Editorial

Introduction to Digitalization Cases:
How Organizations Rethink Their Business for the Digital Age

by

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Abstract

Digitalization confronts organizations with huge challenges and opportunities. With all economic and societal sectors being affected by emerging technologies, the digital economy is highly volatile, uncertain, complex, and ambiguous. Against this backdrop, this book reports on best practices and lessons learned from organizations that succeeded in tackling the challenges and seizing the opportunities of the digital economy. It illustrates how twenty-one organizations leveraged their capabilities to create disruptive innovation, to develop digital business models, and to digitally transform themselves. These cases stem from various industries and countries, covering the many facets that digitalization may have.

1. The Impact of Digitalization – and Motivation for this Book…

Digitalization reflects the adoption of digital technologies in business and society as well as the associated changes in the connectivity of individuals, organizations, and objects (Gartner 2016; Gimpel et al. 2018). While digitization covers the technical process of converting analog signals into a digital form, the manifold sociotechnical phenomena and processes of adopting and using digital technologies in broader individual, organizational, and societal contexts are commonly referred to as digitalization (Legner et al. 2017).

The key driver of digitalization are digital technologies. Due to considerable investments in technological progress, various digital technologies are on the market. Thereby, an ever-faster commoditization and time-to-market can be observed. For example, early hardware-heavy information and communication technologies such as the telephone required 75 years to reach 100 million users, whereas lightweight applications such as Instagram achieved the same coverage in little more than two years (Statista 2017). Digital technologies include both emerging technologies such as the Internet of Things (IoT) or blockchain and more established technologies such as social media, mobile computing, advanced analytics, and cloud computing (SMAC) (Fitzgerald et al. 2014; Gartner 2017).

Loebbecke (2006) refers to digital technologies as all technologies for the creation, processing, transmission, and use of digital goods. Further, Yoo et al. (2010) argue that digital technologies differ from earlier technologies in three characteristics: re-programmability, which separates the functional logic of a device from its physical embodiment, homogenization of data, which allows for storing, transmitting, and processing digital content using the same devices and networks, and a self-referential nature yielding positive network externalities. Digital technologies can be further classified with respect to whether they involve humans actively or passively, how they treat data, whether their input and output is purely digital or can also be physical, or whether they serve infrastructural or application-oriented purposes (Berger et al. 2018). In sum, digital technologies enable platforms, autonomous products, sensor-based data collection, analytical insight generation, as well as analytical and augmented interaction.

Based on advances in digital technologies, digitalization impacts business and society. Digital technologies enable innovative business models such as the platform-based models of well-known companies including AirBnB, Uber, or Facebook, or decentral models enabled by blockchain and 3D printing (Fridgen et al. 2018; Goodwin 2015). Digitalization also changes industry structures (Gimpel et al. 2018): reduced entry barriers make technology-savvy start-ups flourish and digital giants such as Google or Apple push forward to manifold sectors. Regarding the IoT, for example, 50 billion smart devices are expected to be connected to the Internet by 2020, having an economic impact of $7 trillion (Macaulay et al. 2015; Wortmann and Flüchter 2015). Further, the volume of available data is known to double every three years (Henke et al. 2016), and insights-driven businesses are predicted to take away $1.2 trillion per year from less-informed competitors by 2020 (McCormick et al. 2016). Digitalization also empowers customers and impacts our private lives. Today, more people have access to cellphones than to toilets, and one in five people has an active Facebook account (Halleck 2015; UN International Telecommunication 2014). In the digital age, wowing customers is more critical – and more challenging – than before, independent from an organization's position in the value network, as customers decide themselves how to interact organizations (Hosseini et al. 2018). Likewise, employee behavior and thought patterns evolve towards a new future of work, calling for new work and collaboration models (Brynjolfsson & McAfee 2014).

Digitalization, however, is neither a new phenomenon nor will it be the final evolutionary stage of information and communication technology (Porter and Heppelmann 2014). Data has been processed and exchanged digitally for more than half a century. An early example is electronic data interchange. Further, the Internet has been used for civil purposes since the 1990s, and e-commerce was first promoted around the year 2000. With smart devices and mobile applications, digitalization experienced an additional boost. While, in former times, digitalization only concerned data managers of corporate IT departments, it now affects all business departments as well as product and service offerings (Urbach & Ahlemann 2018; Urbach et al. 2017). Consequently, discussions moved (again) from support

to core processes, from efficiency to excitement, from hygiene factors to opportunity factors, as well as from cost reduction to revenue generation.

In our opinion, the most significant characteristics of digitalization are not the usage of data or adoption of technology, but the unprecedented speed of change and level of connectedness, which also facilitates the customers' dominant role as well as the convergence of the physical and the digital world (Gimpel et al. 2018). As such, digitalization shapes a world that is at once the cause and effect of its own characteristics: volatility (i.e., constant and massive changes), uncertainty (i.e., lack of predictability), complexity (i.e., multitude of interrelated and self-organizing actors), and ambiguity (i.e., confounding cause and effect relationships) (Bennett & Lemoine 2014).

As our discussions with senior managers (e.g., Chief Executive Officers, Chief Information Officers, Chief Digital Officers, and Digital Transformation Officers) in the last years showed, nobody doubts that digitalization "came to stay", continuing to impact on all facets of organizations, i.e. customer relationships, value propositions, data analytics, operations, organizational setups, collaboration, and transformation management itself (Gimpel et al. 2018). Rather, the key questions relate to the "what" and the "how", i.e. what organizations should look like in the future and how the to-be state can be reached both in an agile and adaptive manner as well as without jeopardizing existing assets and capabilities (A.T. Kearney & Project Group BISE of the Fraunhofer FIT 2017). Many organizations already defined accountabilities for digitalization and set up transformation initiatives. Nevertheless, digitalization remains a vague concept. What is missing are success stories, good practices, and lessons learned that make the benefits of digitization tangible, help prioritize investments, choose among action possibilities, reveal "internal homework" that needs to be done before customer-facing initiatives make sense, and provide a platform for exchanging thoughts on challenges and opportunities ahead. However, in our research and project work, we also came across many successful companies – be it incumbents or start-ups – that successfully leveraged their capabilities to create digital innovation, develop digital business models, and transform themselves. These organizations have valuable first-hand insights to share.

Against this background, we initiated the *Digitalization Cases* book project to match the supply and demand for ideas, experiences, benefits, and lessons learned related to digitalization. Together with an editorial board of forward-thinking digitalization experts, we compiled twenty-one identically structured case descriptions that provide rich insights into the digitalization activities of renowned organizations from diverse countries and industries.

Below, we first structure the field of digitalization into digital disruption, digital business, and digital transformation as a first step to make it more tangible (Section 2). After that, we overview the cases included in this book structured around these three fields of action (Section 3). We conclude with hints on the unified structure of the included cases and on how to read this book (Section 4).

2. Structuring the Field of Digitalization

To structure the field of digitalization, we use an enterprise architecture model that consists of five layers (Figure 1). These layers include: business model, business processes, people and application systems, data and information, and technological infrastructure. To tackle the challenges and to seize the opportunities of the digital age, it is essential for organizations to align these layers.
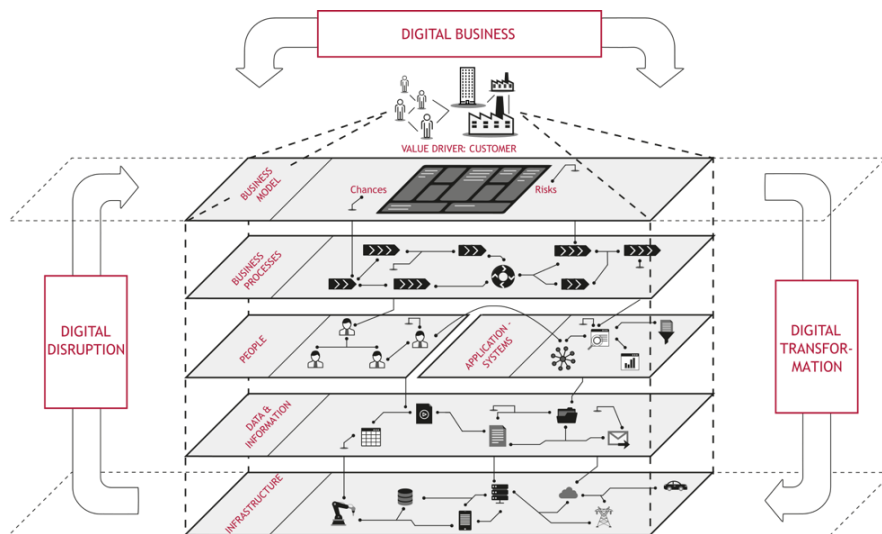

Figure 1: Structuring the field of digitalization along the enterprise architecture

Considering the turbulence of business environments and the rich set of opportunity available, a key challenge for organizations in the digital age is to distinguish sustainable opportunities promising in the long run from short-term hypes. Against this backdrop, an organization's *business model* is of utmost importance, as it enables exploiting existing market potentials and seizing new opportunities. Business models specify on target markets, operating models as well as cost and revenue streams. This also involves the organization's value propositions, describing which customer needs are satisfied by which product and service offerings. In the digital age, digital technologies allow for entirely new business models such as platform-based business models or innovative decentral models.

To turn their business model into reality, organizations require cross-functional work routines structured around *business processes*. In the digital age, process thinking must not only span across departmental but also organizational boundaries, covering entire value networks and ecosystems. Thereby, business processes define the tasks to be performed to achieve specific goals. Beyond established business process management (BPM) concepts that support efficient and stable execution of

routine operations, organizations also require agile BPM concepts that support non-standard operations, the management of emerging and proactive organizational behavior as well as fast reactions to changing customer needs.

The tasks included in business processes can be performed manually by employees, automatically by machines or application systems, or collaboratively. Thus, *people* are part of an organization's structure that systemizes roles, responsibilities, and reporting lines. In line with the shift towards agile BPM concepts, organizations must also foster people agility by moving from hierarchical to networked-like structures as well as by fostering employees' digital mindset and related skills. Further, organizations must account for new roles involved in business processes such as crowd workers, freelancers, robots, and autonomous things. Particularly, the collaborative execution of tasks is strongly advanced by technologies related to human-machine interaction, artificial intelligence, smart devices, and robotics. Many of these technologies also push the frontier of automation, because not only well-structured, but also unstructured tasks can be automated. Consequently, organizations need not only adopt traditional enterprise systems (e.g., enterprise resource planning or customer relationship management systems), but also novel system types such as mobile apps or digital assistants.

Employees, application systems, and machines create and process *data and information*. In line with the increasing adoption of digital technologies, the volume of data available is growing rapidly, revealing new knowledge potential. Structured data (e.g., tables or relational databases) can still be analyzed by means of statistical analytical methods. In addition, modern algorithms, leveraging advances in artificial intelligence (e.g., cognitive computing or deep learning), allow for an increasingly precise processing of unstructured data (e.g., texts, graphics, videos, and audio files). Big data analyses enable analyzing and combining large amounts of data from different sources, and thereby enable organizations to make better decisions, predict trends in their business environments, reveal optimization potential, and, above all, understand the needs of customers and employees.

To exploit the potential associated with digitalization, organizations need an appropriate *technological infrastructure*. Besides traditional components (e.g., personal computers, tablets, servers, network, and security components), the infrastructure includes also novel components such as cyber-physical systems as well as shared resources such smart meters, smart grids, autonomous cars, or cloud infrastructure. In the digital age, conventional information and communication infrastructure is becoming increasingly integrated with production infrastructure (operations technology) to bridge the gap between the physical and digital world.

Organizations that aim to thrive in the digital age must unfold the potential of digital technologies, rethink their business models, and transform themselves. Accordingly, we see three major fields of action spanning the different layers of the enterprise architecture as described above (Legner et al. 2017):

- Companies face the challenge of making strategic decisions on the timely use of disruptive technologies. Due to the extensive impact on organizations at large, the goal of the action field *digital disruption* is to monitor and analyze emerging and maturing technologies to reduce uncertainty in the

selection of technologies. In this context, systematically analyzing potentials and threats as well as deriving recommendations for action is of great importance. This also includes developing competences for utilizing these technologies.

- In the digital age, many companies are forced to adapt their business models, e.g. from product to customer and service orientation as well as from stand-alone to ecosystem-enabled value propositions. In fact, digitalization is not about making existing models more efficient, but about designing new models. Thus, the action field *digital business* refers to the realization of new business models that are enabled by digital technologies. This often results from the fusion of the physical and digital world. Data-driven services, smart products, product-service hybrids, and platforms are examples for new business opportunities in the digital age. Developing viable business models requires organizations to understand the effects of digitalization on the individual, organizational, competitive, and increasingly societal level.

- Due to fundamental changes in business models, a thorough transformation of the entire enterprise architecture is necessary. The technology-induced change is covered by the action field *digital transformation*. This embraces the necessary goal-oriented organizational, processual, and technological transformation necessary for organizations to succeed in the digital age. Digital transformation requires organizations to understand how business models can be implemented and how digitalization itself changes how organizations must be managed. Existing business processes and organizational structures, application systems and data as well as the underlying infrastructure need to be aligned with the requirements of new customer needs and business models in an integrated manner.

3. Introducing Cases of Digitalization

We classified the digitalization cases included in this book in line with whether they relate to digital disruption, digital business, and digital transformation. Below, we briefly overview all cases structured around these three fields of action.

3.1 Digital Disruption

First, the case of Schmitz et al. reports on *Deutsche Telekom*, which aimed to implement a digital strategy and identified Robotic Process Automation (RPA) as an enabling technology to digitalize and automate transactional processes. In addition to the setup and execution of the RPA initiative, the case outlines the most

important results, such as an increasing number of automated transactions per month.

In their case with *Lufthansa Systems*, Ripolles et al. tackle the challenge of creating software applications while accounting for desired security levels. By applying the so-called Multi-cloud Secure Application (MUSA) approach to create a new prototype, the case not only demonstrates the use of this approach, but also analyzes the impact it has on development, deployment, and operations.

Confronted with novel customer interaction forms such as attended shopping or virtual fitting, the fashion retailer *Baur* aims at systematically accounting for the customer perspective in its site engineering process. By conducting an extensive survey among different customer segments, Baier et al. provide valuable insights into the use of digital technologies not only for product selection, but also in ordering, packaging, and delivery processes.

Auf der Mauer et al. report on the case of the automobile manufacturer *Porsche*, aiming to leverage predictive maintenance. With predictive maintenance requiring a deep integration with the machines to be monitored, *Porsche* developed a solution concept called 'Sound Detective', an approach based on deep learning algorithms that monitors sound sequences from microphone. The case demonstrates the feasibility of the Sound Detective's reference architecture and discusses challenges as well as learnings during its implementation.

3.2 Digital Business

As *KAESER COMPRESSORS*, a manufacturer of compressed air systems and services, started to transform and expand its traditional business model, a service-based operator model was introduced where customers no longer purchase customized air compressors, but pay a monthly rate for the air they used. Besides the introduction of the service-based operator model, the case of Bock et al. highlights related benefits for both *KAESER* and its customers.

In their case with *Danske Bank*, Staykova and Damsgaard report on the challenges of an established bank regarding the new technologies and changing customer preferences. The case demonstrates how *Danske Bank* ventured into disruptive digital initiatives and launched 'MobilePay', a digital payment platform used by more than 90 % of the Danes today.

Further, Wildhirt et al. describe the case of *GKN*, a leading manufacturer of high precision parts for the automotive industry, that faces the question of how to deliver the technology of metal additive manufacturing to its customers. Together with a 3D printing start-up, *GKN* realized a new business model and succeeded in digitalizing related back-end processes.

The case of Blaschke presents the recently lunched digital platform *Helix Nebula – The Science Cloud*, which aims to deliver easy and large-scale access to a broad range of commercial cloud computing services, competing with leading digital

platforms. The case shows how the organization implemented different consecutive and interrelated actions to cope with complexity.

As *Sitecore*, market leader in the web content management industry, was forced to include an integrated commerce and content platform in its product portfolio, they required a commerce engine. Henningsson and Nishu show how *Sitecore* established the strategic rationale for the acquisition of a company named SMITH. In the end, *Sitecore* investigated the feasibility of achieving its strategic aspirations, and is about to integrate both the technology and the development team of the e-commerce engine into a coherent platform.

Asiedu and Boateng contributed the case of the *Presbyterian Church of Ghana*, which struggled to reach out to larger and younger communities, and therefore developed an interactive online presence as well as launched social media activities. Besides the development of an online community and a better promotion of worship services, mobile money and a point of sale device were used to facilitate cashless payment of voluntary contributions.

Nissen et al. report on the consulting provider *Dr. Kuhl Unternehmensberatung*, which decided to develop a flexible architecture for virtually assessing the project management situation in the form of a digital assessment tool available to its clients. The case describes the design and development of a prototype process model and suggests other consultancies to build up experience and knowledge in virtualizing own services as soon as possible.

Using an anonymous *insurance company* as example, Weingarth et al. present a strategic digital transformation initiative driven by the top management to build up digital capabilities and to meet the state-of-the-art agility/innovation requirements. The case demonstrates that actively managing cultural change is paramount across all business and functional areas right from the beginning.

3.3 Digital Transformation

As for digital transformation, Sandberg et al. discuss how *ABB* became a global leader in the process automation industry by successfully transforming their operations. Facing the infusion of digital technology into *ABB*'s physical production environment, the case describes a substantial adjustment that led to an ambitious transformation of the organization's business model.

As the strongly customer-oriented company *ENGEL Austria GmbH* aimed to decrease the lead time of one of its machines by at least 30%, Value Stream Mapping was used to document the production process and identify weak as well as opportunity points. After that, subject-oriented Business Process Management served as foundation for specifying new and improved processes. In sum, the case of Moser and Říha describes the optimization of cross-company processes as well as the digitalization formerly manual processes.

Deelmann and Müller present the case of *BruderhausDiakonie*, a social services organization, willing to engage in digital transformation under the slogan

"standardization before digitalization". By identifying routine tasks, implementing an easy-to-use technology platform and mobile devices, as well as giving data security a number one priority, the organization already achieved the first digitalization successes.

At *Aarhus Denmark*, the case of Meister et al. captures the initiative of the Danish Government to build five super hospitals in different regions that implement vertically and horizontally digitalized processes by having a common information architecture. The preliminary results deduced from the case are used to define a basic framework and to define a method called "maturity index for hospital 4.0" to measure the digital maturity of hospitals.

Also located in the healthcare sector, the case of Vogt et al. focuses on the digital transformation of care processes by presenting the innovation project Bea@Home at *Charité*. Introducing this new care model, the development and implementation of coordinated processes across all relevant healthcare sectors has been identified as an important foundation for inter-sectoral change processes before technological aspects can be addressed.

The case of Scheffler and Wirths shows how the insurance company *AXA* plans to unlock the potential of its data. Focusing on this challenge, they founded a Data Innovation Lab to build up an interdisciplinary work environment between the Data Analytics and the Data Management Office. The target operating model shows how *AXA* simultaneously increased data and customer centricity.

Operating in a challenging business environment, *Volkswagen* was required to build up skills through new corporate education and training solutions. In their case, Wildgrube et al. elaborate on the establishment of the *Volkswagen* Education Lab, an independent unit for target group centered problem-solving.

The case of Fortmann et al. demonstrates how *Deutsche Bahn Vertrieb* reorganized its IT division in the passenger transportation industry. After restructuring the IT division into a single digital IT unit, channel-spanning strategies were enabled, and the organization experienced a boost in motivation and employee engagement, although bringing different modes of operation together took longer than expected.

The last case of our book examines how the *U.S. Federal Communications Commission (FCC)* executed its IT modernization effort. Desouza et al. outline how *FCC* analyzed the current status of IT and human resources and conceived several initiatives for diverse employees and other stakeholders in the process of IT modernization.

4. How to Read the Cases

The case descriptions compiled in this book aim to provide insightful examples for practitioners and interesting cases for researchers, teachers, and students. Each case illustrates how a specific company or public organization leveraged its capabilities

to create disruptive innovation, to develop digital business models, and to digitally transform itself.

To make the case descriptions easily accessible and comparable for readers, they follow a unified structure, which has been initially proposed by vom Brocke & Mendling (2017). Each case elaborates on the situation faced in the focal organization, the actions taken, the results achieved as well as lessons learned. The situation faced highlights the initial problem situation and specifies the needs, constraints, incidents, opportunities, and objectives that induced action. The actions taken reflect what the organization did to tackle challenges and opportunities. The results achieved reflects on realized and expected outcomes of the actions taken and how they changed the organization. Finally, the lessons learned reflect the overall case and propose learnings empirically grounded transferrable to other contexts.

Due to the unified structure, each case can be read independently from all other cases. Readers may read the cases in line with their preferences regarding digital disruption, digital business, or digital transformation. Further, many cases reveal the organization where the case was conducted such that readers can select cases by the most similar organization or industry, or just focus on the cases that interest them most.

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