

THE IMPACT OF DIGITAL TECHNOLOGY ON ESTABLISHED BUSINESSES: RETHINKING BUSINESS MODELS

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ABSTRACT

The literature argues that a real digital transformation of firms requires holistic changes of the business model. Despite knowledge about this ambitious goal, understanding of how digital business model transformation can be achieved is still very limited. In this article, we explore how firms achieve digital business model transformation. We apply a case study design to investigate how incumbents have changed their respective business model dimensions during digital transformation. Our findings center on interview data and complementary archival records from 15 cases. We present a framework for digital business model transformation along the dimensions of value proposition, value creation, and value capture. Our results emphasize the importance of a preparatory phase in which the strategic course is set. Furthermore, our findings demonstrate that transforming a company's business model is most effective when a single person, namely the Chief Digital Officer, is responsible. Our findings contribute to the business model literature, by providing a more holistic view on how business model innovation can be utilized during digital transformation

1. INTRODUCTION

RAPID developments in digital information and communication technologies have recently created new business opportunities, but have as well disrupted established industries and have led to new market entrants and intensified competition [1]-[3]. Technologies, such as the Internet of Things (IoTs) [4], [5], three-dimensional (3-D) printing [6] or artificial intelligence [7] offer fundamentally new ways of doing business and may even have the potential to disrupt traditional business concepts [8]. Furthermore, research demonstrates that successful digital transformation has positive effects on firms' performance and creates competitive advantages [9]. Thus

companies in many industries are forced to engage in digital transformation efforts. The results of large scale practitioner oriented studies regularly report that companies are heavily investing in digitalization and digital transformation efforts [10].

Digital transformation however is arguable not an easy endeavor. As compared to new start-ups that are often build around new digital technologies, incumbent firms need to find ways to digitally transform while preserving core competencies and traditions [11]. Since new digital technologies often affect the fundamental mechanisms of how companies run their operations, they must

obtain new management practices and strategies to cope with the challenges of digital transformation [12], [13]. Recent research, therefore, clarified that instead of just encoding analog information into digital format or electrifying exiting processes (i.e., digitization), digital transformation describes a company-wide change that requires the development of new business models by implementing a new business logic to create and capture value [11], [14].

Business models are conceptualized as configurations of the three interrelated elements: value proposition, value creation, and value capture [15]-[18]. Business model innovation (BMI) is then defined as "designed, nontrivial changes to the key elements of a firm's business model and/or the architecture linking these elements" [17, p. 207]. In the case of digital BMI, these changes are embodied in or driven by digital technologies [18]-[20].

Despite the general agreement that incumbent firms need to pursue BMI for successful digital transformation, limited research has addresses the nature of digital BMI. Previous research has focused mostly on the external antecedences of incumbents BMI such as IoT [5], big data analytics [21], opportunity recognition [22] or family influence [23]. Li [24] examines how digital technologies have been used to facilitate BMI in creative industries, highlighting which areas of the business model were affected by automation, extension or transformation. Other studies explore very specific types of technology driven business

models such as 3-D printing business models [6] or digital platform business models [25].

Despite these recent advancements in this research area, we still lack understanding on how the business models of incumbent firms are innovated during digital transformation. This gap is of a high theoretical and practical relevance, considering that many firms still struggle with a holistic transformation of their business models [26] and as Gebauer et al. [27] recently high- lights the digital paradox "which means that they invest in digital offerings, but struggle to achieve the expected revenue growth, despite the proven growth potential of digital technologies." To fill this gap we analyze the literature regarding BMI and digital transformation. We, then, empirically analyze the process of BMI during digital transformation based on cases of incumbent companies that have transformed their business models. Based upon our findings, provide a process framework that provides companies with a structured template for achieving digital BMI.

We contribute to the academic literature and provide managerial recommendations: We provide insights for Fjeldstad and Snow [28] call for an analysis of how new digital architectures affect BMI. Our findings identify transformation activities in all three business model dimensions. Following Massa, Tucci, and Afuah's [29] we provide a deeper analysis of important activities, outcomes and individual involvement in

BMI processes. We conclude on a process framework of digital BMI that aggregates relevant business model reconfigurations during firms' digital transformation. This is of a high relevance for managers as it can be used as a basis for cognitive reflection or benchmark of own activities and it provides a basis for a structured planning of BMI during digital transformation.

II. THEORETICAL BACKGROUND

A. Digital Technology and Changes in Business Models

Digital transformation has gained recent attention in practice and academia, as new digital technologies have emerged continuously over the past decades [14], [30]-[32]. Technology driven organizational change has for example been studied concerning technological enablers [33], necessary resources [34], and its potential advantages [35]. However, the discussion about digital technology's transformational impact was particularly driven by a perspective on technology adoption for improving business operations and processes in an organization [1], [32]. Thus, research has dealt in particular with facilitating business application systems, infrastructure, and organizational and financial frameworks [36] to achieve outcomes such as enhanced efficiency and cost reductions from automatized and optimized processes [35].

More recently, the literature showed that digital transformation has to go beyond the

electrification of existing processes and structures by implementing new technologies (i.e., digitization), but requires the holistic change and innovation of a firms' business model [11], [14], [27]. Verhoef et al. [14] highlight that digital transformation is a companywide phenomenon that changes the logic of value creation and value capture through the use of digital technologies. In line with this the more recent literature on digital business models and digital BMI [1], [22], [37], [38] shows that digital BMI requires fundamental organizational changes. The redesign of an organization's structures is more important than simply integrating a certain amount of digital technology [39]. This is particularly important if the idea of digital BMI is a greater service-orientation and customer interaction to achieve value creation across the boundaries of the firm [27], [28], [40], [41].

Recent studies already demonstrate the link between digital transformation and business model design in particular setups. Warner and Wager [42] analyzed the dynamic capabilities needed for digital transformation. Although they do not provide a more detailed analysis of the nature of BMI, they concluded that that all the digital transformation of all incumbents' in their case analysis involved the strategic renewal of business models. Gebauer et al. [27] identify three phases of converting digital offerings into revenue enhancements in the B2B industry. Whereas in the first phase, products are augmented with software, in the second phase, more complex

customer problems are solved through software solutions and in the third digital platforms are used to store and combine data about customers' manufacturing systems. Li [24] analyze how digital technologies change business models in creative industries. By analyzing very specific changes to the business model dimensions, they found that reconfigured business models were often not new in an unprecedented sense but that through using digital technology the deployment of multiple business models became possible.

BMI was found to be an important mechanism for small and mid-sized enterprises (SMEs) in Europe [16]. Just recently, studies in the European context have analyzed the determinants of technology driven and digital BMI. Cozzolino et al. [43] based on a longitudinal case study of an Italian news media publisher found that disruptive changes of incumbent firms business models can either be triggered by opportunities that arise from new (digital) technologies or by threats from new industry entrants. These external triggers then lead to mechanisms in which external knowledge is accumulated (i.e., through alliances and acquisitions) and internal knowledge is created (i.e., through experimentation). Similarly, Garzella et al. [44] show that digitalization increases the connection point and interfaces with the firms external stakeholders (e.g., customers) and thereby stimulates BMI. Heider et al. [45] found that dynamic capabilities enable digital innovation in the dimensions of the business model (i.e., value creation, value

proposition, and value capture). However, the benefits for sensing and seizing as well as transformation can be utilized to a significantly lower degree in small firms. Based on a large scale dataset among German SMES, Soluk et al. [23] have identified environmental dynamism and dynamic capabilities as drivers of digital BMI. We add to this important stream of empirical research by taking a more detailed look at the nature of digital BMI instead of its determinants.

B. Business Model Innovation

The business model consists of several components which are aggregated into business model dimensions. In fact, there are more than 70 semantically different business model components in the literature which form between two and up to 12 business model dimension [15]. More recently, researchers agreed that the business model can be appropriately captured based on three interrelated dimensions: value proposition, value creation, and value capture [15], [17], [18]. We used Teece's [18, p. 179] business model definition for our research project: "A business model articulates the logic, the data, and other evidence that support a value proposition for the customer, and a viable structure of revenues and costs for the enterprise delivering that value." These business model dimensions are not separate from each other, but form unique configurations of an organization [46]. If one dimension is changed, modular changes in the other dimensions are usually necessary [17].

BMI deals with the design of new business models or the reconfiguration of existing ones [17], [47]. BMI is a new type of innovation complementing product and process innovation through a holistic perspective on innovation potentials in the key dimensions of the organization. [48]. Besides designing new and changing existing business models, BMI includes the discovery of new business practices, which seek to generate a new value proposition, new value creation processes, and new cost and revenue streams [49]. This process is particularly facilitated by new digital technologies [44], [50]. In the following, we provide an overview of digital technology's potential for BMI.

"The value proposition dimension contains a portfolio of solutions for customers and how they are offered [15, p. 387]." Innovation in the value proposition process is enabled by digital technologies as these significantly affect customer behavior. Many digital technologies (e.g., smart phones or smart home devices) are now present in customers' homes. This provides companies with opportunities to remain in constant contact with (potential) customers [51]. Digital customer interfaces have positive effects, e.g., on customer relationships, customer satisfaction, and/or on brand reputation [52], [53]. For many digital products and in particular if a company provides a platform in which the value proposition is to facilitate transactions between otherwise independent actors [54], firms rely on network effects [55]. Direct network effects are created if the value of the value proposition is

enhanced if more users join an ecosystem in general [56]. This could be for example if a group of buyers could jointly negotiate better prices from a supplier if their number increases. Indirect network effects arise if an increased number of users leads to greater number of participants from a different segment (e.g., more users of an online market place lead to more providers in this space). Digital advertising and promotion may become even more important owing to the fact that especially younger people spend much time online [57]. Through digital interaction processes with customers and customer products large amounts of data can be obtained that can be used for product development or individualized marketing activities [58]. Digital technologies influence on distribution channels is evident looking at internet-only players such as eBay or Amazon. Matarazzo et al. [51] recently demonstrated that digital transformation in the value proposition dimension can facilitate omnichannel marketing and delivery in particular for new digital offerings.

"The value creation domain defines how and by what means firms create value along the value chain using the resources and capabilities of intra and interorganizational processes [15, p. 387]." In general, digital technologies help companies to innovate their value creation as processes can be automated to a very high level [59]. Furthermore, digitalization creates new interfaces that help companies to integrate customers into the companies' value creation [51]. Incumbent firms can use digital

technologies to strengthen customer relationships along various physical and digital channels and touch points of the consumer journey [60]. Digital tools are used for customer co-creation to better understand consumer desires and future trends for higher product success [51]. Business functions such as product development and marketing can be supported or even taken over by communities of self-selected individuals [19]. Incumbent firms can facilitate value co-creation with customers through knowledge transfers and the establishment of structures and rule for collaboration in the ecosystem [61], [62]. Opportunities for digital value creation processes arise from a growing customer demand for customized products and services [59], [63]. Digital technologies, such as 3-D printing provide customers with the opportunity to get highly individual solutions for prices that are significantly lower than traditional tailor made solutions [6], [64]. Companies can in turn analyze the preference data from customers to enable better a and more sustainable co-creation relationship with their customers [65]. Another example for innovative value creation and service processes is the IoT IoT describes the connection and communication processes between products and services that are supposed to form a network for constant data exchange [66]. Therefore, companies must enhance their IT and software to handling data's changing role [67]. Besides the opportunity to integrate customers in a digitally enhanced value creation process, an

improvement of the industry and university collaboration can be a source for BMI [68].

"Value capture defines how value propositions are converted

3 into revenues. It defines how firms gain revenues that cover cost and achieve profits that ensure sustainable performance [15, p. 387]." The value capture dimension can change when digital technology disrupts the ways product firms compete and offer services [69]. For many companies, digitalization efforts in the other dimensions of the business model also require the design of the right value capture approach [70]. This is in particular because value capture innovation was shown require systemic adaptations of the other dimensions of the business model to prevent potential issues from local optimization [16]. In recent years, many companies' revenue concepts changed from one-time sales to achieving recurrent revenue streams. Examples are pay per view/use, subscriptions, or freemium models [18]. The opportunity to use various revenue models is closely connected with the immaterial nature of software. Software can be produced with marginal variable costs. Thus pricing and revenue model decisions are more holistic. Additionally, revenue models, such as subscription facilitate more long term relationships in which also value creation can continue, e.g., through software updates [27]. Further, digital technologies provide opportunities to build digital services that are bundled with products in companies portfolios and create additional revenues [71]. One case in point example is

the strategy of many B2B machine construction firms who now sell machines with small margins or even install these for free but offer long term maintenance and service contracts. Such service offers are facilitated by the advancements in sensor technologies that enable the manufacturers to collect valuable data and to provide predictive maintenance solutions that could not be offered by independent service providers. For most companies, a combination of different revenue streams may be useful [69].

III. RESEARCH DESIGN AND METHODOLOGY

As we seek to explore the BMI process for digital transformation of incumbent firms, we used a qualitative case study research design [72]. The chosen research design allowed us to conduct a cross-case analysis, which is beneficial to discover emerging patterns between interrelated constructs, and therefore provides more generalizable insights than single-case studies [73]. Moreover, as the discovery of patterns and their relationships can provide key conceptual insights, it supports theory-building as well [74].

A. Sample and Data

Our purpose is to analyze how incumbent companies (in business for >10 years) change their business model in the course of digital transformation efforts. We needed to select companies that pursued corresponding digital transformation initiatives. Following a purposeful sampling strategy [75], we only

considered incumbent companies for our study that described concrete digital innovation steps for at least one of their respective business model dimensions. We attempted to select "illuminative cases" that exemplify contexts where an innovation was perceived notably as a success or a failure [75]. We, therefore, searched for critical incidents as a major source for case selection [76]. We gathered information from academic research results, corporate websites and annual financial reports for selecting incumbent companies which conducted digital BMI. The business model categorization of Clauss [15] was used as a pattern for identifying BMI activities in the information provided at corporate websites and in financial reports. In line with Hess et al. [13], we searched for cases that utilized rather complex digital BMI as compared to a simple integration of technologies. Furthermore, some cases were identified from recommendations of business consultants in the area of digital transformation. These consultants were further interviewed to validate our findings from the case studies from the perspective of external experts who have a broad understanding of various projects aiming for digital BMI. The advantage of integrating the view of external informants (e.g., consultants) is that they may unveil internal retrospective and key informant bias [77]. We aimed for maximal sample variation [75] in order to understand the phenomenon from as broader perspective, to generate more generalizable results and to enhance our findings' external validity [74]. Therefore, we purposefully selected cases

across industries and of very different sizes (ie., from small-sized to large-sized firms). This may on the one hand reduce the direct comparability of results but ensures that we generate a more complete picture of digital BMI. In line with this, we included one startup company (company O) that developed a digital business model. Although this company had a less established business model, they went through a similar process of pivoting and developing the digital business model. Our final case selection based on 15 companies. Although these companies all went through rather complex changes in their business models, each one was associated with innovation in one primary BMI dimension. Five of these cases were primarily associated with a value proposition, six cases with a value creation innovation, and four with value capture innovation.

After the case companies were identified, we approached these via telephone. Semistructured interviews were our primary data source, since they are the most appropriate method for collecting retrospective data from experts [78] who were involved in BMI processes. After an initial kick-off discussion with a member of the management board, we either decided to conduct the interview directly with the respective board member or asked for the contact information of a manager in charge for digital innovation. We asked the interviewee for a retrospective description of their digital BMI efforts. We followed a detailed interview protocol for each of the interviews (see Appendix A). This protocol was used for the interviews with each case

company. The business consultancies referred to the questions from the perspective of firms who used their consulting services. We gathered data over a five-month period from September 1, 2016 to January 20, 2017. The interview duration was between 30 and 65 minutes (average of 45 min). Interviewees were CEOs (n=3), business development managers (n = 8), project managers, or other persons responsible for their company's digital BMI initiative (n=7).

Furthermore, we received additional archival data (e.g., innovation descriptions in annual reports, strategy presentations and handouts, or the description of digitally induced change in the corporate history) which we used for triangulation to ensure the validity of our study results [79]. First, we analyzed the corporate website and social media presence of each company. Second, we were provided with internal documents of reports, presentations, plans for BMI, work instructions, etc. Third, we analyzed the incumbents' annual reports (if available) to see the financial impacts of the BMI processes (value capture perspective). Finally, we took notes during all additional conversations with companies' representatives (kick-off discussions, interviews, queries). Table I gives the key characteristics of our selected case companies and Table II gives the information about the validation interviews with the consulting firms.

B. Analysis

Through our documentation and analysis of the interview data, website and social media

activity, annual reports, and additional internal documents, we strived toward establishing a chain of evidence [80] while improving validity and reliability. We followed an iterative coding procedure as suggested by Corley and Gioia [81] and Gioia et al. [78]. First, we started with open coding to aggregate similar statements across the interviews into first-order concepts. We, then, condensed related concepts into second-order themes. This data structure allowed us to build aggregated dimensions in a third step. Further, we sorted the 9-D from the coding procedure to

the three business model dimensions which we deduced a priori from the analyzed theory. This data-theory matching process enabled us to further assess the validity of the article [82]. The data were coded by two independent researchers and the codes were compared and discussed before they were aggregated according. Excerpts of the findings were presented to and discussed with the members of the business consultancies to receive an external validation of our findings. Fig. 1 shows the results of our data analysis.

TABLE I
SELECTED CASES

| Business company | Description | Em- ployees | Tenure in years | Interviewee's position | Data | Primary di- mension of BMI |
|---|---|----------------|-----------------------|---|--|-----------------------------------|
| Company A: Communica- tion provider | International telecom- munication company, established in 1950 | 225,243 | 7 | Head of Digital Innovation | Interview, kick off dis- cussion, website/social media, reports, internal documents | Value proposi- tion innovation |
| Company B: Self-service department store | International retail business, founded in 1828 | 43,000 | 5 | Head of Multi- channel Man- agement | Interview, website/so- cial media, reports, in- ternal documents | Value proposi- tion innovation |
| Company C: Public utility 1 | Service company in primary care, estab- lished in 1919 | 156 | 19 | Head of Opera- tional Services | Interview, kick off dis- cussion, website, inter- nal documents | Value proposi- tion innovation |
| Company D: Public utility 2 | Service company for electricity, gas and dis- trict heating, founded in 1901 | 356 | 23 | Project Leader Digitalization | Interview, kick off dis- cussion, website/social media, reports, internal documents | Value proposi- tion innovation |
| Company E: Energy pro- vider | Responsible for the en- ergy supply of 1 of the 16 German states (1921) | 20,288 | 9 | Head of Digital Office | Interview, kick off dis- cussion, website/social media, reports | Value proposi- tion innovation |
| Company F: Automotive supplier | International automo- tive supplier, founded in 1915 | 138,269 | 14 | Head of Corpo- rate Communi- cation | Interview, website/so- cial media, reports | Value creation innovation |
| Company G: Heating-Syst. manufacturer | Family business since 1917 that produces heating technology products | 11,600 | 8 | Head of Corp. Development | Interview, kick off dis- cussion, website/social media, reports, internal documents | Value creation innovation |
| Company H: Engineering company | Supply engineering company for heating and sanitary, founded in 1963 | 24 | 30 | Chief Executive Officer | Interview, website, in- ternal documents | Value creation innovation |
| Company I: Airport opera- tor | Operating company of an airport, founded in 1947 | 20,720 | 11 | Head of Digital Transfor- mation | Interview, kick off dis- cussion, website/social media, reports | Value creation innovation |
| Company J: Airline | German airline group, established in 1953 | 129,424 | 6 | Head of Digital Business Devel- opment | Interview, website/so- cial media, reports | Value creation innovation |
| Company K: Medical sup- plier | Medical- and pharma- ceutical company, founded in 1839 | 55,719 | 9 | Product Man- ager | Interview, kick off dis- cussion, website | Value creation innovation |

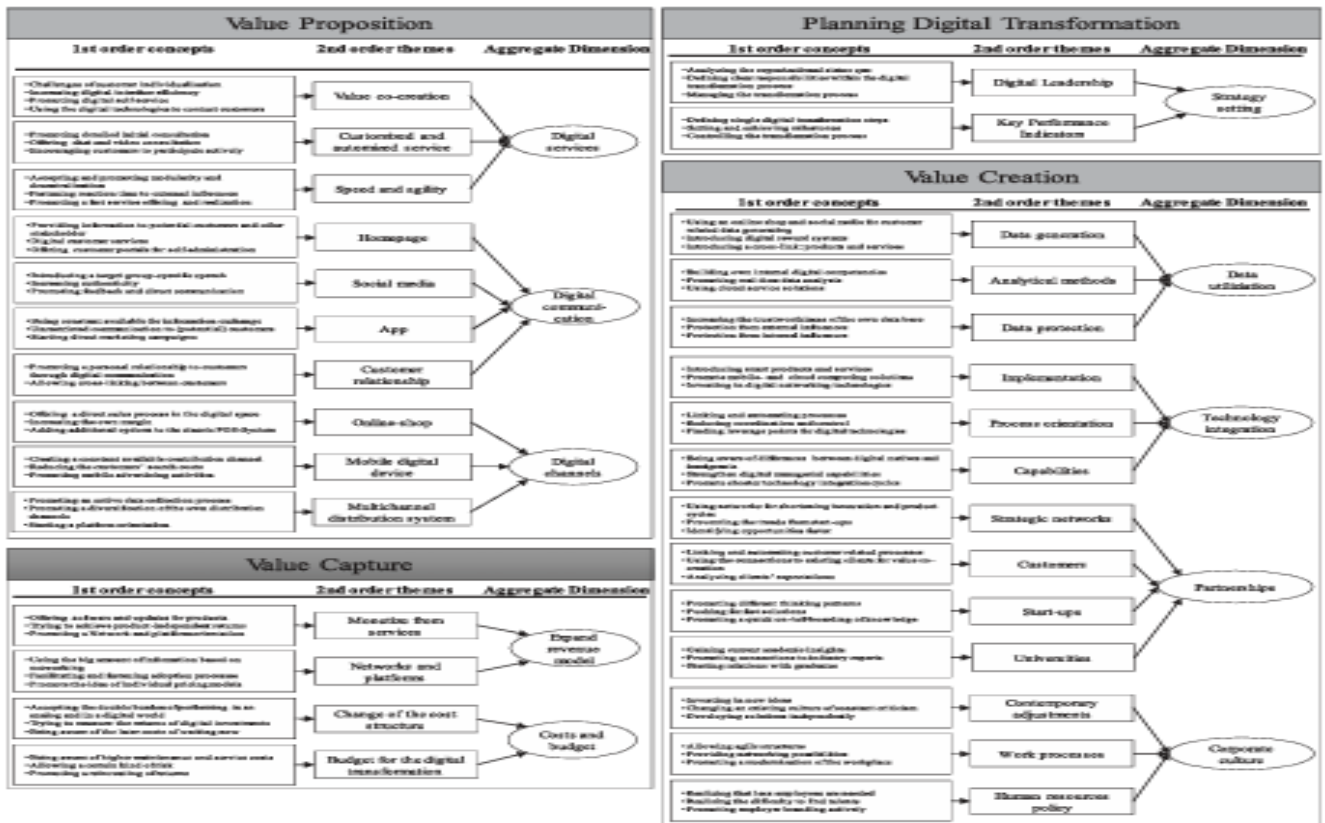
IV. FINDINGS

All the incumbent companies in our case study had conducted BMI activities during their digital transformation efforts. Interestingly, most companies focused on the value proposition and value creation dimension, whereas less activities were conducted changes in the value capture dimension. Although, we basically conducted our analysis along the three constitutive business model dimensions-value proposition, value creation, and value

capture we could clearly derive a new and additional pattern from our data. Many interviewees emphasized the need of a separate phase, in which the digital BMI process is prepared and the strategy is defined before changes in the business model are conducted. We will now outline how incumbent companies conducted changes in their business model dimensions. Based upon our findings we summarize the main activities for BMI during digital transformation in Fig. 2.

TABLE III
CROSS CASE ANALYSIS

| Dimension | 2nd order theme | Case | | | | | | | | | | | | | | Frequency | |
|------------------------|--------------------------------------|--|---|---|---|---|---|---|---|---|---|---|---|---|---|-----------|----|
| | | A | B | D | B | E | F | G | H | I | J | K | L | M | N | | O |
| | | Planning Digital Transformation | | | | | | | | | | | | | | | |
| Strategy setting | Digital Leadership | x | x | x | x | x | | | | | x | x | x | x | | | 9 |
| | Key Performance Indicators | x | x | x | x | x | | | | | x | | | x | x | | 8 |
| | | | | | x | | x | | | | | | | x | | | 3 |
| | | Value proposition | | | | | | | | | | | | | | | |
| Digital services | Value co-creation | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | 15 |
| | Customized services | x | x | x | x | x | x | x | | | x | x | x | x | x | | 8 |
| | Speed and agility | x | x | x | x | x | x | | | x | x | x | x | | x | x | 12 |
| Digital communication | Homepage | x | x | x | x | x | | | x | x | x | x | x | x | x | x | 11 |
| | Social media | x | x | x | x | x | | | x | x | | | x | x | | x | 14 |
| | App | x | x | x | x | x | | | x | x | x | x | x | x | x | | 6 |
| | Customer relationship | x | x | x | x | x | | | x | x | x | | x | x | x | | 9 |
| | | | x | x | x | x | x | | | x | x | x | x | x | x | | 10 |
| Digital channels | Online-shop/ Customer Service Portal | x | x | x | x | x | | | x | x | x | | x | x | x | | 10 |
| | Mobile digital device | x | x | x | x | x | | | x | x | | | x | x | x | | 7 |
| | Multichannel distribution | x | x | x | x | x | | | x | x | x | | x | x | | | 5 |
| | | | x | x | x | x | x | | | x | | | x | | | | 7 |
| | | Value creation | | | | | | | | | | | | | | | |
| Technology integration | Implementation | x | x | x | x | x | x | x | | | x | x | x | x | x | x | 13 |
| | Process orientation | x | x | x | x | x | | | x | | | x | | | x | x | 4 |
| | Capabilities | x | x | x | x | x | | | x | x | | x | x | x | x | | 10 |
| Data utilization | Data generation | x | x | x | x | | | | x | x | x | x | x | x | x | | 9 |
| | Analytical methods | x | x | x | x | | | | x | x | x | x | x | | | | 12 |
| | Data protection | x | x | | | | | | x | x | x | x | x | | | | 10 |
| | | | x | x | x | x | | | x | x | x | x | x | | | | 7 |
| Partnerships | Strategic networks | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | 9 |
| | Customers | x | x | x | x | | | | x | x | | | | | | | 15 |
| | Start-ups | x | x | | | | | | x | x | | | x | x | | | 4 |
| | Universities | x | x | | | | | | x | | | | | | | | 6 |
| | | | x | x | | | | | x | x | | | | | | | 3 |
| Corporate Culture | Contemporary adjustment | x | x | x | x | x | x | x | | | x | x | x | x | x | | 12 |
| | Work processes | x | x | x | x | x | x | | | | x | x | x | x | | | 8 |
| | Human resource policy | x | x | x | x | x | | | x | | | | x | x | | | 9 |
| | | | x | | x | | | | x | | | | x | | | | 4 |



The above findings are in so far important as they show that digital relationships with customers might rely on rather trivial and basic technological changes in the first place. Instead of carrying out complex holistic digital strategies, even large firms were starting with rather basic structural interfaces to enable a bilateral communication with their customers.

Besides the structural interfaces, internal processes and roles need to be established that take the responsibility for continuous maintenance of these channels. Quite surprisingly even the larger firms were struggling to ensure that these channels were used regularly and in both ways: The establishment of this initial ability to connect the firms offerings with their

customers then has to be integrated with the remaining organization and strategy. Although firms have established these channels to facilitate interactions, they are then in the need to use the collected information (and data: see value creation innovation) for product development and organizational learning. Consequently, it is necessary that all online and of line communication processes with customers are gathered in databases (Le.. customer relationship management systems) and are used for customized communication and offerings. Besides the possibility to identify customer needs anonymously via data analysis, active communication with and involvement of customers allows firms to co-create new digital services which enable

the establishment of long term relationships with cos- tomers. Along this line case firms utilize digital technologies to empower the customer to customize their solutions and to continuously interact with the firm. Many case firms mention that they have established virtual platforms for crowd sourcing and open innovation activities. Related to this, interviewees em- phasized that detecting new opportunities derived from customer needs is fairly simple, while providing necessary resources and establishing required capabilities in a short period of time is challenging.

Because of the connection with other partners in the ecosys- tem, firms can then extend their value proposition as product- service systems that offer an "all-round carefree packages" (Company A) in which accompanying services around the main product or service of the company are offered from other players in the ecosystem. Our case firms highlight that the customization of the value proposition may be the most remarkable objective and challenge which is enabled through digital technologies.

This is kind of mass customization is enabled because cus- tomers can provide their preferences more easily and as the customization of digital or digital-enhanced products is doable with reasonable efforts. In turn, dominant product configurations can be adopted for R&D and new regular products.

In line with the above, communication channels are integrated with digital

distribution channels. This also requires resource to maintain online and offline channels resulting in a financial double burden. However, besides the downsides of the financial double burden to run digital as well as analog distribution channels, we find that incumbent companies also question the commercial viability of digital sales channels due to fierce pricing competition.

C. Innovating the Business Model's Value Creation Dimension

In this dimension incumbents focus on design steps, such as successfully integrating digital technologies, handling data, and establishing relevant capabilities either internally or externally through partners. Necessary changes are supported by a change in corporate culture. Innovating the value creation begins with integrating new IT which However, we see that most case firms, digitalization was used to optimize current processes and workflows in order to realize efficiency gains

One of the main gesources for value creation in digital business models is data. Our analysis suggests that the data collection process does not represent a bottleneck in the value creation innovation. Most of the case companies indicate that data are readily available and are also collected. Interestingly, however companies see a major challenge in the process of making sense of the data and transforming data into a basis for decision mak- ing. Combining data, detecting data patterns, extracting valuable information are less developed yet

important requirements for digital BMI in incumbent companies.

As companies often report that it is difficult to establish the relevant digital capabilities through training and hiring, it is essential to also rely on partnerships with stakeholders that already possess the relevant capabilities. Company G, which is a traditional family firm that was established more than a century ago for instance concluded that of course new competences and capabilities need to be established but that these also need to fit into the organization. Besides that, especially in more rural areas, the availability of digital experts might be limited. Therefore, all cases emphasize the importance of collaborations with partners who can compensate for the internal lack of digitalization capabilities.

It can be concluded that companies who successfully want to transform their business models should establish a network with different partners. The case companies collaborated with various stakeholders such as technology providers or B2B customers, but also with universities and/or start-ups who can serve as a "window on technology." As there is not a universal solution to BMI, collaborative value creation benefits from diversity and boundary spanning.

In addition to revenues that can be directly generated for customers, all case firms realize the value of newly generated data. However, none of the firm so far established a revenue model that generates direct revenues from selling these data. The primary value lies in the use of data for a better

understanding of the customer. This, then, leads to more individualized offerings and in turn enables individual price differentiation. Additionally individualized offerings and additional services lead to enhanced customer retention, resulting in higher customer lifetime values and therefore higher profits.

V.DISCUSSION AND CONCLUSION

This article sought to provide a more holistic view on how business models of incumbent firms were innovated during digital transformation and to demonstrate concrete design options/steps during this process. Based on the analysis of our collected qualitative data, we were able to provide an aggregated framework of digital BMI by presenting different design options along a preparatory phase and the constitutive business model dimensions (see Fig. 2). Our empirical analysis revealed nine main activity blocks incorporated in the digital transformation process: creating digital services; enhancing digital communication; expanding digital distribution channels, technology integration; data utilization, establishing strategic partnerships: changing corporate culture: adjusting and extending revenue model, and handling costs and budgets. In comparison of the activities in the various case companies, we saw that each company put an emphasis on some particular areas in their business model. Although, the epicenters for the start of the BMI process were not the same, we realized from the cross-case comparison, that each

company conducted some activities in each business model dimension and that even companies that focused primarily on one dimension have adapted the other dimensions of the business model as well. We highlighted those activities in light grey that were mentioned by more than half of the case companies, these may represent then set of BNI activities during digital transformation.

A. Theoretical Implications

Following Fjeldstad and Snow's [28] request for an analysis of how new digital architectures effect BMI and Massa et al.'s [29] call for a deeper analysis of important activities, outcomes, and individual involvement in the BMI process, the article contributes to the evolving discourse on BMI for and during digital transformation.

First, the aggregated findings of our case analysis in Fig. 2 provide a comprehensive overview of potential design options for the BMI process. Therefore, we contribute to the ongoing research on BMI management [e.g., 83]. Previous European studies on digitalization and BMI in incumbent firms have paid attention to the determinants of digital BMI [23], [43], [45]. Furthermore, studies investigated the integration of particular technologies in the business model [5], [6] or the utilization of digitalization strategies [84] [85]. We provide a more holistic operational perspective on digital BMI. In support of Chanias et al. [85] we saw in all companies that the process of developing a more digital BMI was not linear, but rather iterative. This is because

most companies did not follow a clear digitalization strategy. We found that the preparatory phase of BMI during digital transformation did also not show a homogenous picture. Whereas about half of the case firms operated without having a formal planning phase and/or role (i.e., CDO) for the transformation, we however saw, that this planning phase and digital strategy making [84] was key to accelerate the transformation process and to prevent internal redundancies.

B. Managerial Implications

Our research results also have high practical relevance. Managers can use our findings to better understand the process of BMI during a digital transformation process. By aggregating and categorizing the BMI various activities, we provide different design options, which allow managers to plan and execute the aspired BMI process. We show common factors that are important for a digital transformation of the business model, regardless of a company size and industry Our framework is of a high relevance for managers as it can be used twofold. First, it can be considered as a basis for cognitive reflection of benchmark of own activities when digital transformation activities were already started. Second, it provides a basis for a structured planning and controlling of BMI during digital transformation. This may be particularly relevant during digital strategy making.

APPENDICES

APPENDIX A
INTERVIEW GUIDE (SHORTENED)

| <i>Business Model Innovation</i> | |
|----------------------------------|--|
| Value Proposition | <p>In your opinion, to what extent do the new possibilities in digital space affect the value proposition you make to your customers? What influence do new/digital possibilities have on the relationship between companies and customers?</p> <ul style="list-style-type: none"> - To what extent does the way in which offers are submitted change? - What effects does digitalization have on sales channel selection and sales promotion? - What are new ways of communication between your business company and your customers? - Which new jobs were created in your business company to proof value proposition? - What are potential risks of involving digital technologies into the value proposition to the customer? |
| Value Creation | <p>To what extent do the new digital possibilities affect the performance of your company? How do new digital possibilities affect your services?</p> <ul style="list-style-type: none"> - What opportunities do exist to involve customers in the service delivery process? - Regarding digital technologies and new opportunities, what role do partnerships play in your business model? - How would you characterize your corporate culture in terms of digital technologies? - Which opportunities does "Industry 4.0" offer for your business model? - Which opportunities does the Internet of Things offer for your business model? - What methods do you use to generate customer data? - What is the purpose of this data acquisition? - Which special technologies does your company use for data analysis? |
| Value Capture | <p>To what extent do the new digital opportunities affect your revenue model?</p> <ul style="list-style-type: none"> - To what extent does digital technology offer the opportunity to generate new revenue streams? - Which costs arise and which costs incur? - How do you benchmark your value capture system with competitors? - How can the new revenue streams be used in common? - How do you estimate the problem that the costs of investing in digital technologies are immediate, but the impact is only discernible in the medium or long term? - How did digital technologies change the cash flows of your company? - What are potential risks of integrating digital technologies into the value capture process? |

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