SPRINGER BRIEFS IN BUSINESS

Daniel R. A. Schallmo
Christopher A. Williams

Digital Transformation Now!

Guiding the Successful Digitalization of Your Business Model

Springer

SpringerBriefs in Business

Daniel R. A. Schallmo • Christopher A. Williams

Digital Transformation Now!

Guiding the Successful Digitalization of Your Business Model

Contents

Chapter 1
Introduction

Summary
Digital transformation affects different areas of society and the economy. It opens up new networking possibilities and allows for cooperation between different actors, who can then exchange data and thereby initiate new processes. In this book, the concept of the digital transformation of business models is explained. Four examples of digital transformation are presented. In addition, existing approaches to digital transformation are shown and a five-phase Roadmap based upon these approaches is presented. The phases are described with their objectives, activities, and tools. In the final section of this book, selected examples are provided.

What you can find in our book:

- A compact, tried-and-true aid for the digital transformation of your business model
- Foundations for the digital transformation of business models
- Selected examples of digital transformation
- A selection of existing approaches to digital transformation
- A Roadmap to the digital transformation of business models with activities, tools, and examples.

Technological potentials, which allows for digitization and facilitates digitalization, play an important role in the context of the digital transformation of business models. Today, products are produced with mechanical and electronic components and represent complex systems that allow for the linkage of hardware, software, and data storage. This makes products more intelligent and interconnected than in the past (Porter and Heppelmann 2014: 36). In addition to products, new business models require but also allow for services, processes, and value chains to be digitized (Porter and Heppelmann 2015).

D. R. A. Schallmo, C. A. Williams, *Digital Transformation Now!*, SpringerBriefs in Business, https://doi.org/10.1007/978-3-319-72844-5_1

One example of more intelligent products is Linde Material Handling, a manufacturer of forklift trucks. Linde Material Handling equips its forklift trucks with transmission units which send data such as operating hours or error codes via Bluetooth or mobile network. This data allows spare parts to be ordered and repairs to be performed without delay.

In addition to technological potentials and changing business models, ever-changing customer requirements also play a vital role. Nowadays customers often demand full service packages instead of merely individual products.

The objective of this book is to explain the concept of the digital transformation of business models. Furthermore, existing approaches to digital transformation are shown. These approaches are then used to develop a Roadmap that includes five-phases: 1) *Digital Reality*, 2) *Digital Ambition*, 3) *Digital Potential*, 4) *Digital Fit*, and 5) *Digital Implementation*. The phases are described along with their objectives, activities, and tools, while selected activities are further explained using detailed examples.

What is included in our book:

- Brief introduction to the foundations of digital transformation
- Practical examples of the digital transformation of business models
- Existing approaches to digital transformation
- Roadmap for the digital transformation of your business model, including activities and tools

Our book's intended audience:

- Those in the fields of management, strategic planning, business development, marketing, and sales
- Researchers, lecturers, and students in the fields of innovation management, technology management, strategic management, and entrepreneurship

Benefits for the readers:

- The book provides professionals with succinct, tried-and-true assistance with the successful digital transformation of their business models in order to increase their potential within their business model or within their industry
- The book offers researchers, lecturers, and students vital insights into the topic of the digital transformation of business models

References

Porter ME, Heppelmann JE (2014) Wie smarte Produkte den Wettbewerb verändern. Harv Bus Manag 12(2014):34–60

Porter M, Heppelmann J (2015) Wie smarte Produkte unternehmen verändern. Harv Bus Manag 37:12

Chapter 2
History of Digital Transformation

Summary
In this section, the definition of digital and a brief history of digital transformation will be presented. Additionally, we explore the difference between digitization and digitalization. Finally, we will address the similarities and differences between Business Process Reengineering and digital transformation and look at the future of digital transformation.

2.1 What Is Digital?

Before examining the digital transformation of business models, it is important to understand exactly what the "digital" in digital transformation means. There are several definitions of "digital" (Berman 2012; Auriga 2016) but we utilize a definition developed by McKinsey which states that digital is less about any one process and more about *how* companies run their business (Dörner and Edelman 2015). McKinsey's definition of "digital" can be broken down into three primary foci:

- Creating **value** at the new frontiers of the business world
- Optimizing the **processes** that directly affect the **customer** experience
- Building foundational capabilities that support the entire overall business initiative

In a Capgemini Consulting publication in cooperation with MIT Sloan Management, Westerman et al. (2011) defined digital transformation "the use of technology to radically improve the performance or reach of enterprises." Although the definition highlights the broad sense of the term, it fails to include the important ingredients for achieving digital transformation. In any definition of digital transformation, it is important to stress the requisite elements that lead to digital

D. R. A. Schallmo, C. A. Williams, *Digital Transformation Now!*, SpringerBriefs in Business, https://doi.org/10.1007/978-3-319-72844-5_2

transformation because without these ingredients true digital transformation is not possible.

The implementation of technologies into business processes is only a small part of digitally transforming a business. Technologies need to create additional value for the customers, the business itself, and other essential stakeholders. "To succeed in digital transformation, leading companies focus on two complementary activities: reshaping customer value propositions and transforming their operations using digital technologies for greater customer interaction and collaboration" (Berman 2012).

For the purposes of this book, we define digital transformation as a sustainable, company-level transformation via revised or newly created business operations and business models achieved through value-added digitization initiatives, ultimately resulting in improved profitability.

2.2 Brief Historical Look at Digital Transformation

Although digital transformation is a popular point of discussion at the moment, the ideas of digital products, services, and mediums were already well-understood in the 1990s and 2000s (Auriga 2016). For example, in the retail industry, mass media advertising campaigns were considered important digital channels to reach customers in the 1990s and 2000s, even though purchases were still primarily made inside brick-and-mortar stores, often with cash. From 2000 to 2015, the rise of smart devices and social media platforms led to a drastic sea change in the methods customers used to communicate with businesses, and also the expectations customers had with regards to response times and multi-channel availability. Businesses started to see that they were now able to digitally communicate with their customers on an individual basis, and often in real time. An ever-growing selection of digital payment options such as PayPal also contributed to more and more online commerce and opportunities for web-based points of sale. Nowadays, there is a focus on mobile devices and on creating value for customers by leveraging the kinds of personalized customer data that mobile technologies can generate on a massive scale. Businesses are taking advantage of this personalized information and are able to better tailor their products, communications, and interactions to fit customers' specific needs.

2.3 Digitization vs Digitalization

In this book, the terms "digitization" and "digitalization" will both be used but they are not interchangeable. There has been some recent discussion regarding the definitions of digitization and digitalization (Brennan and Kreiss 2014). There is considerable value in understanding the distinction between these terms before

diving into the digital transformation of business models. First, the importance of differentiating digitization and digitalization will be discussed. Next, current definitions for both terms will be shown and lastly, our definitions for digitization and digitalization will be presented.

2.4 What Is Digitization?

There are several different definitions of "digitization" which differ depending on the context. One of the most common associations with the term digitization is the transformation from analog to digital. Researchers across different fields would define digitization as the transformation of some type of analog or physical artifact into a digital artifact. One (easy) example of this would be taking a photograph and turning it into a digital photograph. One (more complex) example would be a synthesizer. Synthesizers create sound through "continuous variables such as changing voltages" rather than binary 1s and 0s (Pinch et al. 2009).

The first explanation can be considered a more transformation-oriented definition. The next definition could be seen as process-oriented definition. Companies should not simply turn analog things into digital artifacts just to follow the current trends. Brennan and Kreiss (2014) argue that any material with two differentiated states can store and communicate digitized signals. "This has motivated many scholars to highlight the "immaterial" (e.g. Manoff 2006) quality of information generated through digitization, while deemphasising the material systems (transistors) on which that information is housed" (Brennan and Kreiss 2014). This definition of digitization emphasizes the innovative process of mediation between material (i.e. sensors) and immaterial (i.e. business processes).

Additionally, some industry experts have also offered additional definitions of digitization. For example, Cisco has defined digitization as "the connection of people, process[s], data and things to provide intelligence and actionable insights enabling business outcomes" (Surber 2016). This definition points out the importance of data and processes but also highlights the newly gained knowledge which is a key difference between Business Process Reengineering (BPR) and digitization. BPR will be discussed later. Another industry expert, Garnter, defines digitization by saying, "the goal is to create and deliver new value to customers, not just improve what is already being done or offered" (Moore 2015).

For the purposes of this book, we define digitization as digitally enabling analog or physical artifacts for the purpose of implementing into said artifacts into business processes with the ultimate aim of acquiring newly formed knowledge and creating new value for the stakeholders.

2.5 What Is Digitalization?

The first use of the term "digitalization" can be found in a 1971 essay published in the North American Review (Brennan and Kreiss 2014). Robert Machal talked about the "digitalization of society" with regards to the limitations and potential for computer-aided research. A digital business consultancy, I-SCOOP (2016), offers a concise definition of digitalization. "Digitalization means the use of digital technologies and of data (digitized and natively digital) in order to create revenue, improve business, replace/transform business processes (not simply digitizing them) and create an environment for digital business, whereby digital information is at the core."

For the purposes of this book, we define digitalization as fundamental changes made to business operations and business models based on newly acquired knowledge gained via value-added digitization initiatives. In this book, we will focus on the digitalization of business models and ultimately, the digital transformation of these models.

2.6 Business Process Reengineering vs. Digital Transformation

Some researchers and practitioners might see some similarities between Business Process Reengineering (BPR) and digital transformation. In their oft-cited work, Hammer and Champy (1993) provide a definition of BRP. The authors state that BRP is the rethinking and reengineering of business-related processes to reduce costs and improve products and services.

Although there are some similarities between BPR and digital transformation, there are some distinct differences between the two approaches as well. According to Proctor (2017), BPR's focus is mainly on automating rule-based processes. Rule-based processes are defined as clearly assigned rule-based processes which are automated by technologies. Instead of focusing on the rule-based processes like in BPR, the main objectives of digital transformation are obtaining new data and using this data to reimagine these old, rule-based processes.

A more data-oriented approach allows for the opportunity to gain new knowledge and in turn reimagine innovative business models and operations. For example, Airbnb turned its attention from processes to data. Airbnb does not own its own physical assets (e.g. hotels). Here is an example of how old, rule-based processes in the hotel industry can be completely reimagined in a data-driven world. These temporary apartment landlords and landladies who own properties in highly sought-after locations offer an alternative to hotels and provide an unique value for guests (Bendor-Samuel 2017).

The big difference with digital transformation is how employees interpret the newly acquired know-how and use it to improve decision-making capabilities. All

of the new data sources create newly formed knowledge sources based on that data. Instead of only making processes more efficient or quicker, which is the aim of automation, digital transformation requires individuals to rethink old processes and reimagine new processes and decisions.

2.7 What Does the Future Hold for Digital Transformation?

There is a general consensus among industry experts and professionals that digital transformation needs to be an integrated and continuous part of any overall business strategy. Many companies are creating new digital departments and hiring digital specialists in several different divisions with the aim of driving their digital transformation strategy. The International Data Corporation (IDC), global provider of market intelligence, predicted that by 2018, the number of Internet of Things (IoT) devices will double. In part because of this, mobile application development should not be expected to slow down anytime soon. More importantly, IDC predicts that digital transformation (DX) will reach a macroeconomic scale and impact. "Over the next three to four years, DX efforts will no longer be "projects", "initiatives", or "special business units" for most enterprises. In effect, every (growing) enterprise—no matter its age or industry—will become a "digital native" in the way its executives and employees think and how they operate" (Gens 2016).

Gartner also recognizes the impact of digital transformation now and in the foreseeable future (Forni 2016). For example, Gartner states that by 2021, 20 percent of individual daily engagement will involve at least one of the digital giants. At the time of publishing, the top seven digital giants were Google, Apple, Amazon, Baidu, Facebook, Alibaba, and Tencent.

References

Auriga (2016) Digital transformation: history, present, and future trends. https://auriga.com/blog/digital-transformation-history-present-and-future-trends/. Retrieved 15 June 2017

Bendor-Samuel P (2017) The power of digital transformation in a data-driven world. https://www.forbes.com/sites/peterbendorsamuel/2017/07/21/the-power-of-digital-transformation-in-a-data-driven-world/#4e1837393f2c. Retrieved 14 Oct 2017

Berman SJ (2012) Digital transformation: opportunities to create new business models. Strateg Leadersh 40(2):16–24

Brennan S, Kreiss D (2014, September 8) Digitalization and digitization. http://culturedigitally.org/2014/09/digitalization-and-digitization/. Retrieved 17 Aug 2017

Dörner K, Edelman D (2015, July) What does digital really mean? https://www.mckinsey.com/industries/high-tech/our-insights/what-digital-really-means. Retrieved 11 June 2017

Forni A (2016) Gartner reveals top predictions for IT organizations and users in 2017 and beyond. www.gartner.com/newsroom/id/3482117. Retrieved 17 Aug 2017

Gens F (2016, November) IDC FutureScape: worldwide IT industry 2017 predictions [PDF]. International Data Corporation, Framingham.

Hammer M, Champy J (1993) Reeingineering the corporation. Harper Business, New York, NY

i-SCOOP (2016) Digitization, digitalization and digital transformation: the differences. https://www.i-scoop.eu/digitization-digitalization-digital-transformation-disruption/. Retrieved 25 April 2017

Manoff M (2006) The materiality of digital collections: theoretical and historical perspectives, vol 6(3). Johns Hopkins University Press, Baltimore. Portal: Libraries and the Academy. p. 311

Moore S (2015) Digitalization or automation – is there a difference? http://www.gartner.com/smarterwithgartner/digitalization-or-automation-is-there-a-difference/. Retrieved 31 July 2017

Pinch TJ, Trocco F, Pinch TJ (2009) Analog days: the invention and impact of the Moog synthesizer. Harvard University Press, Cambridge

Proctor J (2017) Digital transformation vs. business process reengineering (BPR). http://content.inteqgroup.com/digital-transformation-vs-business-process-reengineering. Retrieved 11 Oct 2017

Surber K (2016) The drive to digitization and the impact on your business and customers. http://blogs.cisco.com/partner/the-drive-to-digitization-and-the-impact-on-your-business-and-customers. Retrieved 25 Aug 2017

Westerman G, Calméjane C, Bonnet D, Ferraris P, McAfee A (2011) Digital transformation: a roadmap for billion-dollar organizations (PDF). MIT Center for Digital Business and Capgemini Consulting, Paris

Chapter 3
Digital Transformation of Business Models

Summary
This chapter introduces relevant definitions for elements pertaining to the digital transformation of business models. These definitions are developed based upon existing definitions from the field of digital transformation. The concept of a business model is also explained. Lastly, the definition and development of the digital transformation of business models is presented.

3.1 Digital Transformation

There is currently no single, commonly accepted definition for the term digital transformation, although we have arrived at one for the purposes of this book. Moreover, the terms digitization, digitalization and the digital age are often used interchangeably (BDI and Roland Berger 2015: 4). Selected definitions referring to digital transformation are shown in Table 3.1.

BMWi does not explicitly define their concept of digital transformation, but does emphasize the importance of digitalization. Digitalization is considered to be a networking of all areas of business and society. In addition, digitization is the ability to collect relevant information, analyze it and translate into actions, which is linked to the topics of big data and analytics (BMWi 2015: 3).

Bowersox et al. use the term digital business transformation and their definition includes the process of redefining a business, digitizing processes, and expanding relationships across multiple value-added chains. They see the challenge for management to be leading companies and leveraging the full potential of information technology along the entire value chain (Bowersox et al. 2005: 22). Several dimensions of digital transformation are relevant.

Westerman et al. understand the role of technology in digital transformation to be the enhancement of the performance or the reach of companies. The use of new

D. R. A. Schallmo, C. A. Williams, *Digital Transformation Now!*, SpringerBriefs in Business, https://doi.org/10.1007/978-3-319-72844-5_3

Table 3.1 Selected definitions of the term "digital transformation"

Reference	Definition
BMWi (2015: 3)	Digitization stands for the complete networking of all sectors of the economy and society, as well as the ability to collect relevant information, and to analyze and translate this information into actions. The changes bring advantages and opportunities, but they create completely new challenges
Bowersox et al. (2005: 22ff)	Digital Business Transformation is a "process of reinventing a business to digitize operations and formulate extended supply chain relationships. The DBT [Digital Business Transformation] leadership challenge is about reenergizing businesses that may already be successful to capture the full potential of information technology across the total supply chain"
Westerman et al. (2011: 5)	"Digital Transformation (DT)—the use of technology to radically improve the performance or reach of enterprises—is becoming a hot topic for companies across the globe. Executives in all industries are using digital advances such as analytics, mobility, social media, and smart embedded devices—and improving their use of traditional technologies such as ERP—to change customer relationships, internal processes, and value propositions"
Mazzone (2014: 8)	"Digital Transformation is the deliberate and ongoing digital evolution of a company, business model, idea process, or methodology, both strategically and tactically"
PwC (2013: 9)	Digital transformation describes the fundamental transformation of the entire business world through the establishment of new technologies based on the internet with a fundamental impact on society as a whole
Boueé and Schaible (2015: 6)	We understand digital transformation as a consistent networking of all sectors of the economy and adjustment of the players to the new realities of the digital economy. Decisions in networked systems include data exchange and analysis, calculation and evaluation of options, as well as initiation of actions and introduction of consequences

technologies serves to address the following dimensions: operational processes, customer experiences, and business models (Westerman et al. 2011).

Mazzone (2014: 8) defines digital transformation as the conscious and ongoing digital evolution of a company, a business model, an idea, a process, or a method, which can be both strategic and tactical. This definition shows that digital transformation can also relate to different dimensions.

PwC (2013: 9) defines the digital transformation as a transformation of the corporate world through the establishment of new technologies based on the internet that impact society as a whole. It is clear that the use of new technologies is at the forefront of this definition.

Bouée and Schaible (2015: 6) understand this trend as the networking of all economic sectors and the adaptation of the actors to new realities of the digital economy. To do so involves decisions about networked systems, which includes data exchange and data analysis, the calculation and evaluation of options, as well as the initiation of actions and the introduction of consequences.

Digital Transformation

The digital transformation framework includes the networking of actors, such as businesses and customers, across all value-added chain segments (BMWi 2015: 3; Bowersox et al. 2005: 22; Boueé and Schaible 2015: 6), and the application of new technologies (PwC 2013: 9; Westerman et al. 2011: 5). As such, digital transformation requires skills that involve the extraction and exchange of data as well as the analysis and conversion of that data into actionable information. This information should be used to calculate and evaluate options, in order to enable decisions and/or initiate activities (BMWi 2015: 3; Boueé and Schaible 2015: 6) which increase the performance and reach of a company (Westerman et al. 2011: 5). Digital transformation involves companies, business models, processes, relationships, products, etc. (Bowersox et al. 2005: 22; Mazzone 2014: 8).

3.2 Business Model

To fully address this trend, it is important to first define the term, "business model."

Definition 1: Business Model (Schallmo 2013: 22)

A business model is the basic, underlying logic of a company which describes what benefits are provided to customers and partners. A business model answers the question of how the benefits provided by the company also flow back into the company in the form of revenue. The value created enables a differentiation from competitors, the consolidation of customer relationships, and the formation of competitive advantage. A business model involves the following dimensions and elements:

- The *customer dimension* contains the customer segments, customer channels, and customer relationships.
- The *benefit dimension* includes products, services, and values.
- The *value-added dimension* includes the resources, skills, and processes.

(continued)

– The *partner dimension* includes partners, partner channels, and partner relations.
– The *financial dimension* includes revenues and expenses.

The objective is to combine the business model elements in such a way that they mutually reinforce each other. Thus, it is possible to achieve growth in a way that is difficult for competitors to imitate.

3.3 Digital Transformation of Business Models

Based on the aforementioned statements and the definition of Business Model Innovation (Schallmo 2013: 29), we define the digital transformation of business models as follows:

Definition 2: Digital Transformation of Business Models

The digital transformation of business models relates to individual business model elements, the entire business model, value-added chains, as well as the networking of different actors in a value-added network.

The degree of the digital transformation relates to the incremental (marginal) as well as the radical (fundamental) change of a business model. The reference unit with regards to the level of novelty is primarily the customer, but it can also affect its own business, partners, industry, and competitors.

Within the digital transformation of business models, enabler(s) or technologies (e.g., big data) are used to generate new applications or services (e.g., on-demand predictions). These enablers require skills that make data collection and exchange, as well as analysis, possible, which the enablers must be able to use to calculate and evaluate options. The options are then used to initiate new processes within the business model.

The digital transformation of business models is based on an approach which includes a sequence of tasks and decisions that are related to one another in a logical and temporal context. It affects four target dimensions: time, finance, space, and quality.

Figure 3.1 presents digital transformation of business models definitions and components.

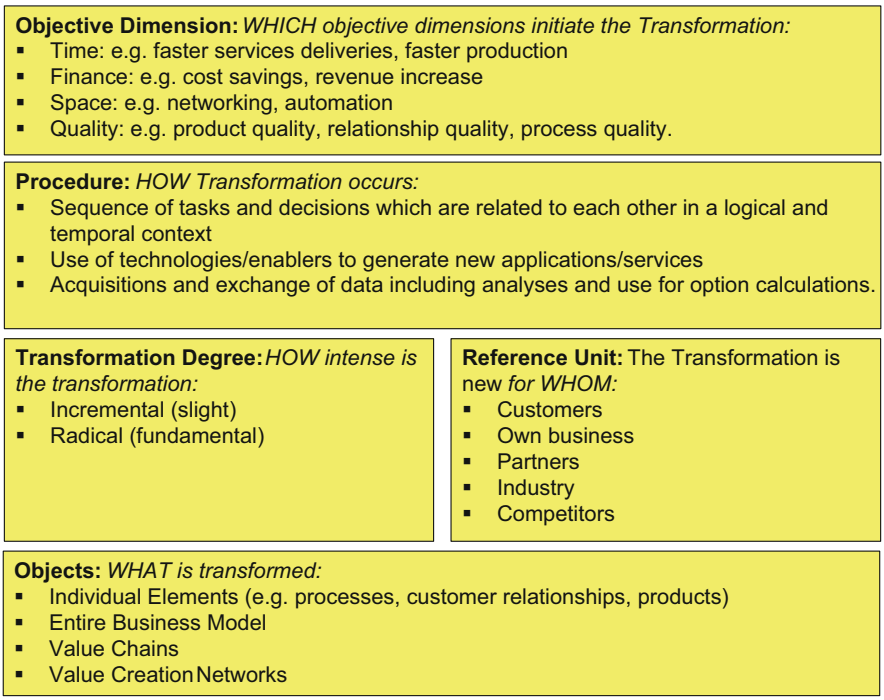

Fig. 3.1 Digital transformation definition

References

BDI, Berger R (2015) Analysen zur Studie – Die Digitale Transformation der Industrie. Roland Berger Strategy Consultants und Bundesverband der Deutschen Industrie e.V, Berlin

BMWi (2015) Industrie 4.0 und Digitale Wirtschaft – Impulse für Wachstum, Beschäftigung und Innovation. Bundesministerium für Wirtschaft und Energie, Berlin

Bouée CE, Schaible S (2015) Die Digitale Transformation der Industrie. Roland Berger Strategy Consultans und Bundesverband der Deutschen Industrie e.V., Berlin

Bowersox DJ, Closs DJ, Drayer RW (2005) The digital transformation: technology and beyond. Supply Chain Manag Rev 9(1):22–29

Mazzone DM (2014) Digital or death: digital transformation: the only choice for business to survive smash and conquer. Smashbox Consulting

PwC (2013) Digitale Transformation – der größte Wandel seit der industriellen Revolution. PwC, Frankfurt

Schallmo D (2013) Geschäftsmodelle erfolgreich entwickeln und implementieren. Springer, Wiesbaden

Westerman G, Calméjane C, Bonnet D, Ferraris P, McAfee A (2011) Digital transformation: a roadmap for billion-dollar organizations (PDF). MIT Center for Digital Business and Capgemini Consulting, Paris

Chapter 4
Selected Examples Demonstrating the Digital Transformation of Business Models

Summary
This chapter presents four case studies, each of which exemplifies the successful digital transformation of a business model. Each example showcases the initial starting point, problem definition, the objectives, a solution approach, the results and application to the first phase of the model.

Initial Situation and Problem Definition
In this section, the selected company's current situation and problems will be outlined. These are important points to discuss not only to get a better understanding of why a company chose a particular approach to the digital transformation of their business model but also to understand potential alternatives.
Objective and Solution Approach
In this section, the objective of the company's digital transformation of their business model and their solution approach will be outlined.
Results and Application to Model
The Venn diagram below portrays the key factors one should consider when initially taking the first steps towards the digital transformation of a business model. The initial step requires a thorough evaluation of the business model in search of opportunities for digital transformation. The next step is called Digital Reality, which is the beginning of our Roadmap to the digital transformation of business models. This will be further discussed in the final section, Application to Model.

Figure 4.1 presents the Venn diagram serves as a preface to our Roadmap.

First Circle: Data to Be Utilized
The first circle, "Data which could be utilized," depicts the broad world of information which could potentially be quantified, digitized, analyzed, shared, etc. but is

D. R. A. Schallmo, C. A. Williams, *Digital Transformation Now!*, SpringerBriefs in Business, https://doi.org/10.1007/978-3-319-72844-5_4

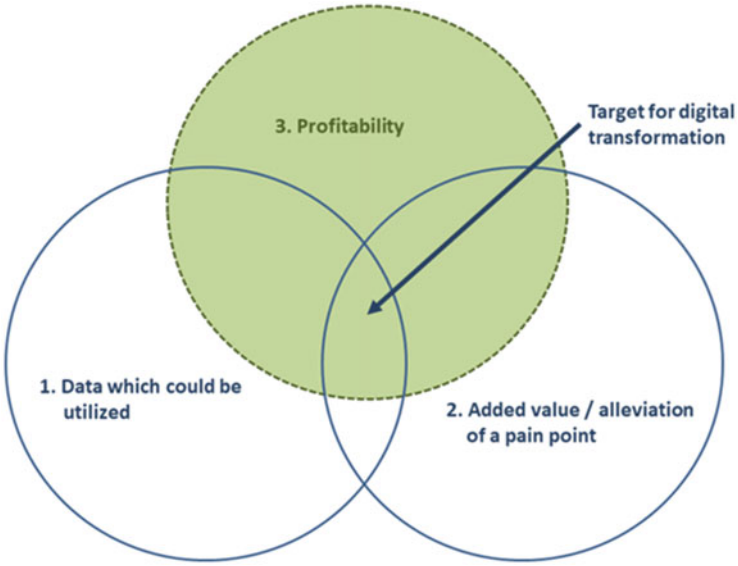

Fig. 4.1 Venn diagram as a preface to our Roadmap

currently lying fallow. With the broad array of sensors and transmitters currently available and the omnipresence of cheap, ubiquitous computing, this circle is ever expanding. Of course, not all theoretically harvestable data can or should be collected. One could, for example, equip a coffee mug with a wireless modem and a barometer and begin collecting and transmitting air pressure and altitude data, but unless the end user or the manufacturer have an interesting value-added idea for what to do with that information, this new, java-filled member of the Internet of Things would simply be an overpriced mug with superfluous functionality, not the expression of a beneficial, digital business model transformation.

Second Circle: Added Value and Alleviation of a Pain Point

That is why the second circle, "Added value/alleviation of a pain point," is so important. From the broad universe of potentially quantifiable data, unutilized information must be identified which has the potential to solve a problem or create additional value for customers, suppliers, subsidiaries, or departments within the company which is seeking to digitally transform its business model. It should be noticed that most of circle two does not overlap with circle one. That is because there are many ways to create value or solve problems which have little or nothing to do with processing hitherto unutilized data. Extending the length of a warrantee or paying invoices faster might be excellent examples of the successful "analog" transformation of a business model, and while these "analog" transformations too may be essential, they simply do not fall under the purview of this book.

Third Circle: Profitability

The core function of any business is to generate returns on investments and to those ends the third circle (and criterion) when evaluating a business model for digital transformation potential is profitability. One could imagine many changes to services, products, or processes which might make good use of unutilized data & add value for customers, employees, or partners, but which fail the third and final test-sustained, long-term profitability. A furniture store could, for example, create an online portal which collects and presents competitors' products and prices in addition to its own, so that customers can compare and shop for furniture more quickly and easily. This would obviously fit inside the overlap of circles one and two in our Venn diagram. Previously neglected data is being utilized in a way that alleviates a pain point for an external stakeholder, namely the customer. So far so good. But if the end result of this online furniture comparison portal is that customers are driven to a competitor's discount warehouse who is able to offer lower prices because they save money on overhead by not offering things like free comparison portals to their customers, then the customer-centric furniture store has undermined its business model rather than digitally transformed it.

Non-profit or academic institutions may not technically be seeking a profit, but they do typically work within the context of limited resources and are hence obligated to their stakeholders to use their budgets as efficiently as possible in the service of their institution's stated mission. Non-profit-oriented organizations can view the third circle of the diagram as "ROI maximization," or stated colloquially, "The most bang for the buck."

In any case, the overlap of these three criteria—potentially utilizable data (circle one), utility for stakeholders (circle two), and profitability (circle three), creates a narrowed target zone in which to hunt for digital transformation potential during the initial brainstorming process.

Application to Model

The Venn diagram depicted above serves as a preface for the Roadmap for the digital transformation of business models, which is outlined in greater detail in Chap. 6 of this book. The Roadmap for the digital transformation of business models is broken down into five phases, and the first of these phases is *Digital Reality*. Using *Digital Reality* as our guide, the following dimensions will be applied to each of the four case studies in this chapter:

- *Customer dimension*
- *Benefit dimension*
- *Value-added dimension*
- *Partner dimension*
- *Financial dimension*

The purpose is to show different examples of how current business models can be evaluated. Later in Chap. 6, the entire Roadmap for the digital transformation of business models, complete with activities and tools, will be enumerated and applied to a single industry in an additional case study.

4.1 Hagleitner senseManagement

Hagleitner is an Austrian manufacturer of sanitary products and sanitary product dispensers. In addition to liquid cleaning and disinfecting agents, they also manufacture paper towel dispensers and dispensers for liquid soap solutions. Hygiene training courses are also offered to their customers.

Most of Hagleitner's customers are in the healthcare, catering, and food industries, as one might expect given the demanding hygiene standards required by law in these industries (Hagleitner 2016a).

Selected Hagleitner products are shown in Fig. 4.2.

Initial Situation and Problem Definition

Hagleitner helps customers meet hygiene requirements by selling and delivering dispensers, especially touchless dispensers, and related supplies. The supplies (e.g., liquid soap and paper towels) are designed to allow easy and quick refilling.

The increasing hygiene requirements from customers, a lack of transparency as to which and when a dispenser must be refilled, unsuitable human resource planning that caused high personnel costs, burdensome supply inventory planning, and excessive inventories led Hagleitner to develop a new system: Hagleitner senseManagement (Hagleitner 2016b).

Objective and Solution Approach

The objective of Hagleitner's senseManagement is providing a benefit to customers by monitoring dispensers' supply levels with sensors. This achieves cost and time savings when refilling the dispensers. Additionally, customer and user satisfaction has risen due to the increased availability of necessary hygiene items.

The system consists of dispensers (e.g., soap dispensers, disinfectant dispensers, paper towel dispensers, and air fresheners) with integrated sensors that measure the current fill level and send the data to a base station. This base station sends the data to a Hagleitner server that provides this data to customers (e.g., cleaning staff) via internet-enabled devices.

The benefit for customers is the increased transparency regarding consumption and costs, which allows for more precise and accurate material and personnel planning calculations. The benefit for Hagleitner is that their own production planning and inventory levels can also be optimized, which has resulted in significant cost reductions (Hagleitner 2016b).

The Hagleitner senseManagement concept is shown in Fig. 4.3.

Results

Hagleitner's decision to create the senseManagement system is an example of digitalization and developing and utilizing dispenser sensor data is an example of digitalization. Their senseManagement system's data collection aims to increase transparency between Hagleitner and their customers, improve inventory planning, and increase customer and end user satisfaction. Some of these issues could have been addressed in other ways, such as by digitizing other product lines. From the universe of theoretically useful data, other data streams could have been leveraged.

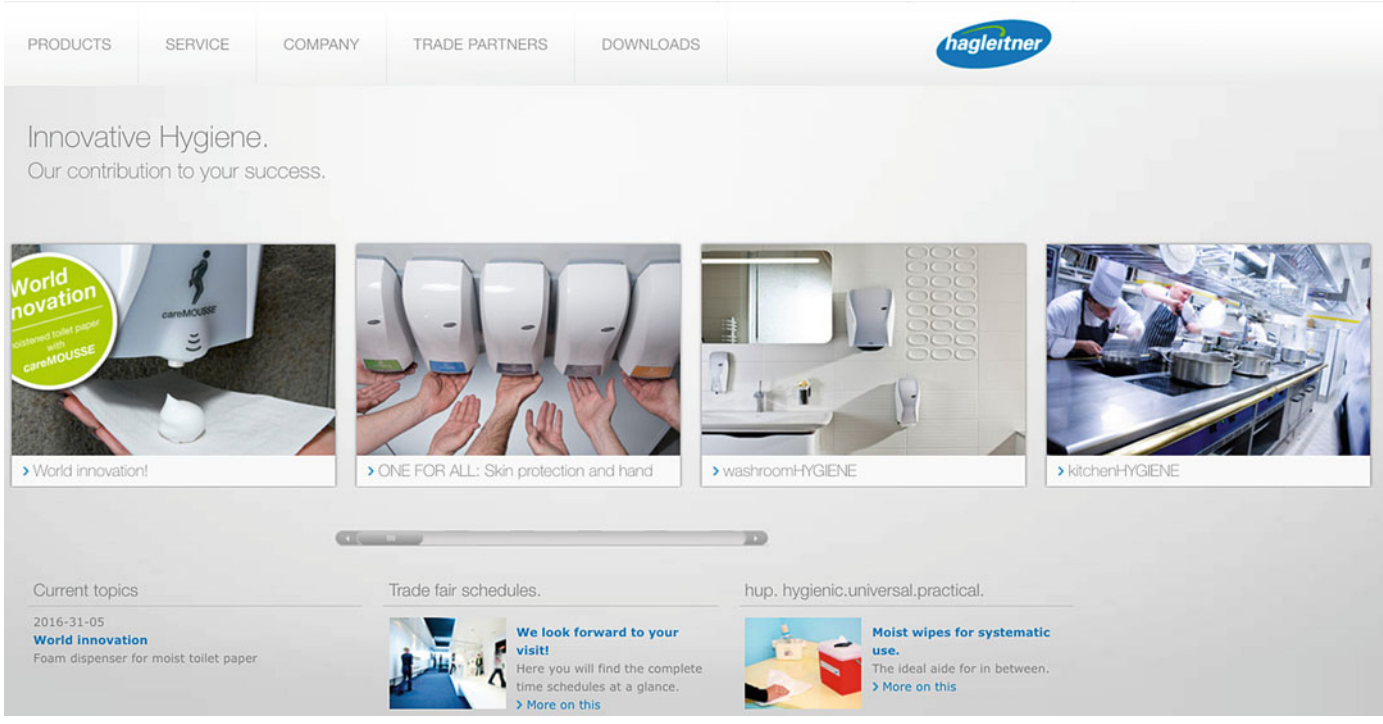

Fig. 4.2 Selected Hagleitner products (Source: Hagleitner 2016a)

Fig. 4.3 Hagleitner's senseManagement system (Source: Hagleitner 2016a)

For example, Hagleitner could have considered implementing toilet paper dispenser sensors which indicate the current number of rolls of toilet paper remaining and when the toilet paper dispenser needs to be refilled.

New standards and/or customer requirements often result in the changing of pricing strategies by the manufacturer, new prices which are not always immediately transparent to the customer. A dearth of real-time stock keeping data and usage patterns had resulted in a lack of transparency and ineffective inventory planning. The implementation of the senseManagement system addressed these problems and provided added value to the customer and to Hagleitner.

The toilet paper dispenser sensor could also have addressed these issues and provided some additional value to the senseManagement system. When considering the different areas of a restroom, some parts, such as stalls, are not always accessible. The location of soap dispensers allows facility managers constant access but that's not true of stalls.

From the customer's perspective, the soap dispenser or toilet paper dispenser sensor would both increase profitability by providing more transparency with regards to costs, allowing for more accurate inventory planning and more efficient personnel planning.

Due to limited access to the toilet stalls, the customers' employees would know immediately when toilet paper needed to be refilled, reducing pointless trips to the restrooms and ensuring a comfortable experience for end users.

The added value for the customer of the soap dispenser sensor or the toilet paper dispenser sensor could be considered and compared ad nauseum but the final and

decisive test is the potential profitability of each digitalization pathway. While a toilet paper dispenser sensor may have offered more overall value to the customer than a soap dispenser sensor, more practical, profit-oriented considerations may have prevailed. One reason why Hagleitner might have decided on the soap dispenser over the toilet paper dispenser is that it required less engineering problem solving and in turn a quicker development process and roll-out. The decision to include either the soap dispenser sensors or the toilet paper dispenser sensors depended on the perceived value by the customer but also on whether this value could be translated into higher profits for Hagleitner.

Application to Model

Hagleitner's road to the digital transformation of their business model involved several critical self-evaluations of their current situation, potential alternatives, as well as an initial look at their proposed solution. This all-important period of reflection corresponds to the first phase of the Roadmap to the digital transformation of business models; discovering their Digital Reality.

Hagleitner's customer dimension

Hagleitner looked at the current requirements of their customers and noticed a discrepancy between their own expectations and those of their customers. These mismatched expectations also affected the customer channels.

The strength and trust of communication between Hagleitner and their customers was tested by their different expectations. Hagleitner recognized that their expectations need to be better aligned but also Hagleitner also needed to provide better transparency.

Hagleitner's benefit dimension

Hagleitner saw the new customer requirements were important to their customers and developed their senseManagement system to meet these requirements. (e.g. increased transparency). The toilet paper dispenser would also have delivered this benefit but it might have come down to which solution created would have strengthen the customer relationship more and generated more enthusiasm.

Hagleitner's value-added dimension

Hagleitner recognized that they possess the internal know-how to develop a senseManagement system and the underlying components like soap dispensers. Hagleitner would most certainly also have had the resources and capabilities to develop a toilet paper dispenser. For Hagleitner, when considering the soap dispenser or toilet paper dispenser for their senseManagement system, the deciding factor might have been the industry's current value-added chain and how Hagleitner would want to be positioned on this chain.

Hagleitner's partner dimension

Based on insights from the customer dimension, Hagleitner discovered that their customers were more price-sensitive and more concerned with personnel scheduling than Hagleitner had previously thought. Based on these two realizations, Hagleitner saw an opportunity to improve their partner relations with promises of better transparency and introducing a partner channel which created more efficient personnel scheduling with their senseManagement system.

Hagleitner's financial dimension

As previously mentioned in the value-added dimension, when Hagleitner was considering whether to develop a soap dispenser or a toilet paper dispenser the final decision would have been heavily influenced by how much a customer would be willing to pay for this benefit and how much would it cost to develop said benefit. Put simply, profitability was a critical factor is the digital transformation of Hagleitner's business model.

4.2 ThyssenKrupp Elevator MAX

ThyssenKrupp is a German industrial group with different divisions. The Elevator Technology division produces passenger and freight elevators as well as escalators for office buildings, residential buildings, hotels, airports, shopping centers, and other facilities. In addition to the sale and installation of elevators and escalators, maintenance, repair, and modernization services are also offered (ThyssenKrupp 2016a).

Initial Situation and Problem Definition

ThyssenKrupp's current business model mainly focused on the manufacturing of elevators, installing them, and carrying out maintenance when needed. An increasing number of tall buildings in major cities led to an increased demand for high-performance elevators. Furthermore, customers and users demanded superior elevator reliability. In addition, several already-installed elevators posed a risk to users due to maintenance backlogs (ThyssenKrupp 2016b; Wetzel 2016).

Additionally, ThyssenKrupp's competitors also offered elevator maintenance services, services which are high margin compared to pure product sales (Dispan 2006: 22; Odermatt and Kressbach 2011).

Objective and Solution Approach

The objective of ThyssenKrupp's elevator business was to reduce the outage duration of their elevators by identifying causes of potential failure in a timely manner. This would ultimately allow for faster maintenance and repair times. To address this concern, they created the MAX, Elevator Monitoring System.

A timely identification of potential causes of outages requires a real-time flow of information which provides key insights into the elevator's current status. To accomplish this, they outfitted ThyssenKrupp's elevator components, such as drive motors, elevator doors, and elevator shafts, with sensors. These sensors collect information such as the cabin speed and motor temperature. The information obtained is then evaluated with the help of predictive analytics and provided to employees, who are responsible for maintenance and technology. These employees now receive warning alerts as well as maintenance guidance and recommendations.

These changes allowed ThyssenKrupp to carry out maintenance work proactively, thus reducing elevator downtime. In addition, costs, resources, and maintenance planning were improved (CGI 2016).

Fig. 4.4 ThyssenKrupp's MAX concept (Source: ThyssenKrupp 2016b)

Figure 4.4 shows ThyssenKrupp's MAX concept.

Results

ThyssenKrupp's MAX Elevator Monitoring System is an example of a maintenance-oriented digitization initiative. MAX collects relevant technical and mechanical information through sensors to reduce maintenance backlogs and improve ThyssenKrupp's overall maintenance services. Put simply, information that was being ignored before is now being collected and utilized to provide value to customers and create profit for ThyssenKrupp—a textbook example of the digital transformation of a business model.

One could also imagine other opportunities for digital transformation which ThyssenKrupp could avail themselves of. For example, an interactive screen/billboard could be implemented into select models of elevators. These touch screens could add value to a wide swath of stakeholders. The interactive elevator billboard could be used by ThyssenKrupp to collect customer satisfaction feedback or the interactive elevator billboard space could be leased or sold outright to end users or third-party advertising agencies. End users could use the interactive elevator billboard space to increase company awareness or collect employee feedback on certain company events, while third party advertisers could use the screen to serve highly-targeted ads to a captive audience.

ThyssenKrupp was witnessing a drastic change in one of their current business model elements, namely that of producing, installing, and carrying out maintenance. Similar to Hagleitner, the customer maintenance requirements were changing and ThyssenKrupp needed to come up with a solution. The sole purpose of the MAX is to gather and take advantage of data and utilize modern predictive analytics to better evaluate and predict maintenance issues.

The proposed interactive elevator billboard space would have addressed another opportunity to add value; workplace communication and a chance to introduce a new media channel and marketing platform into an otherwise barren environment. Effective maintenance services are an obvious priority add-on for a major elevator manufacturer like ThyssenKrupp but an in-elevator touch screen digitization initiative could also have been valuable. The idle-time spent riding the elevator could be seen as a golden opportunity to broadcast information to or collect information from elevator riders. ThyssenKrupp's Max system increased profitability by offering a premium maintenance add-on service which promises to decrease maintenance backlogs.

The proposed interactive elevator billboard space could have provided an additional revenue stream via one-time sales or third-party leasing agreements. Alternatively, advertising revenue from the screens could be used to subsidize the initial list price of the elevator for builders and contractors, allowing ThyssenKrupp to position its products at more competitive price points while maintaining healthy margins vis-à-vis their competitors.

ThyssenKrupp's final decision to implement the MAX system could have stemmed from the realization that their in-house maintenance know-how was not being fully utilized. The increase of revenue through new advertisement space could still be an attractive proposal if ThyssenKrupp believes that such communication expertise exists in the company and can be further leveraged to create additional revenue streams for the company. Comparing the two examples, ThyssenKrupp's MAX maintenance system could be seen as a more pressing need, given their core competencies.

Application to Model

ThyssenKrupp digitally transformed their business model by developing an innovative maintenance management system. ThyssenKrupp's MAX system delivered a data-driven maintenance system which created new benefits for their customers and in turned generated a new revenue stream. The following sections will apply our Digital Reality analysis to ThyssenKrupp's MAX system and compare it to the theoretical, potential alternatives which they could have pursued but did not.

ThyssenKrupp's customer dimension

Similar to the previous case study, ThyssenKrupp's maintenance-oriented customer dimension in their business model was digitally transformed by their MAX system. ThyssenKrupp's customer requirements were becoming more demanding and with their MAX system, customers were willing to pay more for the increased valued to the customer segment element. The MAX system provided clear communication with regards to maintenance repairs and improved their customer relations.

The MAX system introduced an innovative data-driven digital initiative that spoke directly their customer's and ThyssenKrupp's maintenance department. Although the MAX system included additional costs for their customers, the improved long-term relationship and trust between the partners outweighed the costs.

The interactive elevator billboard space takes advantage of underutilized space in the elevators and create a new customer channel. This form of advertisement could create a unique customer relation platform and reaches customers who would be unexpectedly shown commercials and could provide invaluable insights through interactive advertising campaigns.

ThyssenKrupp's benefit dimension

The enhanced transparency with regards to the maintenance requirements provided excellent benefits for all stakeholders. ThyssenKrupp recognized it was essential to create a new digital-driven process but the real benefit for both ThyssenKrupp and their customers was the access to data allowing for real-time maintenance alerts.

High excitement could be generated when elevator riders are presented with an opportunity to provide personal feedback. The touchscreen itself is a relatively uncomplicated technology and its development and installation should easily deliver the benefit of revenue generating advertising or gathering personal feedback.

ThyssenKrupp's value-creation dimension

The data and capabilities (i.e. resources) for such real-time maintenance alerts was available but there was not any process within ThyssenKrupp's business model that specifically took advantage of such resources. Once ThyssenKrupp realized the importance and value of such an innovative maintenance system, it is clear that the development of the MAX system would be able to fulfill this value proposition. The gathered data and simultaneous deliver to both the internal and external stakeholders created tremendous value.

ThyssenKrupp would probably possess the internal capabilities to develop their own interactive elevator billboard space but the development of actual content could also be handed by other external stakeholders. Once the actual space is created, the process of creating content could be handed off to marketing departments.

ThyssenKrupp's partner dimension

ThyssenKrupp's partners are an important part of the business model and to better integrate the partners in their business model, the value of ThyssenKrupp's maintenance services needed to be communicated. In the industry's value-added chain, the communication of maintenance repairs needs to be clearly communicated to the partners and the MAX system was able to deliver which in turn improved the relations between ThyssenKrupp and their partners.

The partners' involved in the development of an interactive elevator billboard space would depend on who delivers the actual content. Again, ThyssenKrupp could use this space to obtain feedback about the overall elevator experience but third-party companies could use the space to communicate to their own demographics.

ThyssenKrupp's financial dimension

The consideration of either developing a data-driven maintenance system like the MAX system or an interactive screen/billboard ultimately depends on the potential revenue and expenses. The revenue stream created by the MAX system could potentially have a better long-term effect with regards to revenue. The importance of an innovative maintenance system might outweigh the potential additional revenue stream of an interactive screen/billboard. The one argument for an interactive screen/billboard could have been the expenses. The MAX system would involve considerable financial investment but an interactive screen/billboard would have involved a smaller investment.

The financial dimension would be affected by an interactive elevator billboard space by providing an additional revenue either to ThyssenKrupp or their partners. For example, ThyssenKrupp could require a rental fee for the space or simply include a surcharge in the purchase of one of their elevators. Another example involving their partners could be pay per click revenue mechanism similar to Google.

4.3 Dynasens in Outpatient Care

Dynasens is a research project which investigates technical solutions to reduce physical and mental stress among outpatient nurses. To these ends, they use dynamic, sensor-based personnel and personnel deployment and tour planning in nursing. It was a research project investigating technical solutions to reduce physical and mental stress among outpatient nurses (Dynasens 2016).

Initial Situation and Problem Definition
One challenging aspect of outpatient care is that nurses are increasingly suffering from the symptoms of physical and mental stress. Repetitive stress injuries arise due to high physical demands and mostly manifest themselves in the limitation of the body's functions due to the damage and impairment of the skeleton, the joints, and the muscles. Mental symptoms include lower job satisfaction and chronic fatigue. Nurses face stresses from hard deadlines and a lack of creative possibilities/freedom.

Objective and Solution Approach
The objective of the project was to provide outpatient nursing staff physical relief through adjustments in individual ergonomic postures. For example, documentation requirements can be reduced in order to alleviate time pressures. Additionally, their documentation responsibilities can be improved so that it allows nurses to maneuver more easily while performing their duties.

The approach which they developed was divided into three areas: a shirt sensor to detect movements and postures, automated documentation, and dynamic personnel deployment and tour planning.

The sensor shirt detects movements and postures that can help promote physical relief. Integrated sensors were developed that are sewn directly into the work attire. This captures a nurse's posture and movements to create a body stress profile. This body stress profile then allows for the identification of improper postures that create stresses and can be used to develop stress reduction training programs. Ultimately, improvements in this area can lower illness- or stress-related absences. Moreover, the body stress profile can provide ideas to improve work functions and procedures to achieve positive transformation.

Some automated documentation of care services is possible by utilizing sensor data. For example, it is possible to determine nursing care activities through data derived from the movement patterns which is then matched with the specified care services. The collected data can be read directly from mobile devices and released by the nursing staff to transfer the data into the care services maintenance software. Therefore, the services provided can be captured completely and in a timesaving manner.

Additionally, dynamic personnel deployment and tour planning was done via software that can accommodate short-term and unplanned events (e.g., personnel shortages or patient delays). Moreover, a combination of employee stress and qualification profiles can be compared and matched to patient requirement profiles.

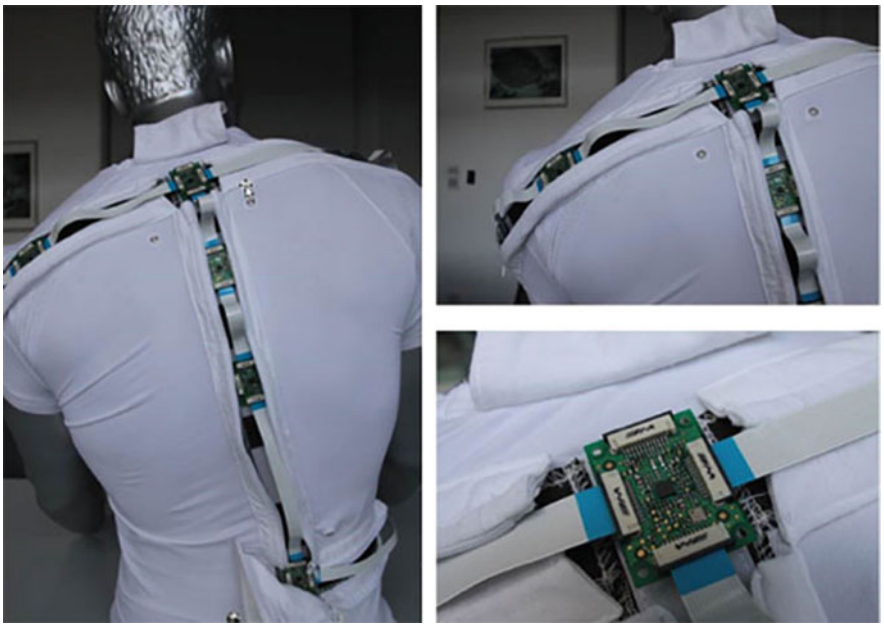

Fig. 4.5 Dynasens' shirt sensor (Source: Starringer 2016)

This would ensure that those in need of care are accommodated by the appropriate caregivers (Dynasens 2016).

Dynasens' shirt sensor is shown in Fig. 4.5.

Results

Dynasens' digitization initiative focused on improving the workplace environment for their nurses. Dynasens used dynamic sensors which embedded into the nurses' clothing and were worn as the nurses went about their work day. The sensors captured motion, position, and orientation data. Once the data had been collected, it was analyzed with the goal of improving ergonomics and workplace layout, and reducing redundant or stressful motions, all of which it was hoped would ultimately result in fewer illness- and injury-related absences and improve the quality of life for the nurses.

Once again, we can contrast and compare the digitalization which Dynasens actually conducted with digital transformations that Dynasens could have (and still could) implement. While a focus on employee ergonomics is certainly understandable, there are other ways to improve the functionality of hospitals and in ways that more directly affect patient outcomes. A sophisticated software diagnostic system like IBM's Watson Health not only has the capability to store endless amount of medical information but also to understand and use language, suggest and assess diagnoses, analyze patient data, and ultimately help doctors make critical medical decisions (Friedman 2014). By giving doctors and nurses access to such a powerful

tool, doctors could diagnosis diseases earlier and more accurately, improving patient outcomes, and both doctors and nurses could spend their time more efficiently.

Healthcare industry experts and researchers can all agree that the physical and mental stress of their health employees particularly the nurses is difficult to manage. Dynasens' digitization initiative included the collection of posture and movement data and this information was analyzed and used to develop nurse body profiles. The nurse profiles aim to create awareness about their overall health and the decrease of absences.

A sophisticated diagnostic system like Watson could benefit not only nurses but also doctors. While providing diagnostic support for nurses, Watson would also allow for the more efficient use of physicians' time which could reduce physical and mental stress. While access to a supercomputer such as Watson might have been out of many institutions' fiscal reach in the past, in recent years these kinds of resources have become increasingly ubiquitous to the point that they are feasible not only for large corporations but also small and mid-cap companies and even nonprofit institutions like Dynasens.

Both the study of worker ergonomics and the addition of a powerful AI tool such as IBM's Watson would add value for Dynasens' healthcare client. But in a world of constrained resources, which avenue of digital transformation allows the non-profit Dynasens initiative to achieve the greatest impact with its limited budget? Employee absences affects productivity, team performance, and impacts hospital budgets. If employees call in sick, this requires other employees to cover these tasks and work longer hours. These overtime hours need to be paid by the employer, increasing the total wages paid. The development of nurse body profiles aims to reduce these absences.

A sophisticated diagnostic system could be profitable for healthcare clients by increasing the time efficiency of doctors and nurses. The diagnostic system could be sold to healthcare institutions with the promise of quicker diagnoses and potentially quicker hospital releases.

Wearable sensors are a low-cost digitization initiative compared to the implementation of a supercomputer and subsequent analysis of the resulting data. Although supercomputers are become more accessible, the cost is still significantly higher than the ergonomics research. Ultimately, the wearable sensors offer a low risk, high reward digitization initiative which could have made it hard for Dynasens to pass up.

Application to Model

The Dynasens project attempted to change healthcare-industry's business model by introducing reasonable priced dynamic sensors on their healthcare employees. The digital transformation of the business model aimed at improving their nurses' ergonomics and through these health awareness tools, nurses would gain a better understanding of their workplace physical and mental stress preventing frequent absence. Below, the first phase of the Roadmap will be applied and show exactly how Dynasens approached their own transformation.

Dynasens' customer dimension

In Dynasens' situation, the healthcare employees' (e.g. nurses) relations played an essential role in Dynasens' customer dimension. The danger of healthcare employees increased physical and mental stress threatened the long-term relationship between healthcare institutions and their employees. The implementation of the dynamic sensors and improved health awareness was seen as a promising digitization initiative. Through these dynamic sensors, the healthcare employees received valuable communications about their personal health. The implementation of a sophisticated diagnostic system would expand the customer segment by including physicians and the patients.

Dynasens' benefit dimension

The dynamic sensors offered a new benefit to the healthcare employees and this was achieved by equipping the employees with a non-intrusive digitization initiative. Additionally, the healthcare employees were offered the benefit without any fear of making their data visible to other external stakeholders.

The requirements for all healthcare employees (i.e. nurses and physicians) and patients are constantly changing and a sophisticated diagnostic system would be flexible and able to adjust over time. Therefore, the benefit would be offered to more stakeholders and the excitement of a sophisticated diagnostic system could be felt not only by one stakeholder.

Dynasens' value-creation dimension

Dynasens' business model mirrors the healthcare institution's model especially with regards to the value-creation dimension. The healthcare employees are some of the most critical internal resources and possess valuable skills that are hard to replace. High healthcare employee absenteeism has a clear negative impact on the healthcare industry's value-added chain. The introduction of the dynamic sensors provided an important process which aimed to further nurture the relationship between all parties.

A sophisticated diagnostic system possesses capabilities that no human can match. This resource creates value for all of the stakeholders and its integration into a business model provides a truly data-driven process. But ultimately, the nurses and physicians would be the ones who make the final diagnosis. Therefore, without complete acceptance from all of the stakeholders, a diagnostic system would not truly transform the value-creation dimension.

Dynasens' partner dimension

Dynasens' digital-driven project involved several partners but it is clear that the healthcare employees were the most vital partners in this business model. The dynamic sensors succeed in not creating more work for the healthcare employees but still provided a new health-related channel and improved partner relations.

Although a diagnostic system provides the capabilities, the human element would still play the most important role in the partner dimension. Therefore, the system should only be implemented if its capabilities are properly communicated to all affected stakeholders and these stakeholders support the implementation of such a system.

Dynasens' financial dimension

In this case study, it is more difficult to see the short-term gain in revenue or decrease in expenses but a long-term effect on personnel expenses should be seen. The main objective of the dynamic sensors was to provide healthcare institutions with information to help prevent illness-related absenteeism. Additionally, the costs of the sensors were covered by several project partners, helping to reduce the initial costs.

The expense of a diagnostic system would be significantly higher than dynamic sensors. The questionable long-term financial returns of diagnostic software might outweigh the benefits of introducing such a system.

4.4 Wurzer Umwelt Limited

Wurzer Umwelt Limited is part of the Wurzer Group. It is a modern waste disposal company and service company and operates in the fields of environmental protection, the material and biological recycling of waste, and the recycling of valuable waste. The services offered include green material recycling (composting), biowaste recycling (biogas production), utilization of waste wood, recycling of bulky waste and mixed waste, mineral processing, as well as the associated container services.

Initial Situation and Problem Definition

A waste management company's garbage pickup routes must be planned in great detail. It is necessary to know exactly where the garbage cans are located and which of them are to be emptied. If a garbage can be overlooked, a second vehicle must be sent, which results in additional and unnecessary costs. The recording of such a route plan is therefore very time-consuming and just as complicated to change. Teaching new routes to employees or existing routes to new employees is therefore also very time-consuming (TomTom Telematics 2017).

Overall, there are three problems that Wurzer Umwelt Limited wanted to solve:

- Enormous time spent preparing a detailed route plan
- Enormous time spent training new employees (about 7 months)
- High employee turnover rate in this industry

Objective and Solution Approach

The above-mentioned problems were to be solved by using the latest technologies, which specifically meant:

- Time saving: Planning and processing of pickup routes should be more flexible
- Cost reduction: Training for new employees was to be streamlined and more efficient
- Improved Resource efficiency: Employees should be deployed more flexibly, decreasing the demand for standby services.
- Independence from employee turnover: Faster incorporation of new employees

- Potential for continuous improvement: Recording and visualization of the routes should facilitate the recognition of more efficient routes

Wurzer Ltd turned to two partners for solution development: Hausner Logistik Services and the IT service provider Logistikkonzepte Software Limited. Together, they developed a branch-specific platform with which dispatchers could plan and process daily routes faster. The basic functions are from WEBFLEET.

WEBFLEET is a fleet management platform from TomTom. In addition to navigation and route planning, it offers an open interface, which allows vehicles' position data to be seamlessly integrated into HLS' own platform. Through the combination of both platforms, complete street sequences can be tracked and visualized (TomTom Telematics 2017). The special feature of the TomTom platform is the point-to-point navigation, including detailed information about the next stop, which helps the waste disposal worker to empty all required garbage cans without forgetting one. The dispatcher can also track the route. The guided route can be stored directly on the navigation device in the vehicle, so that employees not familiar with the route can easily drive it (TomTom Telematics 2017).

By installing the navigation system in any vehicle with a mobile connection to the specially developed platform, the following improvements have been made (TomTom Telematics 2017).

- Shortening of the training period by 93%, from 7 months to 2 weeks
- Enormous increase in efficiency: Only four employees required to operate 300 routes
- Significant cost savings; approx. 90,000–100,000 euros per year.

Results

Wurzer's branch specific WEBFLEET is an example of a multiple partner digitization initiative joint venture and how these partners saw the value of reimagining the use of existing technologies to address current problems. Together with three external partners, Wurzer developed a waste fleet management system which collected specific route information to help current and new employees with route efficiency.

One alternative digital initiative for Wurzer could have been the implementation of NFC sensors on the residents' trash cans. These NFC sensors could have offered more two-way communication Wurzer and their customers. One practical use of these NFC sensors could be customers' requests for additional trash pick-up or even special requests like large bulk pick up.

Wurzer's WEBFLEET was a joint venture between several external stakeholders. Together with these external stakeholders, the overall aim of the WEBFLEET system was to create more efficient waste management routes and help with some fairly ubiquitous personnel issues (e.g. decrease new employee training time and employee turnover). According to the results, not only did the WEBFLEET address those issues but it also contributed to extreme cost savings, which dramatically affected the financial dimension of Wurzer's business model.

In several countries, designated recycling centers provide residents with the opportunity to throw away large bulky items like furniture, beds, and applications. The first difficulty for some residents is that these recycling centers are not in close proximity. Another problem is that residents need sufficient loading equipment like a trailer hitch and trailer to haul these bulky items. Moreover, these recycling centers sometimes charge an additional waste removal fee for such bulky items. Wurzer could have created a new communication channel with NFC sensors which would digitally reinvent the partner dimension of their business model. This communication channel could have allowed residents to communicate directly with Wurzer and request special bulk waste pickup whenever the need was there.

Wurzer saw immediate tangible results which directly affected their profitability. The shortening of training times naturally led to a decrease in training costs. The improved route efficiency (e.g. lower fuel consumption) also positively influenced Wurzer's profitability. Although it is sometimes difficult to see the return on investment (ROI) with some digitization initiatives, Wurzer's WEBFLEET clearly delivered positive results.

The proposed NFC sensors on the residents' trash cans could have also directly affected the financial dimension of Wurzer's business. The NFC sensors would have affected the financial dimension of the business model not only by providing additional revenue potential but the additional revenue could also have been invested in other areas like personnel and route planning. Additionally, the development of NFC sensors for the residents' trash cans would be less expensive and could potentially be done using Wurzer's internal know-how. Finally, the new communication channel could provide Wurzer with marketing research on what possible new services could be offered. For example, based on the frequency of major appliance pickups, Wurzer could offer more frequent pickup dates at an additional charge.

Application to Model

The road to Wurzer's digital transformation involved multiple partners who assisted in developing the WEBFLEET system. Their system harvested already accessible information and Wurzer increased their waste pickup route efficiency and reimagined their employee training program, dramatically reducing training times. Using the Digital Reality as a framework, Wurzer's path to the digital transformation of their business model will be outlined.

Wurzer's customer dimension

Wurzer's digital transformation of their business model focused on their current fleet, waste management workers, and the value of employee training and route efficiency. Wurzer recognized that forming long-term relationships with their employees was difficult given their high rates of employee turnover. The easiest way to solve their problems and reach their waste management workers was by introducing the WEBFLEET system into their vehicles. Interestingly, Wurzer's WEBFLEET digitally changed their customer dimension not by direct

communication with their waste management workers but with one of Wurzer's non-current assets; its vehicles.

Alternatively, the implementation of NFC sensors would have provided direct communication with another partner; the residents. Companies like Wurzer might not look close enough at their residents but this could be a potential interesting customer to add to this segment. Implementing a new customer channel with NFC sensors could have created a new form of customer relations.

Wurzer's benefit dimension

In this case Wurzer received the most obvious benefit. Wurzer's fleet was already on their books and Wurzer believed available vehicle data could be processed by the new WEBFLEET system which would in turn assist in their personnel and route planning.

It might be difficult to excite residents at the prospect of using NFC transmitters, but it is hard not to see the clear benefit of improved communication with their waste management services. The benefit of easily communicating with a waste management company like Wurzer about additional services without the need to call or look up Wurzer's contact information could be of tremendous value.

Wurzer's value-creation dimension

Wurzer recruited some important partners who possessed the resources and capabilities to deliver the WEBFLEET system. The technology to develop such a digital fleet management system already existed but the WEBFLEET system was developed specifically for a waste management business model. Therefore, the system was able to be seamlessly integrated into Wurzer's business model.

Wurzer's core competency is the removal and transport of waste, but ignoring residents in their customer dimension was causing them to miss out on an opportunity to fundamentally change the industry's value-added chain.

Wurzer's partner dimension

Wurzer may not have possessed the necessary internal know-how to develop such a system alone, but was able to rely on key partners who in turn provided unique capabilities and became fully integrated into the waste management company's value-added chain. The development of the partner relations was critical to the successful digital transformation of Wurzer's business model.

One of the clear advantages of NFC sensors is that this type of digital initiative could be done with less partners or even by Wurzer alone. This could have reduced any possible partner communication problems that might arise when dealing with multiple partners like with the WEBFLEET system.

Wurzer's financial dimension

Wurzer's bottom line was improved with the reduction of employee training and overall costs. It is unclear what the agreed upon cost structure was for the partners to develop the WEBFLEET system but based on the initial reports, the financial dimension was positively affected.

References

CGI (2016) Predictive maintenance. https://www.de.cgi.com/casestudy/thyssenkrupp-elevator-predictive-maintenance. Retrieved 20 April 2016

Dispan J (2006) Aufzüge und Fahrtreppen-eine Branche im Wandel. IG Metall, Germany

Dynasens (2016) Erklärung des Forschungsprojekts. http://dynasens.de. Retrieved 20 April 2016

Friedman LF (2014) IBM's Watson supercomputer may soon be the best doctor in the world. http://www.businessinsider.com/ibms-watson-may-soon-be-the-best-doctor-in-the-world-2014-4?IR=T. Retrieved 23 Sept 2017

Hagleitner (2016a) Homepage von Hagleitner. http://www.hagleitner.com. Retrieved 20 April 2016

Hagleitner (2016b) Pressemeldung von Hagleitner. http://www.hagleitner.com/de/presselounge/hagleitner-sensemanagement-624/. Retrieved 20 April 2016

Odermatt P, Kressbach J (2011) Liftkonzerne schröpfen Mieter und Eigentümer. http://www.srf.ch/sendungen/kassensturz-espresso/themen/wohnen/liftkonzerne-schroepfen-mieter-und-eigentuemer. Retrieved 20 April 2016

Starringer (2016) Sensorshirt. http://www.starringer.com/wearable-solutions/medizintechnik/. Retrieved 20 April 2016

ThyssenKrupp (2016a) Homepage von ThyssenKrupp Elevator. http://www.thyssenkrupp-elevator.com/Unternehmen.3.0.html. Retrieved 20 April 2016

ThyssenKrupp (2016b) ThyssenKrupp liefert Mobilitätslösungen für weltweite Wahrzeichen. http://www.thyssenkrupp-elevator.com/Eintrag-anzeigen.104.0.html?&cHash=4b80049df1e8243dcd8a7e31a8ec5c92&tx_ttnews%5Btt_news%5D=564. Retrieved 20 April 2016

TomTom Telematics (2017) Wurzer Umwelt GmbH (PDF). WEBFLEET TomTom Telematics, Amsterdam

Wetzel D (2016) Deutschlands Fahrstühle werden zum Risiko. http://www.welt.de/wirtschaft/article128523956/Deutschlands-Fahrstuehle-werden-zum-Risiko.html. Retrieved 20 April 2016

Chapter 5
Existing Approaches

Summary
The following section introduces three existing approaches to digital transformation that can serve as the basis for a Roadmap.

In the area of business model innovation, numerous approaches have already been analyzed in the literature and consolidated as procedure models (Bucherer 2011: 63; Schallmo 2013: 47; Schallmo 2015: 5, 131; Wirtz and Thomas 2014: 37).

Innovation of a business model includes changes in individual business model elements (e.g., customer elements, services, etc.) or changes to the entire business model (Schallmo 2014: 13). The digital transformation of a business model aims to utilize enablers within the business model, to raise digital potentials, and to create a digital value-added network as well as digital customer experiences. In addition, the digital transformation of business models is based on existing business models, and changes existing business model elements or creates new ones.

The following section introduces three existing digital transformation approaches that serve as the basis for a Roadmap to the digitalization of a business model. Additional approaches are also included that can be used for the design and modeling of new digital business models (Cole 2015; Hoffmeister 2017), or of a mature, existing model (Azhari et al. 2014: 38). These approaches, which are not specifically addressed in the Roadmap, can also be integrated into the Roadmap when suitable. Meanwhile, our primary focus is on Roadmap development.

5.1 Esser's Approach

Esser (2014) defines five phases that outline the development plan for a digital transformation strategy and its implementation. The phases are shown in Fig. 5.1 and are described briefly below.

Figure 5.1 illustrates Esser's approach.

D. R. A. Schallmo, C. A. Williams, *Digital Transformation Now!*, SpringerBriefs in Business, https://doi.org/10.1007/978-3-319-72844-5_5

Fig. 5.1 Esser's approach. Source: Esser (2014)

Analysis
Analysis focuses on four areas: customers, competitors, markets, and business capabilities. Customer needs and values are analyzed and segmented. Competitors are described and measured by their current (market) performance and market positioning. Newcomers to the market are also considered. The market is analyzed according to its size, its potential, its limitations, and future developments. Finally, available business capabilities are gathered.

Strategy
The second, strategy phase includes defining market position, deciding how the business wants to differentiate itself, and selecting the customer target group.

Design
Design is based on three areas: a vision for the customer experience, value proposition, and the identification of opportunities. The vision for the customer experience includes a statement about what the business would like to achieve. The value proposition answers the question of how and with what services one will excite customers. Finally, the identification of opportunities assesses current and new design ideas.

Organizational Impact
Organizational impact refers to the people, the structure, and the culture within the business. In addition, processes and systems are examined, and finally governance and control are defined.

Transformation
The transformation ultimately dictates the Roadmap and program management. In addition, internal communication as well as change management are planned. Lastly, branding and external communications are defined.

The defined phases are very general and therefore specific references to digital transformation are infrequent. Nevertheless, Esser's approach offers useful ideas about which phases and what content should generally be taken into account.

5.2 PricewaterhouseCoopers' Approach

PricewaterhouseCoopers (PwC) defines six phases for digital transformation within a framework (2013: 40). The phases are shown in Fig. 5.2 and specifically below (PwC 2013: 40).

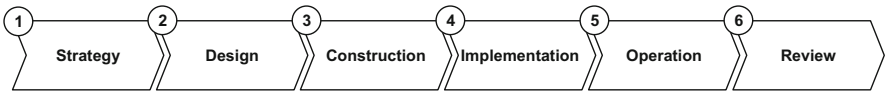

Fig. 5.2 PwC's approach. Source: PwC (2013)

Figure 5.2 shows PwC's approach.

Strategy
A strategy is developed within the framework of the first phase, and the effects of digital dynamics should be understood here. The company's current position is determined and a new business model is designed. In addition, a safety assessment, a value-creation analysis, as well as the legal and tax ramifications are considered. Finally, corporate culture and human capital are analyzed.

Design
The second phase is the design of the transformation Roadmap. To these ends, the collaboration model, the value-creation network, and the operating model are defined. In addition, the target architecture, the transformation plan, and the target model for corporate culture are determined. Lastly, the tax and legal aspects are modeled.

Construction
The third phase is construction, which completes the development of a digital business platform. To achieve this, governance is introduced and a platform or application is developed. The operating model and business/IT services are adapted based on this construction. Digital security and skill management are also defined.

Implementation
The implementation phase initiates the previously developed business platform. Quality assurance and employee training are rolled out to ensure a successful transition.

Operation
In this phase, new business models are considered while in operation as running systems. Here, governance, the platform, and application management and reporting play a vital role.

Review
The last phase is review, which includes performance monitoring and optimization. For this purpose, service level adjustments are made and operational optimizations as well as optimizations to the business model are carried out.

Together, these six phases account for several aspects of digital transformation, all of which are described extensively in the PwC approach.

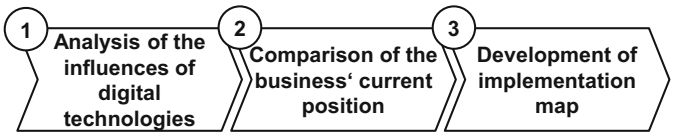

Fig. 5.3 Bouée and Schaible's approach. Source: Bouée and Schaible (2015)

5.3 Bouée and Schaible's Approach

Bouée and Schaible describe a digital transformation master plan that is specifically designed to address a digital future (Bouée and Schaible 2015: 34). The phases are presented in Fig. 5.3.

In Fig. 5.3, Bouée and Schaible's approach is presented.

Analysis of the Influence of Digital Technology on the Industry
Within the framework of this phase, different distinct future scenarios are forecast and potential changes in value chains are analyzed. In addition, technologies are categorized and relevant market participants are evaluated. As a result, there are frequently several changes identified in this phase.

Comparison with Current Position of the Company
The second phase involves an analysis of opportunities and risks for the existing business. Furthermore, affected products, customers, and regions are analyzed. In addition, digital capabilities such as human resources or partnerships are defined and the digital business strategy is established. Resulting implementation and competence gaps are identified.

Implementation of the Roadmap
In the final phase, relevant options for the future scenarios are defined. For example, digital skills in need of further development are identified and cooperative market participants are discussed.

These phases capture several aspects of digital transformation and include detailed analyses.

References

Azhari P, Faraby N, Rossmann A, Steimel B, Wichmann K (2014) Digital transformation report 2014

Bouée CE, Schaible S (2015) Die Digitale Transformation der Industrie. Roland Berger Strategy Consultans und Bundesverband der Deutschen Industrie e.V., Berlin

Bucherer E (2011) Business model innovation-guidelines for a structured approach. Shaker, Aachen

Cole T (2015) Digitale Transformation. Warum die deutsche Industrie gerade die digitale Zukunft verschläft und was jetzt getan werden muss. Franz Vahlen, München

Esser M (2014) Chancen und Herausforderungen durch Digitale Transformation. http://www.strategy-transformation.com/digitale-transformation-verstehen/. Retrieved 2 Feb 2016

Hoffmeister C (2017) Digital business modelling: digitale Geschäftsmodelle entwickeln und strategisch verankern. Carl Hanser Verlag GmbH Co KG, München

PwC (2013) Digitale Transformation – der größte Wandel seit der industriellen Revolution. PwC, Frankfurt

Schallmo D (2013) Geschäftsmodelle erfolgreich entwickeln und implementieren. Springer, Wiesbaden

Schallmo DR (2014) Vorgehensmodell der Geschäftsmodell-Innovation–bestehende Ansätze, Phasen, Aktivitäten und Ergebnise. In: Kompendium Geschäftsmodell-Innovation. Springer Fachmedien, Wiesbaden, pp 51–74

Schallmo D (2015) Bestehende Ansätze zu Business Model Innovationen. Springer, Wiesbaden

Wirtz B, Thomas MJ (2014) Design und Entwicklung der Business Model-Innovation. In: Schallmo DA (ed) Kompendium Geschäftsmodell-Innovation – Grundlagen, aktuelle Ansätze und Fallbeispiele zur erfolgreichen Geschäftsmodell-Innovation. Springer Verlag, Wiesbaden, pp 31–49

Chapter 6
Roadmap for the Digital Transformation of Business Models

Summary
This Roadmap is based on the approaches to digital transformation presented here as well as existing theories about business model innovation. The five Roadmap phases are: (1) *Digital Reality*, (2) *Digital Ambition*, (3) *Digital Potential*, (4) *Digital Fit* and (5) *Digital Implementation*.

A Roadmap is given here based on the presented approaches to digital transformation and based on existing theories about business model innovation (Bucherer 2011: 63; Rusnjak 2014: 109; Schallmo 2013: 47; Schallmo 2014: 52; Schallmo 2015: 5; Wirtz and Thomas 2014: 37).

6.1 Overview of Roadmap for Digital Transformation of Business Models

The Roadmap for the digital transformation of business models has five phases.

Digital Reality
In this phase, Digital Reality, the company's existing business model is outlined, along with a value-added analysis related to stakeholders and a survey of customer requirements. This provides for an understanding of the Digital Reality for this company along different parameters.

Digital Ambition
Based on the Digital Reality, objectives are defined for the digital transformation. These objectives relate to time, finances, space, and quality. Digital Ambition determines which objectives should be considered for the business model and its elements. Objectives and business model dimensions are subsequently prioritized.

D. R. A. Schallmo, C. A. Williams, *Digital Transformation Now!*, SpringerBriefs in Business, https://doi.org/10.1007/978-3-319-72844-5_6

Digital Potential
During the Digital Potential phase, best practices and enablers for the digital transformation are established. This serves as a starting point in terms of Digital Potential and the design of a future digital business model. For this purpose, different options emerge for each future business model element and these options are then combined and connected in a logical manner.

Digital Fit
The Digital Fit phase looks at options for the design of the digital business model. These options are evaluated to determine Digital Fit with the existing business model. This ensures that customer requirements are met and that business objectives are achieved. The evaluated options are then prioritized.

Digital Implementation
Digital Implementation includes the finalization and implementation of the new digital business model. The various options are further pursued within a digital implementation framework. The Digital Implementation also includes the design of a digital customer experience and a digital value-creation network, which describe the integration of the new business model with partners. The resources and capabilities are also identified in this phase.

Figure 6.1 illustrates the Roadmap to the digital transformation of business model with its various phases and activities. The phases are explained further below, each with specific objectives and questions. Activities are shown, along with each of their tools. Selected activities are illustrated by case studies.

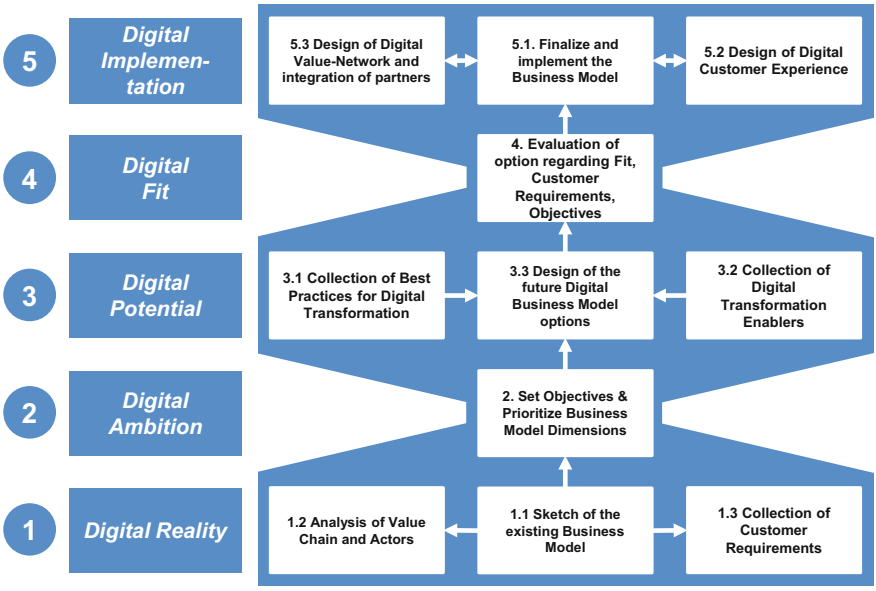

Fig. 6.1 Roadmap to the digital transformation of business models

General Electric with Pivotal (GE 2016a; Pivotal 2016)
GE has a total of nine divisions and sees itself as a leading digital industry company. GE wants to link their core businesses through software-based technologies and solutions that are fast, forward-looking, and progressive. That is why GE invested $105 million in return for a 10% share in the company Pivotal. Pivotal converts data into information that is used for services. Intel and Cisco are also Pivotal partners and Pivotal has a total of more than 100 technology partners and two system integrators: Capgemini and Accenture.

Initial Situation and Problem Definition
GE has collected over 50 million records, gathered by over 10 million sensors installed in machines, equipment, etc. So far, Pivotal has developed over 40 applications for GE, including flight route optimization and downtime avoidance.
The GE Aviation division manufacturers engines and provides maintenance for airlines, for example to the low-cost carrier Air Asia, which has a fleet of 160 planes and operates 340,000 flights per year. Air Asia's flight network consists of over 100 destinations in 22 different countries. There is an example of GE engine in Fig. 6.2.

Analysis showed that across all carriers worldwide there was a savings potential of 18–22% which was being wasted on excess fuel consumption caused by protracted flight times and inefficient flight routes. If fuel consumption were decreased even by 1% p.a., about $30 billion could be saved over the next 15 years.

Objective and Solution Approach
GE expanded their existing business model, the sale and maintenance of drivetrains, by establishing GE Flight Efficiency Services. With the new department they

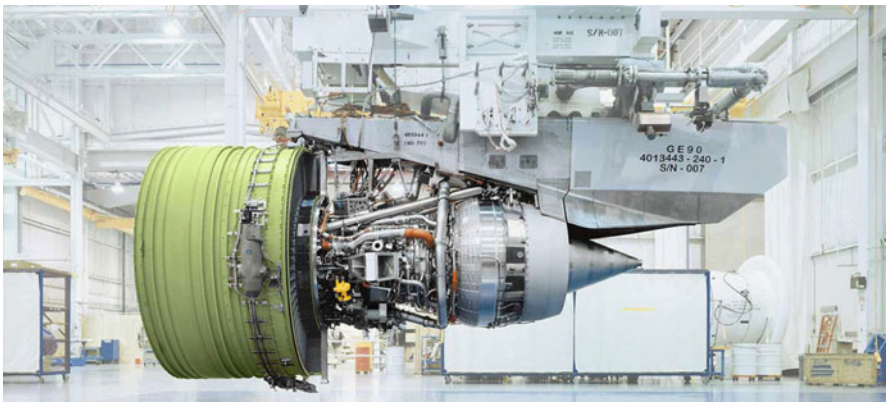

Fig. 6.2 Example of an GE engine (Source: GE 2016b)

offered fuel management, navigation, flight data analysis, risk management, and other services. The objective was to reduce operating costs and improve utilization to achieve cost savings for airlines.

Results

GE Aviation division recognized the inefficiencies in the airline industry and digitally transformed their business model with the creation of GE Flight Efficiency Services. Partnered with an external stakeholder, one of the main services provided by this new department is the collection of vital engine information for the optimization of flights and reduction of downtime.

Meanwhile, other actors in the airline sector have been busy digitally transforming completely different aspects of their industry. One of the most uncomfortable experiences for airline passengers is turbulence. Boeing, in collaboration with FedEx, will be using remote-sensing technology to detect clear-air turbulence. The technology will use LIDAR, a light detection and ranging technology which emits laser pulses from different areas of the plane. "It offers the potential to accurately measure winds as much as 17.5 km (10.8 miles) in front of airplanes and provide pilots with sufficient time to take appropriate action to avoid wind shear and clear air turbulence, which often occurs at high altitude and does not have any visual cues, such as clouds" (Draper 2017). Let's compare these very different digital transformations within the airline industry and the value they add for stakeholders respectively.

One of GE Flight Efficiency Services' primary objectives is improving fuel efficiency. The data gathered by engine sensors provides the necessary information to better plan flight routes and reduce flight times.

The detection and avoidance of turbulence on the other hand could lead to increased passenger satisfaction. Turbulence cannot be totally eliminated but such digitization initiatives can prevent longer spells of turbulence.

Both digitization initiatives should result in increased profitability for airlines.

GE Flight Efficiency Services allows better fuel planning schedules which can decrease flight grounding and this shorter grounding time would increase revenue. Additionally, maintenance planning can also benefit from such data and also lead to decreased grounding time.

Increased passenger satisfaction as a result of consistently smoother flights could help airlines leverage higher air fares or greater market share. Better turbulence detection could also decrease fuel consumption.

GE Flight Efficiency Services is an ambitious attempt to improve the effectiveness of flight planning. Decreasing the length of turbulence would be a welcome improvement for every crew member and passenger but at the moment, such remote sensor technology is still in its infancy. GE decided to take advantage of tried and true technologies—like sensors on engines—but it does not exclude the possibility of GE later including these new turbulence detection technologies as a part of their Flight Efficiency Services.

6.2 Digital Reality: Current Status Evaluation

6.2.1 Objectives and Questions

The objective in this phase of the Roadmap is to evaluate the Digital Reality. To these ends, the existing business model is sketched, and the value-creation chain, actors within the industry, and customer requirements are identified.

The following questions are answered in the Digital Reality phase:

- How is the current business model structured? How distinct are the main dimensions of the business model?
- How is the current value-creation chain structured/designed? What are the value-creation segments?
- Which actors are involved in each stage? How are these actors linked to each other? What are the customer segments? What are the current and future requirements of the customer segments?

6.2.2 Activities and Tools

Within the activities, tools are utilized to achieve the desired results.

Outline of the Existing Business Model

Digital transformation refers to a change in the existing business model. For this reason, it is crucial to develop a thorough understanding of the current business model. A uniform description grid is utilized to describe the existing business model based on 5 dimensions and 13 elements (Schallmo 2013: 119–139).

The business model dimensions are (Schallmo 2013: 118):

Customer Dimension

- Customer Segments
- Customer Relationships
- Customer Channels

Benefit Dimension

- Products and Services
- Values

Value-Creation Dimension

- Resources
- Skills
- Processes

Partner Dimension

- Partners
- Partner Channels
- Partner Relations

Financial Dimension

- Revenues
- Expenses

Each of these business model dimensions is accompanied by several essential questions which must be answered before a business model can be developed. The answers to these questions will not only provide insight into the current business model but will also be used to better understand the situation in your industry and provide the first steps of a digital transformation, which is determining the potential degrees of digitization.

The essential questions are formulated in such a way as to survey the current business model. If the questions are to be applied to a future (not yet existent) business model, the guiding questions would need to be revised accordingly.

Customer Dimension

Constructing a prototype helps us to identify and develop the customer dimension. The customer dimension prototype should describe the following relevant information: 1) customer segments, 2) customer channels, and 3) customer relations (Bieger and Reinhold 2011; Osterwalder et al. 2005).

Within the customer dimension, the guiding questions for the **customer segment** are the following:

- What are the current customer requirements and based on this, how is the customer segment formed?
- What are the customer segments that should be first outlined?
- What benefits should be provided to the customer segment and how much are the customers willing to pay?
- What is the value of the customer segment to the business and which customer segments are the most important?

Within the customer dimension, the guiding questions for the **customer channels** are the following:

- How are customers' communication and sales channels integrated into business operation processes (e.g. enquiries, procurements)?
- How many customers can be reached using these communication and sales channels?
- How should the customer segment be reached using these communication and sales channels?

Within the customer dimension, the guiding questions for the **customer relations** are the following:

- How can new customers be acquired and build a long-term relationship with the business?
- What are the costs of the various forms of customer relations?
- Which forms of customer relations are particularly promising?
- Which forms of customer relations should exist?

Benefit Dimension

Constructing a prototype helps us to identify and develop the benefit dimension. The benefit dimension prototype should describe the following relevant information: What benefits including services (within an incentive system) will be generated (Bieger and Reinhold 2011; Johnson 2010; Osterwalder et al. 2005)? Are there results available (e.g. potential service foci) and general forms for performances and benefits?

Under the benefit dimension, the guiding questions for the **products, services, and benefits** are the following (Bieger and Reinhold 2011: 37; CE VeMaB 2011; Johnson 2010: 28; Mullins and Komisar 2009: 66; Osterwalder and Pigneur 2010: 23; Skarzynski and Gibson 2008: 113–118; Weiner et al. 2010: 57; Wirtz 2011: 140):

- What current and future requirements does a specific customer segment have and how important are these requirements for the respective customer segment?
- What benefits should each of the customer segments be offered and how should this benefit be formulated into a value proposition?
- Which products and services are essential to deliver this benefit and does it fulfill the promise made by the value proposition?
- Which benefits should be offered to the internal and external stakeholders involved?
- How will the customers become enthusiastic about the brand, its services, and the benefits generated?

Value-Creation Dimension

Forming a value-creation dimension prototype with specified resources, capabilities, and processes helps to identify and develop the value-creation dimension. These elements of the value-creation dimension are necessary to develop the services, to generate the benefits, and to operate the business model (Bieger and Reinhold 2011: 32; Johnson 2010: 133; Osterwalder et al. 2005: 10). Results are also made available (e.g. an industry's value-added chain, technology industry map, etc.) and new standards will be developed for resources, capabilities, and processes.

Within the value-create dimension, the guiding questions for the **resources and skills** are the following (Schallmo 2013):

- Which resources and capabilities are essential for the benefit dimension?
- How are resources and capabilities formed and where can they be obtained?
- Which resources and capacities are critical for the success of the business model?
- Which resources and capabilities are unique to the business?
- How should the internal and external stakeholders' resources and capabilities be integrated into the business model?

The guiding questions for the **processes** are the following (Schallmo 2013):

- How is the industry's entire value-added chain developed and what position should be taken within this value-added chain?
- Which processes are essential for the fulfillment of the value proposition?
- Which processes are necessary for the delivery of channels and for nurturing customer relationships?
- Which processes should the internal and external stakeholders carry out themselves and how will this be linked with the partners?

Partner Dimension

The creation of a partner dimension prototype helps to identify and detail the partner dimension. Partners would include any internal and external stakeholders. The partner dimension prototype describes the following relevant information: 1) description of the partners, 2) partner channels, and 3) partner relations (Osterwalder et al. 2005, S. 10; Weiner et al. 2010). There are new standards for the partners which draw from the partner channels and the partner relations.

Within the partner dimension, the guiding questions for the **partners** are the following (Schallmo 2013):

- Which partners are essential to the business model?
- Which resources and capabilities should the partners provide?
- Which partners are integrated into the value-added chain and which processes should the partners perform?
- Which customer channels could be developed through the partners?
- How should the partners be supported with the fulfillment of the value proposition?

The guiding questions for the **partners' channels** are the following (Schallmo 2013):

- Which communication and procurement channels should be used to reach the partners?
- Which communication and procurement channels are especially promising and cost effective?

The guiding questions for the **partners relations** are the following (Schallmo 2013):

- Which forms of partner relations are particularly promising?
- How cost sensitive are the various forms of partner relations?
- Which forms of relations should be developed with partners and how does this collaboration take place?

Financial Dimension

Identifying the financial dimension aims to describe the last of the five business model dimensions which has significant influence on digital transformation. The

financial dimension consists of the revenues and expenses (Johnson 2010; Osterwalder et al. 2005) which arise within the aforementioned business model dimensions and elements.

Within the financial dimension, the guiding questions for the **revenues** are the following (Schallmo 2013):

- Which customers and how many of them are willing to pay for these benefits?
- How can the benefits contribute to the revenue stream?
- Which outputs (product and services) can generate revenue?
- How should the revenue mechanism (e.g. rental fee by the minute) be developed for the customer segments?

The guiding questions for the **expenses** are the following (Schallmo 2013):

- What expenses will arise during the operation of the business model and within the respective business model elements, and which expenses are essential?
- How much will the expenses relate to resources, capabilities, and processes cost?
- How will the cost structured be influenced by factors such as quantity, price, etc.?
- How should the cost mechanism (e.g. royalties payments) be developed with the partners?

Figure 6.3 illustrates the business model dimensions and elements. The relationships between business model elements are also sketched (for a detailed description of business model elements see Schallmo 2013: 117). The example refers to an aircraft engine manufacturer.

Analysis of Value Chain and Actors

This activity is designed to build an understanding of an industry (aeronautics in this example) and its degree of digitization. The stages of the value-creation chain

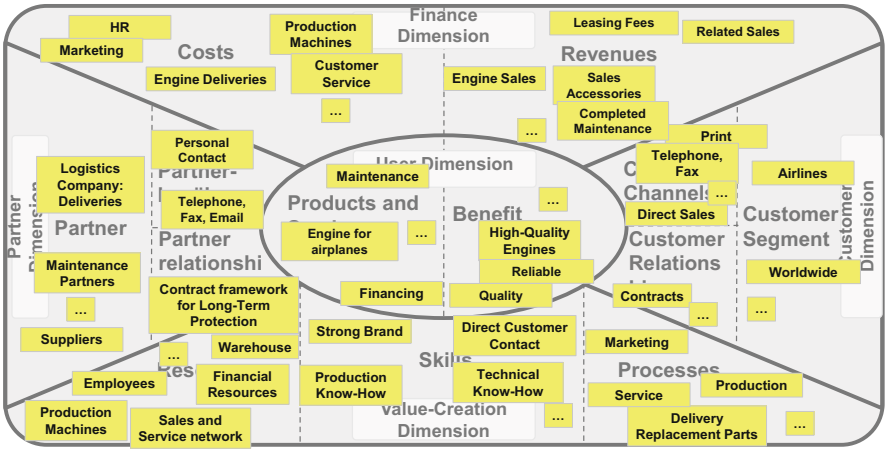

Fig. 6.3 Description of an engine manufacturer's business model

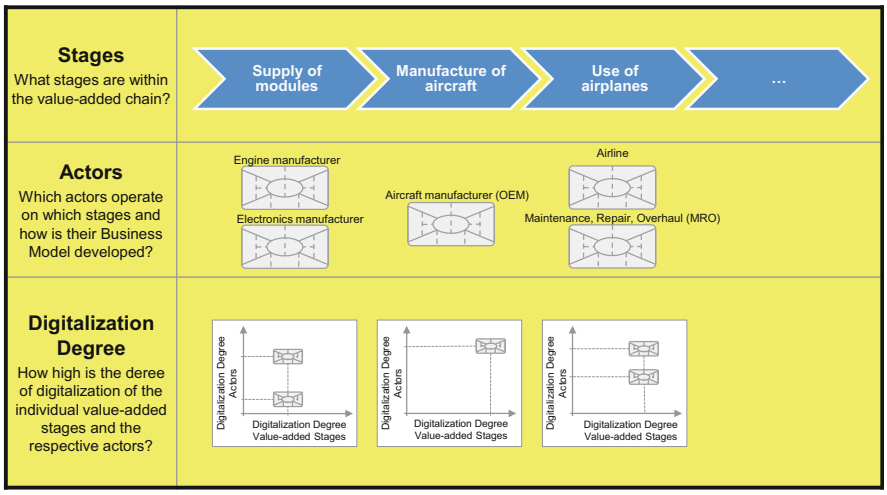

Fig. 6.4 Value-added steps, actors and digitization degree of industry

for this industry are listed. Then the actors relevant to each stage of the value-creation chain are depicted, along with their business model (Hitt et al. 2012: 24; Grant 2016: 123; Gadiesh and Gilbert 1998: 149; Schallmo 2013: 182). Next, the degree of digitization in the value-creation chain is determined, based on uniform criteria (e.g., the use of technologies, networking among various actors, etc.) and is illustrated in a diagram. The degree of digitization and the resulting change in business models varies depending on the industry (KPMG 2013: 9; Bouée and Schaible 2015: 27; Geissbauer et al. 2014: 3). Based on the analysis of the value-creation chain and the actors, it is possible at a glance to identify attractive value-creation chain stages and potential partners. Figure 6.4 shows the value-creation chain stages, actors, and the respective degrees of digitization.

Collection of Customer Requirements

In order to collect customer requirements, a customer profile (or a user profile) is created based on selected criteria (Plattner et al. 2009: 167; Curedale 2013: 224; Gray et al. 2010: 65). A customer profile is commonly used in the business-to-consumer (B2C) industries, but can also be used in the business-to-business (B2B) industries to describe groups of people (e.g., purchasing or production managers or sole proprietorships). Figure 6.5 shows the customer profile of an airline maintenance specialist.

In particular, it is essential to collect the customer requirements based on the following benefit categories (Schallmo 2013: 129 f.):

- Functional benefits: Derived from the use of the basic functions of the product and/or service.
- Economic benefits: Derived from the direct/immediate performance of the product and/or service.
- Process-related benefits: Derived from ease of procurement (e.g., time savings).

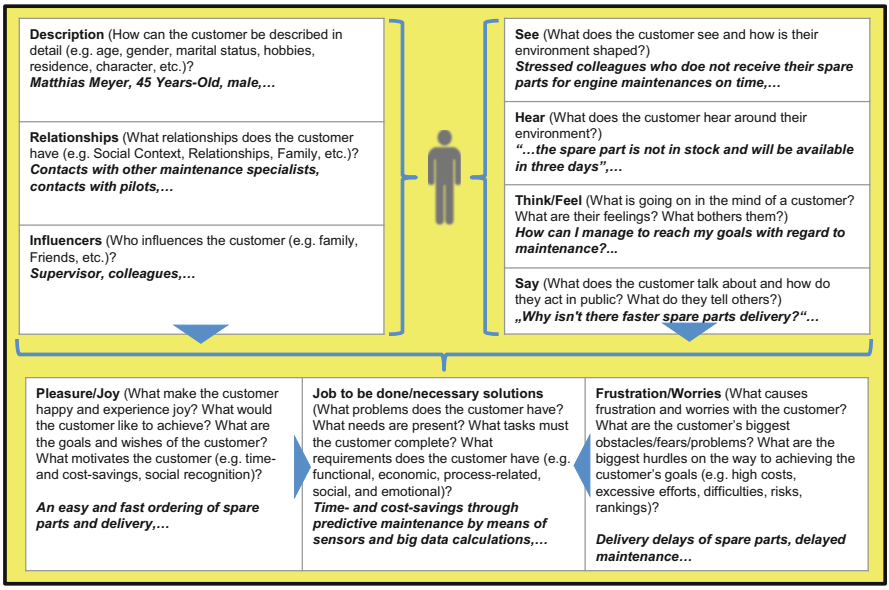

Fig. 6.5 Airline customer profile including customer requirements

- Emotional benefits: Positive feelings experienced through the use of the product/service (e.g., brand).
- Social benefits: Created through the social recognition one attains through the use of the product/service.

6.3 Digital Ambition: Setting Objectives

6.3.1 Objectives and Questions

The objective in this phase is to develop a Digital Ambition for the business model. Here, the objectives are set in terms of the digital transformation and related business model dimensions.

The Digital Ambition phase answers the following questions:

- In light of the digital transformation, what are the objectives for each category (time, finances, space, quality)?
- How should the objectives for each of the business model dimensions be prioritized?

6.3.2 *Activities and Tools*

For the Digital Ambition phase, there is an activity which is described below with the corresponding instrument.

Set Goals and Prioritize Business Model Dimensions
Objectives are set according to four categories for the existing business model and integrated business model elements. The categories include: time, finances, space, and quality (in accordance with: Österle 2013: 109; Schallmo 2013: 194; Kreutzer and Land 2016: 48).

Under the category: "time," objectives are set which relate to the temporal aspects of the business model (such as faster service provision, faster production, etc.).

Within the "finance" category, objectives are set which relate to the financial aspects of the business model (e.g., cost savings, sales, etc.).

Under the category "space", objectives are determined which take the spatial aspects of the business model (e.g., networking, automation, etc.) into account.

The "quality" category contains objectives that relate to qualitative aspects of the business model (relationship quality, product quality, process quality, etc.).

Table 6.1 shows the objective categories and also include business model elements as examples.

These categories take all relevant aspects into consideration as opposed to only focusing on temporal aspects. The objectives which are set can affect several categories and therefore overlap. Although some overlap will exist, the objectives should still be prioritized. Lastly, the business model dimensions can also be prioritized.

Table 6.1 Categories for objectives including business model elements

Category	Objectives based on the business model elements
Time	– Response to disruptions within 6 hr – Reduction of production time to 30 days – Delivery within 12 h – . . .
Finance	– Reduction of sales costs by 30% – Reduction of internal logistics costs by 25% – Increase of service revenue by 35% – . . .
Space	– Automatic transmission of operating data – Customer location-independent inventory control – . . .
Quality	– Preventive maintenance to reduce engine failures – Improvement of customer experience – . . .

6.4 Digital Potential: Establishing Options

6.4.1 Objectives and Questions

The objective in this phase is to identify the Digital Potential of the business model. Here, best practices and enablers of digital transformation are gathered, and they subsequently inform future digital business model options.

The Digital Potential phase addresses and answers the following questions:

- What best practices exist within and outside of our own industry? What is the initial situation, problem definition, objective, approach, and result in each case?
- What enablers are available for the digital transformation? How can these enablers be assigned to the following four categories: digital data, automation, networking, and digital customer access?
- How should the future digital business model be designed? What options are available?

6.4.2 Activities and Tools

Within the scope of the activities, several tools are used to develop targeted results.

Rise of Best Practices for Digital Transformation
In order to come up with ideas for the digital transformation of a business model, the best practices from one's own and other industries are determined and described (Bucherer 2011: 77; Giesen et al. 2007: 32; Schallmo 2013: 185).

Table 6.2 shows possible criteria and explanations in order to uniformly describe best practices.

A set of best practices for digital transformations can be found in the existing literature (Brand et al. 2009; Bouée and Schaible 2015: 9; Botthof and Bovenschulte 2009: 15; Hoffmeister 2017; Jahn and Pfeiffer 2014: 81; Bauernhansl and Emmrich 2015: 24).

The Rise of Digital Transformation Enablers
An enabler allows applications or services to be used for the digital transformation of the business model.

Table 6.2 Best practices description

Criteria	Explanation
Initial situation	– In which initial situation does the company find itself? – How was the business model developed?
Problem definition	– What are the current problems? – Why should the current business model be digitally transformed?
Setting objectives	– What objectives should be set for the digital transformation (in terms of time, finances, space, and quality)?
Solution approach	– What enablers will be used? – What applications are available? – Where will the business model be digitally transformed? – How will the value creation be digitized?
Results	– How was the digital business model developed? – What influences did the digital transformation have on the business model's performance?

There are four categories of enablers and applications/services (based on: Bouée and Schaible 2015: 19):

- **Digital Data**: The collection, processing, and analysis of digitized data to facilitate and improve predictions and decisions.
- **Automation**: The combination of classical artificial intelligence technologies that enable autonomous work and self-organizing systems. This reduces error rates, increases speed, and makes it possible to reduce operating costs.
- **Digital Customer Access**: The mobile internet provides direct access to the client, who in turn is provided with higher levels of transparency and new services.
- **Networking**: Using broadband telecommunications for the mobile or wired networking of the entire value-added chain allows for the synchronization of supply chains, which leads to a reduction in production times and shorter innovation cycles.

Enablers are listed with their applications/services in a Digital Radar, which is shown in Fig. 6.6.

The Digital Radar can accommodate more enablers and applications as needed. The following is an example of additive manufacturing for bionic aircraft components. Additive manufacturing can also be used for the printing of spare parts for engines (Knabel 2014).

Airbus installed a bionic-shaped bracket in an A350 test aircraft in July 2014 and has already flown with it. The component was sintered with titanium

(continued)

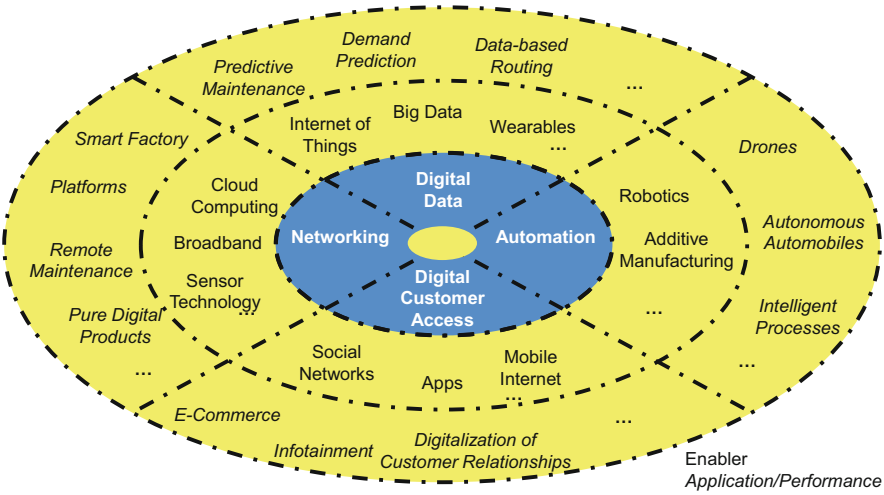

Fig. 6.6 Digital Radar including enablers and applications (Source: Bouée and Schaible 2015: 20)

powder and it has the same specifications as a conventional component with regards to function and strength. Advantages include:

- Less material and less weight (30% lighter)
- Reduction of fuel consumption
- Increased supply chain flexibility, as Airbus can sinter spare parts on site per original specifications without depending on large manufacturing facilities or waiting on deliveries. There is an example of an Airbus bionic and conventional components in Fig. 6.7.

By leveraging enablers of digital transformation, it is possible to design a new business model, a digital customer experience, and a digital value creation network that utilizes the enablers within that value creation network (Bouée and Schaible 2015: 19).

Designing Options for the Future Digital Business Model

Based on best practices and the enablers, the future structures of individual business model elements are now considered. Here, it is crucial to first list all options, without making an assessment. The two key questions are:

- What business model elements are to be digitized and in what form? Benchmarks for consumption data could be provided (e.g. via platforms).
- How can enablers from the Digital Radar be used to improve business model elements? The improvement of the maintenance process or rather the predictability of maintenance intervals for an engine for example, could be possible (e.g., via the use of big data).

Fig. 6.7 Bionic and conventional components (Source: Flugrevue 2016)

Figure 6.8 shows the option space for a future digital business model with attributes tailor-made for an engine manufacturer.

The design of the options for the future business model is based upon the objectives which have been established. The options for the business model should also consider customer requirements and all of the actors within the value chain, and thus come up with ideas for the design of a digital customer experience and the digital value creation network.

The design of a future business model is done within a framework that captures various options in addition to fundamental, digital business model patterns and includes best practices and enablers (Hoffmeister 2017; Esser 2014).

6.5 Digital Fit: Suitability Evaluation

6.5.1 Objectives and Questions

The objective in this phase is to evaluate the suitability of the digital business model. Appropriate combinations of options are defined and integrated into the existing business model. Finally, the combinations are evaluated in terms of business model fit, the fulfillment of customer requirements, and the achievement of objectives.

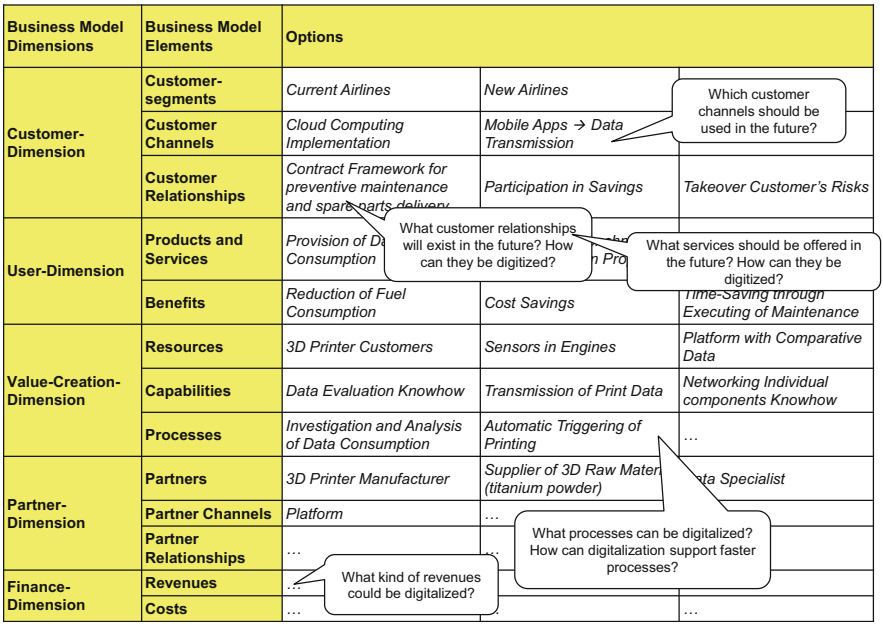

Fig. 6.8 Option space for future business models

The Digital Fit phase addresses and answers the following questions:

- What coherent combinations exist within the options space?
- How can the combinations be evaluated in terms of suitability within the existing business model?
- How can the combination be evaluated with respect to the fulfilment of customer requirements?
- How can the combinations be evaluated with respect to the objectives of the digital transformation?

6.5.2 Activities and Tools

Within this framework of activities, several tools are used to develop targeted results.

Set of Combinations Options
Suitable combinations are determined for the options selected. This means that the options must be mutually compatible. Afterwards, the different option combinations can be integrated into the existing business model.

In Fig. 6.9, two different versions of existing business models are shown with options.

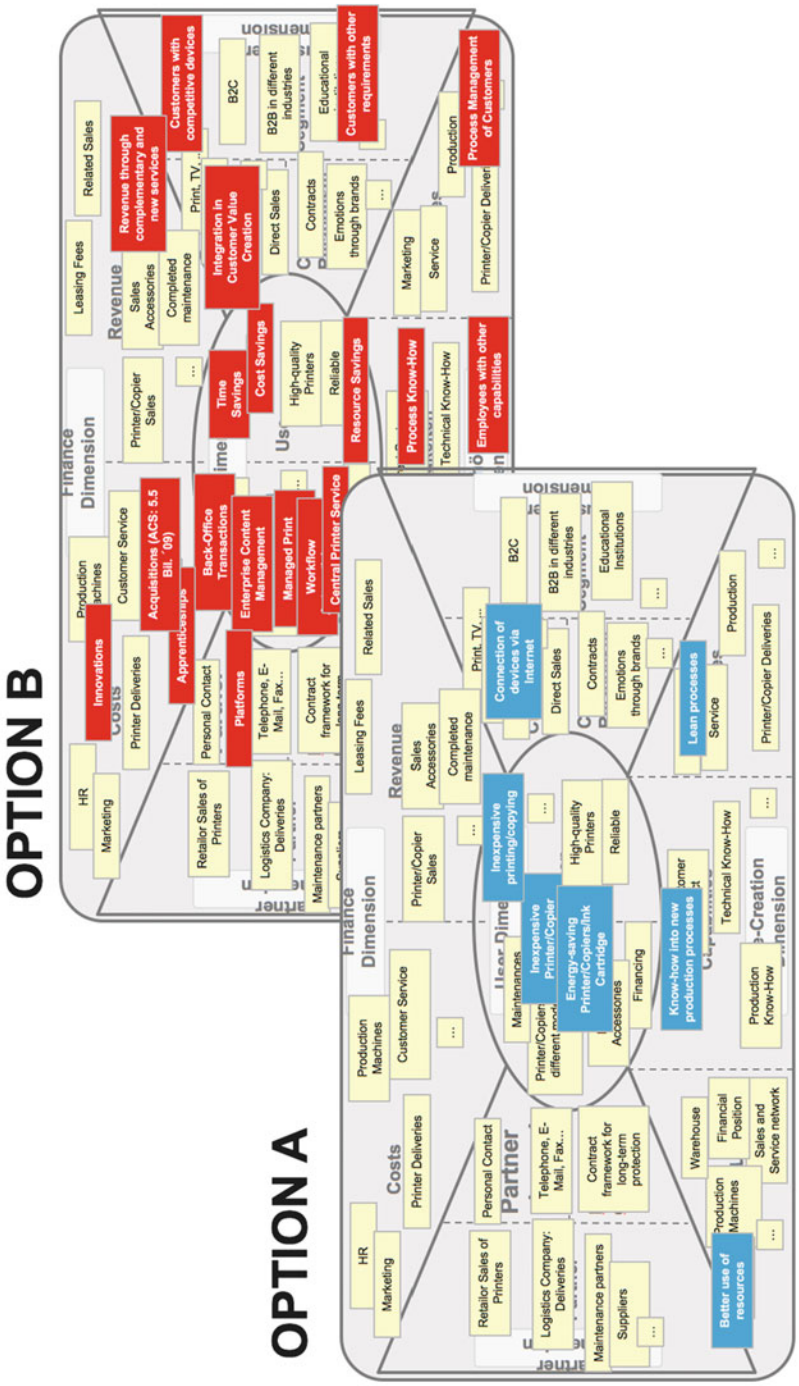

Fig. 6.9 Existing business model characteristics

Evaluate Combinations

The evaluation of various combinations takes place with an eye to business model suitability, the fulfillment of customer requirements, and the achievement of the stated objectives.

Criteria for suitability with existing business model:

- How does the combination of options fit with existing members of the Customer Dimension?
- How does the combination of options fit with existing elements of the Benefit Dimension?
- How does the combination of options fit with existing elements of the Value Creation Dimension?
- How does the combination of options fit to existing elements of the Partner Dimension?
- How does the combination of options fit to the existing elements of the Financial Dimension?

Criteria for the fulfillment of customer requirements:

- How does the combination of options contribute to the fulfillment of functional benefits?
- How does the combination of options contribute to the fulfillment of economic benefits?
- How does the combination of options contribute to the fulfillment of process-related benefits?
- How does the combination of options contribute to the fulfillment of emotional benefits?
- How does the combination of options contribute to the fulfillment of social benefits?

Criteria for the achievement of objectives:

- How does the combination of options contribute to the achievement of temporal objectives?
- How does the combination of options contribute to the achievement of financial objectives?
- How does the combination of options contribute to the achievement of spatial objectives?
- How does the combination of options contribute to the achievement of qualitative objectives?

Based on the criteria listed, the combinations are evaluated in a scoring table in order to prioritize them. An example scoring table is shown in Fig. 6.10.

With this evaluation of digital suitability, different paths and the preferences of the company are taken into account in each of the initial situations in order to drive the digital transformation (IBM Institute for Business Value 2011). The IBM Institute for Business Value defines these two dimensions: The “what” is the change of the benefit for the customer and the “how” is the design of the operational model.

Category	Criterion	Scale	Combination 1		Combination 2	
		1 (not important) to 5 (very important)	Evaluation: 1 (very low) to 5 (very high)	Score	Evaluation: 1 (very low) to 5 (very high)	Score
Existing business model	Fit with the existing customer dimension	3	2	6	1	3
	Fit with the existing value dimension	4	2	8	3	12
	Fit with the existing value creation dimension	5	3	15	4	20
	Fit with the existing partner dimension	3	4	12	4	12
	Fit with the existing financial dimension	4	5	20	3	12
Fulfillment of customer requirements	Contribution to the functional benefits	2	3	6	3	6
	Contribution to the economic benefits	5	3	15	2	10
	Contribution to the process-related benefits	3	4	12	1	3
	Contribution to the emotional benefits	1	3	3	4	4
	Contribution to the social benefits	1	2	2	3	3
Objective achievements	Contribution to objectives achievement regarding time	4	3	12	2	8
	Contribution to objectives achievement regarding finances	4	4	16	5	20
	Contribution to objectives achievement regarding space	3	5	15	4	12
	Contribution to objectives achievement regarding quality	5	3	15	3	15
Total score		-	-	**157**	-	**140**

Fig. 6.10 Scoring options evaluation table

This results in three paths: 1) digitization of business processes, 2) digitization of benefit offers, and 3) development of future necessary competencies.

Based on these specifications, two perspectives are proposed from previous versions: internal and external digitization. Subsequently, this results in three paths (IBM Institute for Business Value 2011; Esser 2014):

Internal: Transformation of benefits and the value creation dimension; for example:

- Creation of new digital products such as eBooks, apps, etc.
- Extension of the existing product offering to include digital platforms and technologies such as E-business and M-Commerce
- Application of technologies to reduce costs in the supply chain and management processes
- Application of technologies to carry out, for example, (worldwide) virtual conferences

External: Transformation of the customer and partner dimension and the value-added chain:

- Application of tracking and analysis tools to analyze customer behaviors and to make predictions regarding future purchasing behaviors
- Application of multiple, integrated channels such as branches, cell phones, websites, and social media for an improved customer experience
- Direct: Parallel internal and external transformation.

The paths dependent on the perspectives are shown in Fig. 6.11.

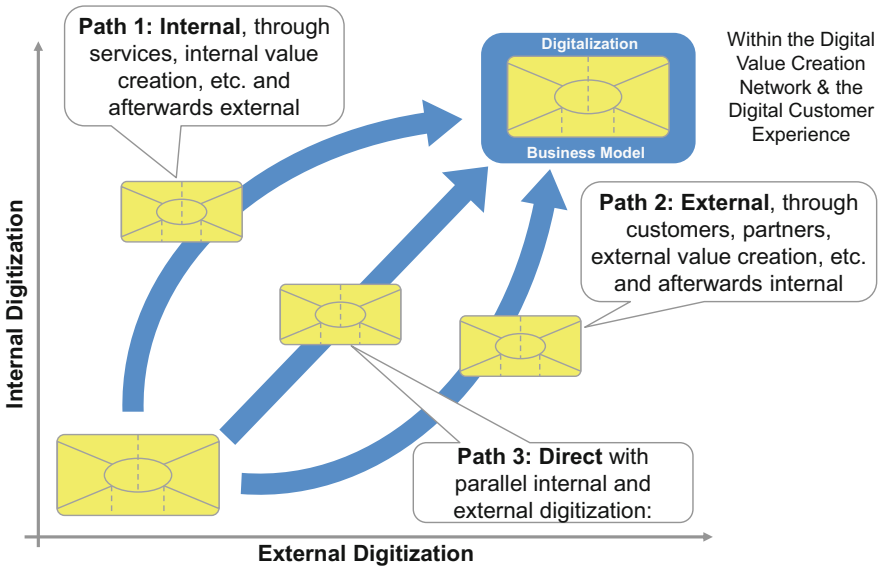

Fig. 6.11 Digital transformation paths

6.6 Digital Implementation: Enabling the Realization

6.6.1 Objectives and Questions

The objective in this phase is to carry out the digital implementation of the business model. The digital business model is finalized and implemented. In addition, the digital customer experience and the digital value creation Network are designed.

This phase of digital implementation addresses and answers the following questions:

- How can the digital business model be finalized and implemented? What changes should be made to the existing business model and in what order? In addition, which projects are necessary?
- How should the digital customer experience be designed? What digital enablers should be used and what applications are produced accordingly?
- How should the digital value creation network be designed and how should partners be integrated? What enablers should be used and which applications are thus produced?
- What resources and skills are generally required to carry out the digital implementation?

6.6.2 *Activities and Tools*

Within the framework of activities, tools are used to achieve targeted results.

Finalization and Implementation the Digital Business Model
Based on the previous evaluation, the most promising combination of options is integrated into the business model in order to finalize it. Then a project and plan of action are developed to implement the final business model. Here, necessary resources and capabilities also play a role in creating the digital business model.

Figure 6.12 shows the embedding of the "engine" product into the business model and the system of systems. Various developmental stages are also shown in Fig. 6.12. The idea of the development originates from Porter and Heppelmann (2014: 44).

The product is an engine installed in an aircraft. The intelligent product provides data collected by engine sensors that allow one to target fuel consumption and possible optimization. When the engine within the aircraft is networked (e.g., landing flaps are controllable), it is considered an intelligent, networked product. The networking can also be done with the entire airline fleet, or fleets of other airlines.

When more services are added to the intelligent and networked product, then it is a product system. In the present example, it is an aircraft system that includes navigation services, fuel management, and risk management (GE 2016a).

The navigation service enables a reduction in miles flown and therefore reduced fuel consumption. In addition, the navigation service contributes to improving the planning and implementation of performance-related navigation procedures. Here, experts from various domains have access to this system which facilitates the implementation of tailor-made customer solutions.

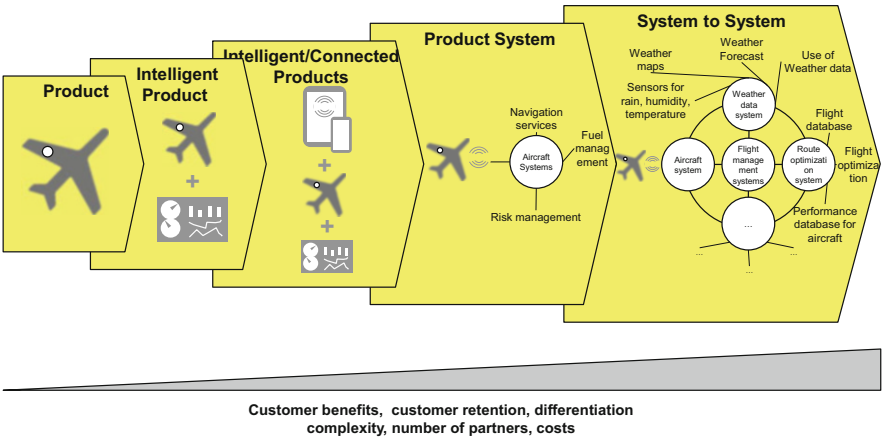

Fig. 6.12 Development product stages for system of systems (Source: Porter and Heppelmann 2014: 44)

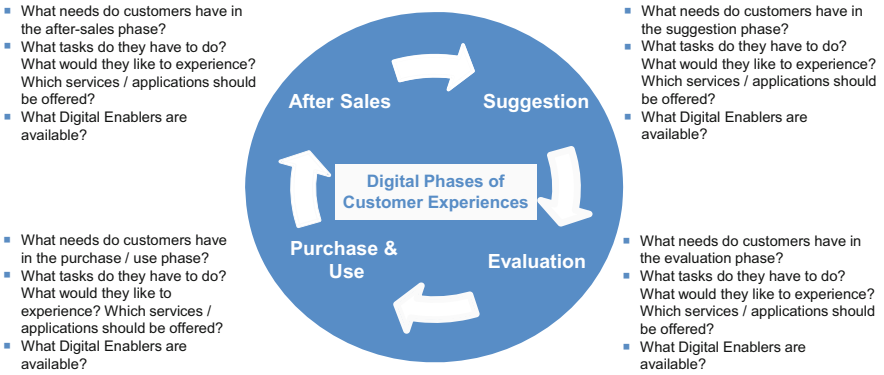

Fig. 6.13 Digital customer experience phases

Fuel management involves providing insights to achieve sustainable fuel savings. Fuel management includes analysis and reporting capabilities to provide insights for additional savings.

Risk management ensures flight safety and fleet productivity with flight-data analysis software. The evaluation and validation of multiple data sources, such as flight, weather, and navigation data is done with the help of automated integration. The functions can be adapted to all fleet types. Precise analysis capabilities also include customizable navigation.

On the one hand, at each stage of development, benefits are generated for customers (e.g., cost savings) and customer loyalty increases accordingly. This also allows for greater differentiation from competitors. On the other hand, however, the complexity, the number of partners, and thus the costs for the provider for each stage of development will also increase.

Design of Digital Customer Experience

The digital customer experience is now developed based upon the customer requirements which were collected in the first phase. In doing so, the most important phases from the customer's perspective are determined. Requirements, tasks, and prerequisite experience are established for each phase, and services as well as digital enablers are defined (in accordance with: Stickdorn et al. 2011: 158; Curedale 2013: 213).

In order to analyze the most important phases from the customer's perspective, a valid description of the digital customer experience is developed. This is presented in Fig. 6.13 (based on: Schallmo and Brecht 2014: 104; Schallmo 2013: 209).

Depending on the industry, customer, and business model, other phases may also be relevant from the customer's perspective. Moreover, the phases should be worked out individually. In Fig. 6.14, an example taken from the use of an aircraft engine is used to demonstrate a digital customer experience design.

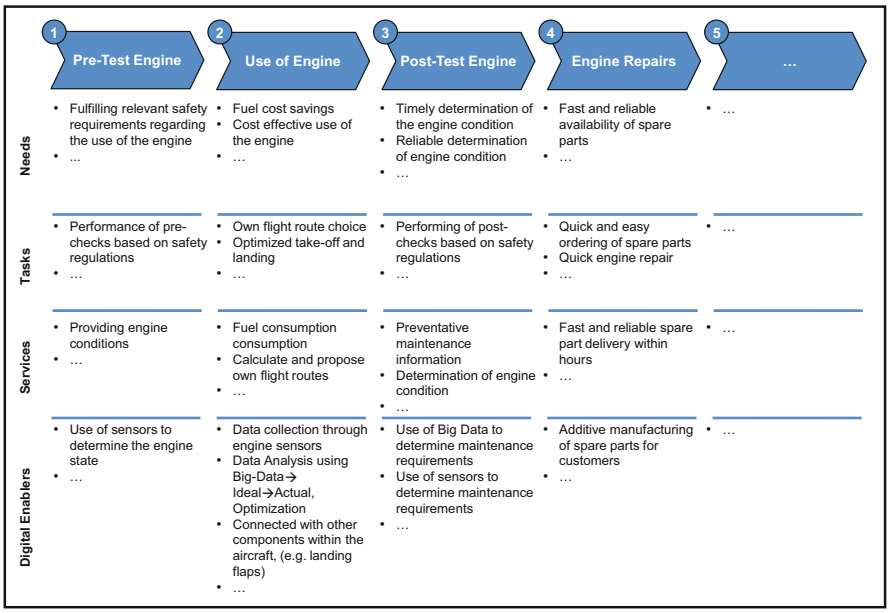

Fig. 6.14 Digital customer experience: engine usage

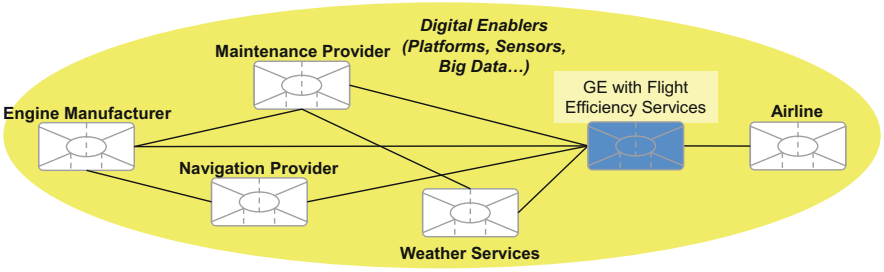

Fig. 6.15 Digital value creation network integration

Design of the Digital Value Creation Network and Partner Integration

Based on the analysis of the value-added chain and actors, as well as the final business model, the design of the digital value creation network is determined and integrated with partners.

It is at this point that someone must be found to fill the role of integrator. Digital enablers are also needed to form the value creation network. Figure 6.15 shows the integrated digital value creation network.

During the final phase, it is crucial that the finalization and implementation of the business model, the design of the digital value creation network, and the design of the digital customer experience are done iteratively. This means that adjustments can be made based on iterative tests.

6.7 Intelligent Business Model as an Ideal Condition

In the ideal scenario, the processes described above conclude and result in an intelligent business model which is characterized by a sophisticated technological infrastructure that is integrated into a cloud. This is equivalent to the system of systems, which is shown in Fig. 6.12. Figure 6.16 shows an intelligent business model with a technological infrastructure, within a cloud (in accordance with Porter and Heppelmann 2015: 57).

The starting point for this ideal scenario is a business model with products, services, processes, etc., using hardware and software. The software includes embedded operating systems, software applications, and an advanced user interface. The hardware includes embedded sensors and processors, network connections and antennas, in addition to traditional mechanical components. By networking the business model, network communication between products, services, processes, etc. is made possible within a cloud.

An intelligent business model within a cloud performs intelligent applications, implements rule analysis engines, operates an application platform, and uses a

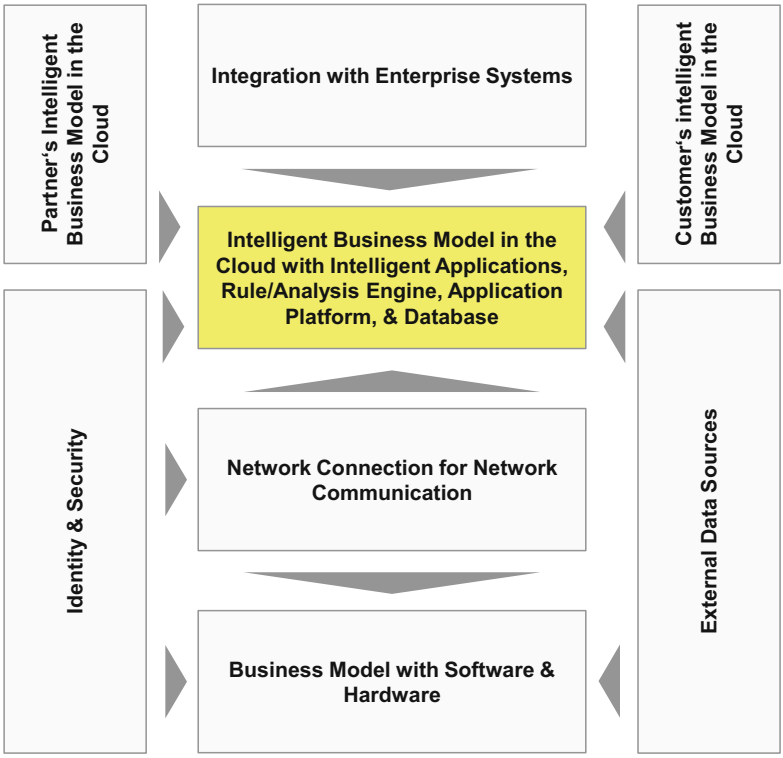

Fig. 6.16 Intelligent business model including technological infrastructure

database. The intelligent applications use cloud features that can monitor, control, optimize, and also be run at least somewhat autonomously.

The engine analysis contains rules, business logic, and big-data analysis capabilities. It provides information and enables new insights into products, services, processes, etc. The application platform includes a development environment in which intelligent, networked applications with data access, visualization, and run-time tools can be created quickly. Within the database, historical and current data is aggregated, normalized, and managed.

The intelligent business model within the cloud is tied to corporate systems and linked to intelligent business models by customers and partners within the cloud. In addition, there is a network with external data sources.

Within the framework of connection-to-connection enterprise systems, tools are used that deliver data from intelligent, networked business models to core systems (ERP, CRM, and PLM). External data sources include connections to information from external sources that serve as a database (e.g., weather, traffic, energy prices, social media, geo-location) for business model functions. User identities and security are ensured with tools that facilitate the management of user profiles and system access. The objective is to secure the business model, network connectivity, and cloud components.

6.8 Procedure Model Summary

Figure 6.17 summarizes the previously described phases of the Roadmap within a business model. Objectives, activities, and results are described here.

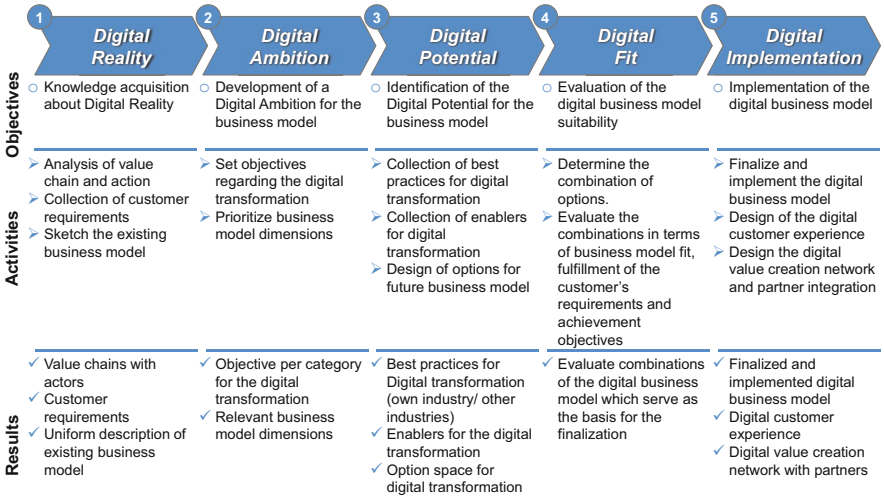

Fig. 6.17 How to model the digital transformation of business models

The process model aims to enable the digital transformation of business models. In addition to the application of the entire model, it is also possible to customize the process model by combining or skipping individual phases and activities.

References

Bauernhansl T, Emmrich V (2015) Geschäftsmodell-Innovation durch Industrie 4.0 – Chancen und Risiken für den Maschinen- und Anlagenbau. Dr. Wieselhuber & Partner GmbH und Fraunhofer-Institut für Produktionstechnik und Automatisierung IPA, Das wertbasierte GeStuttgart

Bieger T, Reinhold S (2011) Das wertbasierte Geschäftsmodell–Ein aktualisierter Strukturierungsansatz. Innovative Geschäftsmodelle, 13–70, Springer, Berlin

Botthof A, Bovenschulte M (2009) Das "Internet der Dinge": Die Informatisierung der Arbeitswelt und des Alltags. Erläuterungen einer neuen Basistechnologie (No. 176). Arbeitspapier, Globalisierung und Europäisierung

Bouée CE, Schaible S (2015) Die Digitale Transformation der Industrie. Roland Berger Strategy Consultans und Bundesverband der Deutschen Industrie e.V., Berlin

Brand L, Hülser T, Grimm V, Zweck A (2009) Internet der Dinge–Perspektiven für die Logisitk. Zukünftige Technologien Consulting, 80. Technologiezentrum GmbH

Bucherer E (2011) Business model innovation-guidelines for a structured approach. Shaker, 121 Aachen

CE VeMaB (2011) Workshop 3 und Interviews Intelligence und Analytics/Geschäftsmodell-Innovation, Ulm, 24 Nov 2011, 09:30–17:30 Uhr

Curedale R (2013) Design thinking: process and methods manual. Design Community College, Topanga

Draper J (2017) Is this finally the end of bumpy flights? Boeing to trial a long-distance LASER that will spot pesky clear-air turbulence up to 10 miles away. http://www.dailymail.co.uk/travel/travel_news/article-4894594/Boeing-trial-turbulence-detecting-lasers.html. Retrieved 4 Oct 2017

Esser M (2014) Chancen und Herausforderungen durch Digitale Transformation. http://www.strategy-transformation.com/digitale-transformation-verstehen/. Retrieved 2 Feb 2016

Flugrevue (2016) Bionisches und herkömmliches Bauteil. http://www.flugrevue.de/zivilluftfahrt/flugzeuge/airbus-a350-fliegt-erstmals-mit-3d-gedrucktem-bauteil/581076. Retrieved 13 April 2016

Gadiesh O, Gilbert JL (1998) Profit pools: a fresh look at strategy. Harv Bus Rev 76(3):139–147

GE (2016a) Data and analytics driving success at AirAsia. https://www.ge.com/digital/stories/Data-and-Analytics-driving-Success-at-AirAsia. Retrieved 2 Feb 2016

GE (2016b) Triebwerk von GE. http://www.geaviation.com/commercial/engines/ge90/. Retrieved 13 Apr 2016

Geissbauer R, Schrauf S, Koch V, Kuge S (2014). Industrie 4.0–Chancen und Herausforderungen der vierten industriellen Revolution. PricewaterhouseCoopers (PWC), 227, 13

Giesen E, Berman SJ, Bell R, Blitz A (2007) Three ways to successfully innovate your business model. Strateg Leadersh 35(6):27–33

Grant RM (2016) Contemporary strategy analysis text only. Wiley, Hoboken

Gray D, Brown S, Macanufo J (2010) Gamestorming: a playbook for innovators, rulebreakers, and changemakers. O'Reilly Media, Beijing

Hitt MA, Ireland RD, Hoskisson RE (2012) Strategic management cases: competitiveness and globalization. Cengage Learning, Andover

Hoffmeister C (2017) Digital business modelling: digitale Geschäftsmodelle entwickeln und strategisch verankern. Carl Hanser, München

IBM Institute for Business Value (2011) Digital transformation creating new business models where digital meets physical. http://www-935.ibm.com/services/us/gbs/thoughtleadership/pdf/us_ibv_digita_transformation_808.PDF. Retrieved 2 Feb 2016

Jahn B, Pfeiffer M (2014) Die digitale Revolution–Neue Geschäftsmodelle statt (nur) neue Kommunikation. Marketing Review St. Gallen 31(1):79

Johnson M (2010) Seizing the white space: business model innovation for growth and renewal. Harvard Business Press, Boston

Knabel J (2014) Airbus über 3D-Druck in der Luftfahrt. https://3druck.com/industrie/airbus-ueber-3d-druck-der-luftfahrt-4919624/. Retrieved 2 Feb 2016

KPMG (2013) Survival of the smartest – Welche Unternehmen überleben die digitale Revolution? KPMG, Berlin

Kreutzer RT, Land KH (2016) Digitaler Darwinismus: Der stille Angriff auf Ihr Geschäftsmodell und Ihre Marke. Das Think! Book. Springer, Wiesbaden

Mullins JW, Komisar R (2009) Getting to plan B: breaking through to a better business model. Harvard Business Press, Boston

Österle H (2013) Business engineering. Prozeß-und Systementwicklung: Band 1: Entwurfstechniken. Springer, Berlin

Osterwalder A, Pigneur Y (2010) Business model generation: a handbook for visionaries, game changers, and challengers. Wiley, New York

Osterwalder A, Pigneur Y, Tucci CL (2005) Clarifying business models: origins, present, and future of the concept. Commun Assoc Inform Syst 16(1):1

Pivotal (2016) Pivotal announces planned strategic investment from GE. http://pivotal.io/corporate/press-release/pivotal-announces-planned-strategic-investment-from-ge. Retrieved 2 Feb 2016

Plattner H, Meinel C, Weinberg U (2009) Design Thinking–Innovation lernen–Ideenwelten öffnen. mi-Wirtschaftsbuch, München

Porter ME, Heppelmann JE (2014) Wie smarte Produkte den Wettbewerb verändern. Harv Bus Manag 12(2014):34–60

Porter M, Heppelmann J (2015) Wie smarte Produkte unternehmen verändern. Harv Bus Manag 37:12

Rusnjak A (2014) Entrepreneurial business modeling – Definitionen – Vorgehensmodell – Framework – Werkzeuge – Perspektiven. Springer, Wiesbaden

Schallmo D (2013) Geschäftsmodelle erfolgreich entwickeln und implementieren. Springer, Wiesbaden

Schallmo DR (2014) Vorgehensmodell der Geschäftsmodell-Innovation–bestehende Ansätze, Phasen, Aktivitäten und Ergebnise. In: Kompendium Geschäftsmodell-Innovation. Springer Fachmedien, Wiesbaden, pp 51–74

Schallmo D (2015) Bestehende Ansätze zu Business Model Innovationen. Springer, Wiesbaden

Schallmo D, Brecht L (2014) Prozessinnovation erfolgreich gestalten

Skarzynski P, Gibson R (2008) Innovation to the core: a blueprint for transforming the way your company innovates. Harvard Business Press, Boston

Stickdorn M, Schneider J, Andrews K, Lawrence A (2011) This is service design thinking: basics, tools, cases. Wiley, Hoboken, NJ

Weiner N, Renner T, Kett H (2010) Geschäftsmodelle im "Internet der Dienste". Fraunhofer-Verlag, Stuttgart

Wirtz BW (2011) Business model management. Design–Instrumente–Erfolgsfaktoren von Geschäftsmodellen, 2

Wirtz B, Thomas MJ (2014) Design und Entwicklung der Business Model-Innovation. In: Schallmo DA (ed) Kompendium Geschäftsmodell-Innovation – Grundlagen, aktuelle Ansätze und Fallbeispiele zur erfolgreichen Geschäftsmodell-Innovation. Springer, Wiesbaden, pp 31–49

Chapter 7
Summary

This book provided two insightful definitions for the digital transformation of business models in Chap. 2.

Then, in Chap. 3, the definition of the digital transformation of business models was developed within a synthesis of previous works. Finally, the future of digital transformation was considered.

In Chap. 4, four examples of successful digital business model transformations were presented, complete with the initial starting point, problems to be solved, objectives, solution approach, results, and application to the first phase, Digital Reality.

In Chap. 5, existing approaches to digital transformation were outlined and these were also used as the basis for the Roadmap.

In Chap. 6, the Roadmap was explained along with its five phases: Digital Reality, Digital Ambition, Digital Potential, Digital Fit, and Digital Implementation. The phases of the Roadmap were discussed along with their respective objectives and the relevant questions which need to be asked when establishing those objectives. Afterwards, innovative activities were put forth, each with its corresponding tools. Finally, the procedure model was presented, which summarizes all the phases of the Roadmap and contains objectives, activities, and results.

The Roadmap and the procedure model for the digital transformation of business models is based on existing approaches and experiences which were garnered within the framework of consulting and research projects.

What You Can Take Away from This Book

- Support for the digital transformation of your business model through the use of a compact Roadmap with five phases
- Practical activities and tools for each phase which are illustrated by examples
- Focused awareness of the Status quo in the first phase: Digital Reality
- Definition of objectives for the digital transformation in the second phase: Digital Ambition

D. R. A. Schallmo, C. A. Williams, *Digital Transformation Now!*, SpringerBriefs in Business, https://doi.org/10.1007/978-3-319-72844-5_7

– Conceptualization of options for the digital business model in the third phase: Digital Potential
– Assessment of the suitability of those options in the fourth phase: Digital Fit
– Realization of the digital business model in the fifth phase: Digital Implementation