

## To Plan or not to Plan? Exploring Entrepreneurial Logics in Digital Servitization

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### Abstract

*Digital servitization is of increasing concern for manufacturers to exploit the potentials of digitalization with new service offerings. In this context, substantial changes within a firm's capabilities, processes and mindset of employees need to be considered. To better understand such changes, we carve out behavioral logics of manufacturers undergoing digital servitization. An alternate template research design is used to discover the entrepreneurial logics of effectuation, causation, and bricolage. For this purpose, we conducted 13 semi-structured interviews with experts from the German manufacturing industry. Our results show that firms approaching digital servitization via hybrid decision logics. Causation can be found within all organizations. Effectuation is integrated to various degrees. Against it, the bricolage-logic is barely present. In total, the results provide new insights for digital servitization and for organizational ambidexterity.*

**Keywords:** Digital Servitization, Causation, Effectuation, Bricolage, Decision Logics

### 1. Introduction

Digitalization is fueling the transformation of manufacturing towards a business of holistic and customer-oriented solutions (Coreynen et al., 2017). Firms are increasingly attempting to exploit opportunities in the form of new business models and smart service offerings (Schallmo et al., 2017). In this course they are shifting from a product-oriented logic to a service logic (Baines et al., 2020; Kohtamäki, Einola, et al., 2020; Weking et al., 2020). These developments can be summarized under the term digital servitization (Kohtamäki et al., 2019). Manufacturing firms' competitive advantage is mostly rooted in a product-dominant view on markets. Experience and market

knowledge is often gained over decades. Thus, planning-driven and efficiency-oriented organizational structures and mindsets prevail. But the adoption of new digitally enabled and service-oriented business models means to "navigate uncharted waters" which affects organizations outside and in (Zaki, 2019). As manufacturing firms are getting involved in both digital and service innovation at the same time, they are increasingly confronted with high environmental uncertainty (Kohtamäki et al., 2019; Poepplbuss et al., 2021).

As digital servitization is still a new phenomenon, we still know little about the underlying rational and behavioral responses within the transformation. Researchers postulate entrepreneurial orientation and their decision logics (Ciampi et al., 2021), i.e., effectuation as appropriate to navigate in such uncertain environments (Sarasvathy, 2001; Yang & Gabrielsson, 2017).

This brought up the question of whether manufacturing companies decide to leave traditional product-focused and planning-driven mindsets behind and adopt a more agile and entrepreneurial logic to approach digital servitization. Therefore, we propose the following research question: *How do manufacturing firms behave during digital servitization from the perspective of entrepreneurial logics?*

In the next section we will introduce key concepts for the paper (i.e., digital servitization and entrepreneurial logics). In section 3 we will describe our research design which is followed by the results from 13 interviews with experts from manufacturing firms undergoing digital servitization. Found behavioral logics (causation, effectuation, bricolage) and their appearance are presented in section 4 and findings as well as research opportunities are discussed in section 5. The paper ends with a short conclusion.

## 2 Related Work

### 2.1 Digital Servitization

Servitization and digitalization are two transformational trends that are positively linked to the increase in business performance (Guo et al., 2017; Martinez, 2019; Martín-Peña et al., 2019). They can be dealt with and addressed separately but are gaining research interest as an integrated phenomenon (Parida et al., 2019; Paschou et al., 2020; Sklyar et al., 2019). Digitalization is reinforcing the transformation of companies from product providers to providers of customer-oriented product-service-software systems (Coreynen et al., 2017; Kohtamäki, Parida, et al., 2020). "[T]he transformation in processes, capabilities, and offerings within industrial firms and their associate ecosystems to progressively create, deliver, and capture increased service value arising from a broad range of enabling digital technologies" (Sjödin et al., 2020, p. 479) is coined digital servitization.

In this context companies need to manage transformational shifts such as an increased focus on customer value and changing business models (Klein et al., 2018; Tronvoll et al., 2020). Previous research has developed an understanding of why it is difficult for manufacturing firms to successfully undergo the described transition (Brunetti et al., 2020; Lütjen et al., 2017). Some findings point to paradoxes between exploratory innovation in solutions and product-oriented exploitative innovation, as well as between customer orientation and an existent engineering mindset (Kohtamäki, Einola, et al., 2020). Beyond that, barriers have been identified that stand in the way of digital servitization. These range from an "inadequate culture" to a "lack of strategy", "insufficient development processes" to the "inability to flexibly adapt to changing circumstances" (Klein et al., 2018, p. 850). Further practices from different domains (i.e., product, service, software) need to be integrated (Huikkola, Kohtamäki, et al., 2021). Hereby, various skills are required that often cannot be provided by one firm alone, leading to a necessity for multi-actor networks that need to work together for service innovation (Anke et al., 2020; Kamalaldin et al., 2021; Sklyar et al., 2019).

In brief, for manufacturing firms, digital servitization means leaving familiar paths and exploring unknown markets and opportunities (Baines et al., 2020). Because these companies often have a long history and are based on old structures, systems, and practices that have made them successful in the past, change is likely to be difficult (Zaki, 2019). It seems that companies have to reinvent themselves without giving up their previous identities (Huikkola, Einola, et al., 2021).

### 2.2 Behavioral Logics in Entrepreneurship

In such change processes entrepreneurial orientation might play an important role (Ciampi et al., 2021; Khan et al., 2020). Causation, effectuation, and bricolage are different logics that have been widely discussed in entrepreneurship research. While causation is mainly seen as a classical logic by being consistent with planning and looking forward approaches, effectuation has derived from the entrepreneurial context which is mainly coined by uncertainty (Sarasvathy, 2001). It is about "redrawing the problem space and reconstituting extant realities into new opportunities" (Dew et al., 2009, p. 289). Because organizational entrepreneurship is often characterized by a severe shortage of resources, Baker and Nelson (2005) brought a third logic into the discussion: bricolage. Bricolage is understood as making do with "whatever is at hand" (Baker & Nelson, 2005; Lévi-Strauss, 1966). Table 1 presents brief descriptions and key elements of the logics, as well as an illustrative example each. Research on such logics has its roots mainly in newly founded companies (Ghezzi, 2019; Sarasvathy, 2003). However, nowadays, these approaches are also becoming increasingly important in larger and long-established companies (Futterer et al., 2018; Henninger et al., 2020), especially when they find themselves in phases of uncertainty such as new product development (Ortega et al., 2017; Sitoh et al., 2014), new service development (Lassila, 2020), as well as in transformational and innovation processes in general (Cui et al., 2019; Szambelan et al., 2019). Since the effectuation logic was one of the first attempts to describe differences between entrepreneurial and managerial behaviors, it has gained much attention. Since, there are ongoing discussions, under which conditions which logic is more suitable and when to choose one approach over another (Dias et al., 2019). Early studies assume that the logics, in particular effectuation and causation, were mutually exclusive and have to be understood as incompatible (Brettel et al., 2012; Chandler et al., 2011).

Later studies rather argue that the logics, including bricolage, can and should coexist (Fisher, 2012). In literature, there is a distinction between three different possible combinations of the logics (An et al., 2020). First, the logics can emerge at the same time in one organization. Second, they can appear successively and coexist at the same time but in different departments of an organization. Third, one logic can dominate at different moments of time. The success and efficiency of such combinations are found to be dependent on contextual factors such as firm size, or the development stage of the firm (An et al., 2020).

**Table 1: Definition of the behavioral logics of causation, effectuation and bricolage**

	<b>Causation</b>	<b>Effectuation</b>	<b>Bricolage</b>
Definition	Resources and means are achieved to most effectively reach the goal.	It is looked at what can be achieved with the available resources and means.	Improvisation and tinkering to create something from nothing.
Key element	Goal orientation	Mean orientation	Reuse and improvise
Illustrative example	When you prepare a dish according to a recipe and buy all necessary ingredients needed. The process begins with the given idea for the dish and focuses on the most effective methods for preparation (Sarasvathy, 2001).	When you cook a dish according to the ingredients you have at hand. The process begins with given ingredients and focuses on the preparation of one of many possible meals (Sarasvathy, 2001).	When you want to design a table, and you do this by looking around your workshop and building it from existing wood at hand and you improvise table legs from metal poles and use leftover paint to color the table (Baker and Nelson, 2005).

### 3. Method

Investigating behavioral logics from entrepreneurship seems meaningful to describe practices and underlying innovation approaches within manufacturing firms that move forward on their path of digital servitization.

In order to explore how the entrepreneurial logics are deployed in the field of digital servitization, we chose a qualitative-empirical approach. We decided to conduct interviews and to follow a deductive alternate template approach for data analysis. This approach consists of five phases (1) selection of theoretical perspectives, (2) selection of context, (3) conducting interviews, (4) matching the data to the theoretical criteria, and (5) drawing conclusions (Fisher, 2012; Langley, 1999).

(1) As the theoretical perspective, we chose the three entrepreneurial logics causation, effectuation, and bricolage. (2) As digital servitization is the context of our study we choose experts from firms located in

Germany that are currently undergoing the transformation. We only include firms that at the time of the interviews were adding digital services to their portfolio and adapting their development accordingly. (3) We conducted semi-structured exploratory interviews. In order to receive reliable and high-quality information, we selected interviewees with positions in the management level or operative employees involved in the digital servitization process of their organization.

The interviews focused on the firms' approaches for new service development and project management but also on the effect that digital servitization has on their organizational structure. In addition, success factors, potentials, and challenges regarding digital servitization were asked for. We asked open questions to get as much information as possible. All 13 interviews (Table 2) were audio-recorded with a total duration of 717 minutes. The recordings were transcribed and anonymized. (4) We generated a coding template with initial codes. Our coding template bears a close resemblance to Fisher's (2012) template about entrepreneurship. Our deductive coding setup allowed us to work

**Table 2. Overview of conducted interviews.**

Company	Organization Description	Employees	Interview	Position	Duration
A	Gear	500-5.000	1	Head of Digital Solutions	0:48 h
B	Cavity pumps, pump systems	500-5.000	2	Product Manager Digital	0:59 h
C	Machines for pharma	500-5.000	3	Chief Innovation Architect	1:03 h
			4	Head of Digital Solutions	0:40 h
D	Mechatronics for automation	500-5.000	5	Project Manager	1:13 h
				Data Scientist	
E	Plant construction for packing	<500	6	Head of After Sales Service	1:03 h
F	Elevators, escalators	>15.000	7	Vice President Supply Chain	0:44 h
G	Forming technology	5.000-10.000	8	Managing Director	0:57 h
H	Electric drives and controls	>15.000	9	Businessowner Digital	0:58 h
I	Relays and connectors	>15.000	10	Head of Business Development	0:51 h
J	Pump systems	5.000-10.000	11	Head of Sales	0:40 h
K	Pumps and valves	>15.000	12	Head of Innovation	1:04 h
L	Supplier	>15.000	13	Head of Digital Services	0:57 h

systematically through each interview transcript and identify relevant sections and code them according to our template. The authors went through the transcripts individually and evaluated their results in a group discussion to find consensus on relevant sections and associated key characteristic behaviors. For coding the data, we used MAXQDA software. During our data analysis, we modified the template. Specifically, we were able to identify two additional key characteristic behaviors in the context of causation (“strategically changed organizational structure” and “procured external services or resources”) and one in the context of effectuation (“developed a prototype to test a solution”) which were not described in Fisher’s (2012) template about entrepreneurship but were present in our context of digital servitization. (5) Last, after we finished the process of coding, we subsumed the findings in a cross-case analysis by identifying used behavioral logics across the different interviews.

## 4. Findings

The findings from our data analysis provide insights into the behavioral logics which the different firms adapted during their digital servitization efforts. With the templates of key characteristics of the three behavioral logics causation, effectuation, and bricolage and our generated codes, we were able to create the overviews in Table 3 showing which companies adapted which characteristics.

### 4.1 Named principles indicating causation

Interviewees reported that they identified **long-run opportunities**. It was claimed for example: “[...] of course we see a lot of potential in the medium to long term” (Interview 1). Firms further **calculate the returns** during digital servitization. More precisely, this means that firms weigh up “[...] what does the corresponding pricing look like, how do I really bring it out to the customer” (Interview 9). Nine of the twelve companies wrote a **business plan** or a similar strategic concept before deciding to shift towards digital services: “In the early project phase, we have to write a business plan” (Interview 2). Further interviews mentioned that such a business case would be helpful. “[W]ishful thinking at this point on smart services that we have really defined an entire business case” (Interview 12).

Most of the participants confirmed that they defined a “[...] steering structure in some way to make sure that it [the transformation] works.” (Interview 7). We derived from such statements that some sort of control process was implemented and organized. Companies seem to need **control processes** “[...] you

first need clear accountability and you also need clear economic accountability [...]” (Interview 13). This can be realized through specific roles such as a project manager (Interview 2) or through establishing internal or external steering committees such as boards and investors: “And you still have to sell this to your investors.” (Interview 1) and “For this we have the digitalization control board” (Interview 12).

Firms **observed their market environment**. In order to do so they interviewed potential customers beforehand or “[...] define the target group, and then [...] go to the customers [...]” (Interview 4). Also, Interviewees of five companies acknowledged that, Interviewee 1 said “[...] we are certainly no different from other machine manufacturers who also don’t have a lot of experience in that field.” Interviewee 4 made a similar remark “[...] I know from other machine producing companies that they have a target of 30 % of their sales coming from such models, I definitely think that this is realistic, but that it will take us some time to reach this” (Interview 4). The statements show that the firms actively and specifically **observed how their competitors act** in order to use the information as an input for their own actions.

Regarding the purpose of digital servitization in all but one firm (company E) it was common to **express a clear vision** at an early stage. In articulating the vision, they tried to predict a certain outcome that their efforts should have in the future. Interviewee 7 referred directly to the fact that a clear vision was expressed saying that “[...] we developed a target state and said, what should [this state] look like that we are aiming at?” (Interview 7).

Ten companies from our set of interviews developed a **project plan**. This implies that not only a plan was made but service and market developments were monitored in relation to it. Even if project plans were defined in a flexible way, it seems to be inevitable for companies to have some degree of planning. For instance, company F defines milestones before starting any service development project: “These are actually things that can be seen as parts, as milestones. And when we have them worked out, we are finished” (Interview 7).

Only four companies mentioned **marketing planning**. However, if they decided on writing up a marketing plan in an early stage of digital servitization, they did so in order to be able to communicate the new offering as early as possible. Interviewee of firm K summarized it with the words: “The marketing of the product begins with its development” (Interview 11)

Companies **strategically changed the organizational structure**. Almost all interviewees indicated a change either of departments or on an individual level. They claimed that the previous structures were not

suited for service development and that a structural frame had to be set for the transition they were facing; “not everyone is allowed to do what they want to do [...], there must be a clear structure [...]” (Interview 9).

If the company does not have the necessary individual competencies or service features within its organization, interviewees explained that **external orders** were placed. This was especially the case if there was an uncertainty whether to build up internal resources at the start of digital servitization “you buy a lot externally, and then at some point you realize: Yes, it will be a core competence for the company in the future” (Interview 11).

#### 4.2 Named principles indicating effectuation

Four companies appeared to have **developed multiple variations**. This can generally be described through actions focusing on the “[...] testing of innovative digital services prototypically” (Interview 1).

Interviewees of company D confirmed this by explaining that “before we implement anything, we develop mockups to simply test our hypotheses. [...] these mockups are [...] evaluated with the potential users of our Smart Service” (Interview 5). The experts mostly referred to the aspects of **prototyping and testing** in connection with the use of agile methods, which the companies implemented during digital servitization. Two experts indicated that they are **experimenting** with different selling opportunities. Interviewees stated: “when it comes to business models, we test ourselves through different models” (Interview 4) and it was added: “[...] what can we then demand as a price for it? We also deal with this at an early stage and validate it with our customers” (Interview 5).

Six firms **changed their offering**. Firm H, for instance, changed the entire service model: “[...] we started out in a very different way. We started with this topic of predictive diagnosis and realized relatively quickly that individual services did not work.” Other

**Table 3: Overview of characteristic entrepreneurial behaviors found in the different companies**

<b>Key characteristic behaviors of causation</b>	A	B	C	D	E	F	G	H	I	J	K	L
Identified and assessed long-run opportunities in developing the firm	✓	✓	✓	✓			✓	✓				✓
Calculated the returns of various opportunities	✓	✓		✓				✓				
Wrote a business plan		✓	✓	✓	✓		✓			✓	✓	✓
Organized and implemented control processes	✓	✓	✓	✓	✓	✓		✓		✓		✓
Gathered and reviewed information about market size and growth		✓	✓	✓		✓	✓	✓	✓			
Gathered information about competitors and compared their offerings	✓		✓			✓	✓	✓				
Wrote up or verbally expressed a vision for the venture	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
Created a project plan to develop the product and/or services		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Wrote up a marketing plan for taking the products/services to market		✓				✓		✓			✓	
Strategically changed the organizational structure	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
Procured external services or resources		✓			✓	✓	✓	✓		✓	✓	✓
<b>Key characteristic behaviors of effectuation</b>												
Developed multiple variations in arriving at a commercial offering	✓		✓	✓					✓			
Developed a prototype to test a solution	✓	✓	✓	✓	✓							✓
Experimented with different ways to sell and/or deliver			✓	✓								
Changed the product or service substantially as the venture developed		✓	✓	✓				✓		✓		✓
Committed only limited amounts of resources at a time	✓		✓			✓		✓				
Responded to unplanned opportunities as they arose		✓	✓	✓	✓					✓		✓
Adapted what they were doing to the resources on hand	✓		✓	✓	✓							
Entered into agreements with customers, suppliers	✓	✓	✓	✓	✓	✓		✓	✓		✓	
<b>Key characteristic behaviors of bricolage</b>												
Took identifiable action to solve problems	✓											
Combined existing resources in creating solutions		✓						✓				
Reused resources for purposes they weren't originally designed for	✓											
Used existing resources (rather than seeking resources from outside)	✓	✓					✓	✓				
Used forgotten, discarded, worn materials to create new solutions								✓				
Involved customers, suppliers, and hangers-on in providing work												
Encouraged the use of amateur and self-taught skills												
Worked around rules and standards												✓

companies changed their service through updates: “[...] and everything that comes after that, that renders out, we notice that in the field and then we develop an update” (Interview 11).

There were four experts who indicated that only a **limited amount of resources at a time** is committed. Companies need to seek out ways of doing things in an inexpensive way because they could not afford to “[...] do 70 iterations in testing” (Interview 4). It was also claimed that resources might be a problem: “[...] budgeting and planning cycles and if the resource is not there, the resource is not there” (Interview 7).

Overall, six firms confirmed activities insinuating that they **respond to unplanned opportunities**. Interviewee 1 commented on the scarcity of resources and his need to adapt to this by explaining that “I can't really plan in isolation for such customer projects, so it doesn't make sense to do a big plan [...].” Interviewee 3 justified the need to **adapt to the resources at hand** with the smaller size of the firm: “First of all, we are simply too small to divide up all responsibilities in the service development process in any way” (Interview 3). Firm F decided to transfer a part of the service development to the customer “because [they] would not have the resources for it” (Interview 7).

Interviewees of nine firms mentioned that they entered into **agreements with customers, suppliers, and other organizations**. Interviewee 3 summed it up with the words “of course we are dependent on a network of partners. Because we do not have everything in-house” (Interview 3). Furthermore, the results indicate that firms especially interact and negotiate with the customer prior to having a fully developed service. Interviewee 1 explained that this is a result coming from the decision to enter the service market and thus developing a solution in a different way than they were used to: “We have no choice but to work out certain questions together with our customers, [...] otherwise you can't answer these questions” (Interview 1). Firm D also identified that “the customer is an important partner in the development of such projects, because the customer carries the expert knowledge also for the analysis of the data” (Interview 5). Additionally, firms collaborate with start-ups. “In order to gain relevance on the market in the field of smart services, which is why we developed a strategy together with a start-up” (Interview 9). The quotes referring to agreements with partners show that firms obviously have understood the necessity and advantages of collaboration for service development.

#### 4.3 Named principles indicating bricolage

Our findings indicate that the firms from our sample appear to hardly follow a bricolage logic. Five

companies mentioned factors that are related to *making do by applying combinations of the resources at hand* but only two companies had more than two characteristics. In the following, we share some quotes from the database indicating characteristics of the bricolage-logic within the examined companies. Interviewee 2 addressed that factor by saying: “we **take what is available** in our company at an appropriate level of maturity and at an appropriate price, we take it with pleasure and we use it with great pleasure for new things” (Interview 2).

Firm A showed a tendency of bricolage by referring to reused resources: “The people who are now doing this project at the customer's premises are the same people who normally deliver new machines and solve machine problems in the service business” (Interview 1).

The most often mentioned characteristic behavior of bricolage is that companies **use existing resources**. Four companies confirmed this. Interviewee 8 said for instance: “This means that we somehow have to work with the people who are on board here with us. And they are making an effort right now” (Interview 8). Others pointed out: “[...] this means that the people who perform tasks today must perform other tasks in addition” (Interview 2).

#### 4.4. Cross case analysis

We found that no firm is limited to one single behavioral logic of causation, effectuation or bricolage. However, characteristic behaviors of bricolage were mentioned scarcely, and we noticed a stronger tendency of firms to follow the effectuation and causation logics, frequently in combination. The decision for their behavior is often guided by long-established industry logics for which interviewee A found good words: “So in this context, the most important thing for me is [...] that a classic mechanical engineering company is efficiency-driven, both in production and in development. Everyone always says: “Yes, be more efficient and better, become faster etc. but for this whole topic of digitization and development smart services is actually about developing as effectively as possible, i.e., that you really offer the right solution and not only a fast one” (Interview 1).

In addition, the probands also expressed difficulties to get into effectual logic, even if they are aware of the necessity, for example for partnership agreements: “You also have to find a customer who has the time to tackle a project like this. [...] the customer's contact person is often so overloaded with work that he cannot support the project as much as he would like to” (Interview 6). The overall impression that we de-

rived from our interview data was that digital servitization leads to various changes in manufacturing firms. We observed that companies developed an organizational frame but used the effectuation logic within it. This is a big difference compared to the plan-driven processes from the past. Manufacturing companies establish new processes and adapt methods that are usually known from the start-up scene: *“We do this according to Design Thinking and agile in short cycles and then we basically follow these Lean Startup methods to continue iterating and then at some point it becomes more about classic project management. And of course, this makes us a bit of a two-speed company”* (Interview 4).

Not all firms approach digital servitization in the same way. However, all the interviewees have noticed that existing structures and established mindsets are questioned by digital servitization: *“Therefore, it makes no sense to sit down five years in the basement and develop an allegedly perfect product following a classic roadmap. Even if it was the perfect product at the time, when it is developed to the end, it is outdated”* (Interview 2). Causation logic seems to be omnipresent in manufacturing companies. Still, during digital servitization companies build up smaller business units and work more agile and use an effectuation logic. Hereby these entrepreneurial logics seems to co-exist.

## 5. Discussion

Because of its applicability in phases of high uncertainty and as well the recommendation to use effectual logic in exploiting high innovation potential (Brettel et al., 2012) we thought to find a high degree of effectuation in our study. However, it turned out that the companies during the digital servitization followed an effectual logic only in some parts but were rather consistently influenced and guided by the causation logic. Furthermore, characteristics of the bricolage-logic could be only identified in a few companies. This might be due to the manufacturing industries, since the concept of the bricoleur was opposed to the engineer in its origin (Lévi-Strauss, 1966) and our study focuses on engineering-oriented companies.

Concerning the question posed by An et al. (2020) whether combinations of logics are dependent on contextual factors such as firm size, or the development stage of the firm to ensure success, no clear statement can be made. What is interesting, however, is that possibilities of combination presented by fellow researchers (An et al., 2020) were found in our interviews. In addition, the realization that large companies are causation-driven at a later point in time and that the effectuation logic is absent is in line with the findings of our

study. The statement that “causation and effectuation are incompatible for large late-stage firms” (An et al., 2020, p. 854) is discussable, and thus we examined it more closely. In digital servitization, some of our cases revealed precisely such co-existence. Regarding the proposed high-performance development paths for firm growth by An et al., the researched pathways always described a continuous development towards company growth and a change from effectuation to causation. Our study shows another path as manufacturing companies are coming from causation logic and had a development path back into smaller business units and work in an effectuation logic. This is an interesting result which should be further investigated in detail.

Our results also contribute to the wider field of organizational ambidexterity, i.e. the ability to explore and exploit innovations simultaneously (Jansen et al., 2005). Ambidextrous behavior, consciously or unconsciously, is used within the digital service transformation. None of the companies uses one decision logic exclusively. Given existing research work, such an ambidextrous approach seems promising for established companies, in particular within high market turbulence and technological uncertainty (Yang & Gabriellsson, 2017). Still, it should be noted, that it involves high risks, especially for new ventures, or companies that only have scarce resources and capabilities to deal with occurring paradoxes (Parida et al., 2016). Related works on organizational ambidexterity advise choosing one way rather than a mixture in such cases (Parida et al., 2016). In addition, organizations that are strongly exploitation-driven may also be well advised to develop capabilities, such as strategic agility instead of changing to an exploration orientation (Clauss et al., 2020). Here the lens of effectuation and causation might lead to new insights. However, in order to make a clear statement on this, further studies should be carried out to investigate the influence of different entrepreneurial logics and their application on company performance during digital servitization.

With our results, the question arises whether the omnipresence of causation is a corset, which supports companies to target certain ambitions, or whether innovation potentials are left out because of it. Recent studies show that a causal logic conflicts with business model innovations that use a new value logic, which is true for digital servitization (Brenk et al., 2019). On the other side, as mentioned before, “changing to an exploration orientation might be difficult or even impossible” (Clauss et al., 2020, p. 9). One possible answer could originate in the desired effect digital servitization should have for a company. If digital servitization is a matter of bringing smaller innovations to the market, a causation-driven approach seems to be in

line with the literature to date (Brettel et al., 2012). However, if it is a matter of opening up entirely new business areas and exploiting high levels of innovation, a stronger orientation towards an effectuation logic (Brettel et al. 2012) is advisable as entrepreneurial orientation has a positive mediating effect on business model innovation (Ciampi et al., 2021). Here, “considering bricolage as an ability to overcome limitations concerning existing resources and their uses” (An et al., 2020, p. 853) for large corporations would be exciting to investigate.

As already mentioned, a takeaway from this study is that there seems to be no existing path for digital servitization which has proven to be successful. Thus, firms are uncertain what to exactly do and how to adapt their behavior. We argue that this finding is in line with Kohtamäki et al. (2020) who claim that different paradoxes have to be considered in digital servitization. The companies of our study try to individually tackle the four major paradoxes by adapting their behavior and figuring out an approach in order to find a balance between their traditional product business and the new service business.

This brings us to our implication for practice. We cannot advise on how to make such a transformation a guaranteed success. However, if you are dealing with digital servitization, the awareness of shown behavioral logics and the reflection of your own existing behaviors seems a good starting point. Also, to question existing logics seems appropriate. Especially in the phase of uncertainty, effectual logics, or even a bricolage approach in which you first look at what can be achieved with existing resources could be promising and above all reduce the risk. In addition, we are pleased to provide companies with insight into how other companies take up the challenge and deal with the paradoxes described. Only future results and success stories will lead to a more straightforward path.

We are aware that our research may have limitations. The study only investigated twelve German manufacturing firms. Therefore, the findings might not be transferable to culturally distinct regions and the findings might not be generalized to other industries. Another limitation is that our sample includes experts operating on diverse management levels varying from sales, data science, innovation, business development, and after-sales service. It might be that specific positions inherently adopt a specific behavior logic and the experience level of the expert could determine which behavior logic is preferred by the expert in the digital servitization process. In most cases only one expert was interviewed. Additional interviews within the cases would probably generate further insights. Since all companies are still in the early stages of digital servitization further research should investigate

the meaningfulness and effectiveness of the shown approaches.

## 6. Conclusion

We stated the question: *How do manufacturing firms behave during digital servitization from the perspective of entrepreneurial logics?* Our study brings in a fresh perspective on this transformation. Due to 13 interviews we were able to increase the understanding of organizational behaviors within digital servitization by examining different dimensions of three entrepreneurial logics. We predominantly find the two logics of causation and effectuation in established manufacturing firms. Bricolage was only mentioned sparsely. Companies try to change traditional product-focused and planning-driven mindsets within their organization (i.e., causation) and adopt a more agile and entrepreneurial logic (i.e., effectuation) for digital servitization. Ultimately, we were able to show that different logics coexist during the transformation process. Even if the results do not allow an evaluation of the used logics, especially regarding success, we provide new insights to better understand how firms approach digital servitization.

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