigure their assets when moving from selling products to selling product-service-software systems. This study advances our understanding of how manufacturers exercise their dynamic capabilities by providing longitudinal data on reconfiguring modes and associated practices, thus extending the knowledge of dynamic capabilities in the context of servitization (Coreynen *et al.*, 2017; Huikkola *et al.*, 2016; Kindström *et al.*, 2013). Our data show that unlike firms in high-technology industries (e.g., Ott and Eisenhardt, 2020), manufacturers in more stable industries develop their assets non-sequentially. Thus, even though manufacturers are increasingly facing pressures that digitalization inevitably causes, they should not follow “stepping stone” approach of capability development but focus on developing assets in parallel. Even though analogical thinking may be beneficial when done carefully, our results suggest that manufacturers should not frame their resource development activities with firms operating in high-technology and consumer industries where development cycles are much faster. Instead, as the customer preferences and decision-making styles are different in manufacturing context, they should follow more conventional and slower approach to asset development.

As a second contribution, our study extends the discussion of different types of smart solution providers (Davies *et al.*, 2007) by identifying distinct practices that different types of manufacturers (smart system sellers / smart system integrators) employ when they start to provide smart, connected solutions to their industrial clients. Vertically integrated (smart) system sellers create new capabilities to manage their internal digital activities more effectively whereas (smart) system integrators create new capabilities to manage more effectively their digital development activities that take place outside the company. When leveraging their existing assets, (smart) system sellers start to provide total solutions to their clients, highlighting the benefits related to client’s decreased transaction-costs. Respectively, (smart) system integrators focus on more narrowed scope of offerings, highlighting that clients buy from the “best” provider instead of buying from one provider. When accessing external resources, (smart) system sellers highlight M&As when gaining access to core technologies whereas (smart) system integrators highlight the establishment of strategic alliances. Lastly, when releasing existing (manufacturing) resources, (smart) system sellers highlighted the need to develop assets that enable proprietary solution development and (smart) system integrators stressed the benefits of flexibility through external asset development.

Managerial contributions

For practitioners, our study reveals that they need to establish their long-term smart solution visions and identify the new capability configurations to achieve that vision. Firstly, managers must ask themselves what resources they need to create internally and externally to achieve this vision. Secondly, manufacturers need to define the boundaries of resource leverage: what level of “strategic stretch” is purposeful and what is the “strategic fit” of the diversification initiatives. Thirdly, managers need to define partners for collaboration, why they choose these partners and what is the goal of this collaboration and why. Fourthly, managers need to consider resource trade-offs and which resources need to be released to pursue their strategic change towards smart, connected solutions. Lastly, managers should consider the interplay between reconfiguring modes and whether these modes should be managed simultaneously or sequentially. Based on our initial findings, we suggest that non-sequential capability development may be more useful in non-high-velocity business contexts and benchmarks from high-technology contexts may not be directly applied among manufacturers despite the fact that digitalization is shaping their external environment and internal activities remarkably.

Limitations and future research

This empirical study is not without its limitations. The results were derived from leading industrial companies in their sectors, and although far-reaching generalizations cannot be made given the qualitative nature of this study, the present work provides valuable insight into how firms reconfigure their capabilities and what practices they follow when trying to become different types of companies. The studied firms were relatively large companies, and they had prior competencies and experience with software and IT development. It would be beneficial to study SMEs and how they alter their assets when starting to provide smart solutions to their clients. We welcome researchers to study the microfoundations of dynamic capabilities in digital servitization context. In particular, it would be valuable to understand both (managerial) cognitions and practices related to digital development among different sizes of manufacturing companies when they pursue digital servitization strategies both successfully and non-successfully.

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