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Conceptual framework for a digital organization

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Purpose: *Innovative technologies are forcing companies to incorporate digitization more into their value creation processes in order to remain competitive long-term. A transformation to a digital organization is therefore required. Aim of the paper is to identify which key components should be covered during the transformation to a digital organization and should therefore be part of a conceptual framework. The conceptual framework will help companies achieving a holistic transformation into a digital organization.*

Methodology: *Based on an analysis of the literature, the key components necessary to successfully transition to digital organization are identified. The relevance of these core topics are then examined with the help of expert interviews. Based on the results, a conceptual framework for a holistic transformation into a digital organization is developed.*

Findings: *Six key components are identified for the framework, which represent the basic requirements for the transformation into the digital organization. Furthermore, drivers as well as challenges are shown that companies have to overcome in the digital transformation.*

Originality: *Scientifically sound concepts that include a holistic approach to transformation into a digital organization have, until now, lacked the scientific methods used to collect the content. The development of our framework has a scientifically grounding.*

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1 Introduction

In times of Blockchain, Big Data, the Internet of Things, and Artificial Intelligence, there is hardly a company that can avoid the topic of digitalization. The multifaceted flood of innovative technologies and novel forms of value creation forces companies to increasingly incorporate digitalization into their products and value creation processes in order to remain competitive in the long-term. A transformation to digital organization is therefore necessary (Bounfour, 2016; Salkin et al., 2018).

The unsuitable organizational structures and inflexible business processes of traditional systems present organizations with enormous challenges transitioning into the digital age (McKinsey & Company 2014, Beaudry and Pinsonneault, 2005). Results show that, after initial successes in implementing digital initiatives, companies increasingly find it difficult to sustain competitive advantages realized through digital transformation, including well-known organizations such as General Electric, Ford, Lego, and Procter & Gamble (Davenport and Westerman, 2018). This is partly due to the fact that often no holistic approach was taken during implementation.

The transformation to a digital organization, therefore, requires a holistic concept in which the individual components are coordinated to ensure long-term success. The aim of this paper is to identify which key components should be covered during the transformation to a digital organization and should therefore be part of this conceptual framework. First, core issues for the transformation into a digital organization are identified with the help of a literature analysis. The insights gained from the literature are then checked for their practical relevance with the help of expert interviews. Subsequently, the methods and procedures are explained. Based on the results of the literature analysis, a scientifically sound framework for digital transformation is developed. After a short discussion of the results, the paper ends with a summary and an outlook on further research.

2 Digital Transformation and Digital Organization

According to Mazzone (2014, p. 8) digital transformation is "the deliberate and ongoing digital evolution of a company, business model, idea process, or methodology, both strategically and tactically." The digital transformation, also known as digital change, pursues goals such as increasing flexibility, productivity, customer focus, securing and improving a competitive position, automation, increasing efficiency and company-wide innovation (Schroeder et al., 2014; Gilchrist, 2016; Bounfour, 2016). The cause and biggest driver of digital change is technological progress in conjunction with innovative technology concepts (Gilchrist, 2016). A large number of technologies can be cited here, such as cyber physical systems (CPS), additive manufacturing processes, augmented reality or artificial intelligence, cloud computing, 5G mobile phone standard, and Internet of Things platforms, among others (Salkin et al., 2018).

Digital change affects companies in all industries and brings with it both opportunities, such as efficiency gains or productivity increases, and challenges, such as a lack of knowledge, unclear target visions or complexity management (Gilchrist, 2016; Bounfour, 2016).

In order to change digital organization, all organizational structures and processes in the company must adapt to increasing digitalization. However, established approaches to organizational development have not yet been able to meet the requirements of digital transformation (Jones, 2013). Therefore, in the scientific literature there are numerous approaches to implementing a digital organization. These, however, focus primarily on individual core topics of digital organization, such as the implementation of new technologies and digital business models, intelligent products, and services/leadership through digital change (Casadesus-Masanell and Ricart, 2011; Gilchrist, 2016; Westerman et al., 2011; Esser, 2017; Cameron and Green, 2015). However, these core issues should be coordinated and embedded in a holistic framework to guarantee long-term success. Scientific concepts, which include a holistic approach to digital organization transformation, either rarely exist or lack a clear scientific method with which the content was collected (Snow et al., 2017; Kane et al., 2018; Gilchrist, 2016; Salkin et al., 2018; Westerman et al., 2014). However, it is apparent that in recent years a large number of

multi-faceted maturity models for Industry 4.0 and digitization have been developed to enable companies to speed along their digital maturity (Anderl et al., 2015; Back and Berghaus, 2015; Millack et al., 2015; Maier et al., 2012; Westerman et al., 2011; Catlin et al., 2015; Wendler, 2012). These should, therefore, be included in the following analysis so that the key components of transformation into a digital organization can be identified and then empirically tested. Finally, based on the results, a scientifically sound conceptual framework for transformation into a digital organization should be developed.

3 Research Methodology

While individual focal points for the transformation to digital organization have been the subject of scientific discussions over the previous years, developing a scientifically based conceptual framework remains relatively unexplored. Thus, an attempt is made with this paper, to answer the following research question: "What are key components of a conceptual framework for a transformation into a digital organization?"

To answer this research question, a systematic literature review was conducted. The scientific data bases, Science Direct, Web of Science, and Google Scholar were the primary post-2000 sources of published articles used to guarantee current results. Scientific papers were selected and evaluated using the keywords "maturity model", "maturity assessment", "digital maturity", and "digital organization". In addition, the literature research shows that, besides academia, consulting companies in particular issue their results on digital maturity models. Therefore, the generic approaches on organizational maturity published by the largest consultancy companies, like Accenture, Deloitte, PricewaterhouseCoopers, KPMG, and McKinsey & Company were also taken into account (Statista, 2017). In a second step, the dimensions of digital maturity used in the models and the various organizational areas examined were compared regarding their content.

Based on the literature results, expert interviews were conducted in July 2018 to confirm the relevance of the content. Table 1 shows the list of experts.

Table 1: List of experts

Number	Industry sector	Position
1	Education sector	Manager IT security
2	Automotive	Project manager additive manufacturing
3	Aviation	Material & logistics manager
4	Aviation	Head of innovation management
5	Medical and security technology	Digital systems management
6	Consultancy	Associate consultant
7	Aviation	Corporate innovation manager
8	Aviation	Digital business manager
9	Commerce & services	Senior online marketing manager
10	Human resource management	Digital human resource manager

The experts have significant experience and specific knowledge in the field of digitalization. All interviews were carried out in person in the native language of the interviewee. During the interviews, the different key components of a digital organization

were discussed in detail. All interviews were recorded and then transcribed using QDA software MAXQDA (Creswell, 2003).

4 Literature analysis about digital maturity models

The dimensions of digital maturity used in the models and the various organizational areas examined were compared regarding their content. These dimensions are crucial components of organizations and therefore best-suited as key components for the conceptual framework for a transformation to digital organization. Table 2 shows an extract of individual digital maturity models and the content considered. The models were developed by both scientists and consulting firms. In total, 34 digital maturity models and 216 dimensions of digital maturity were analyzed.

Table 2: Digital maturity models (extract)

Author	Year	Key components
Anderl et al.	2015	Business models, IT services, communication, connectivity, products, production, machine-to-machine communication
Back and Berghaus	2015	Customer experience, product innovation, strategy, organization, process digitalization, collaboration, ICT operation and development, culture, expertise, transformation management
Catlin et al.	2015	Strategy, capabilities, culture, organization, talent

Author	Year	Key components
Competence Center	2019	Strategy, Technology, Products and Services, Organization and Processes, Employees
Deloitte	2018	Customer, Strategy, Technology, Operations, Organization & Culture
KPMG	2916	Digital Strategy, Digital Governance, Digital Culture, Digital Customers and Channels, Digital Organisation and Process, Technology Management, Digital People and Capabilities
Maier et al.	2012	Structured process, organizational structure, people, learning
Millack et al.	2015	Strategy, organization, smart factory, smart operations, smart products, data-driven services, employees
Westerman et al.	2011	Customer experience, operational process, business model, digital capabilities

The evaluation of the maturity models showed that it is often impossible to understand how the content of particular dimensions is created. Furthermore, many of the models have a thematic focus; for example, Chaffey's maturity model (2010) focuses on the maturity of digital-marketing governance. In comparison, Som and Gamroth (2019) developed a model to determine the digital maturity for human resource management. Additionally, some models have an industry focus, like e.g. Mettler and Pinto (2018)

focusing digitalization in the health care sector. A generic, holistic approach for the transformation to a digital organization, which also considers interdependencies between individual dimensions does not yet, unfortunately, exist within these models (Westerman et al., 2014).

5 Results

With the help of the literature analysis, six content-related key components for the transformation to a digital organization were identified, and their respective content-related relevance was subsequently confirmed in the expert interviews. These key components include organizational structure, strategy, human resource management, new technologies and their infrastructure, value chain, and customer-considerations, and thus form the foundation of the framework (see Figure 1). Noteworthy: there is a large number of interdependencies between the individual key components; however, these key components have not been further subdivided for clarity.

Organizational structure

The key component “organizational structure” was rated as highly relevant by the experts. It reflects a company's efforts to adapt the strategic positioning of the organization to new challenges. In doing so, it aims to efficiently provide digital skills within the company. New approaches to the organization of a company to successfully and decisively transform to digital organization is made possible by emerging technologies and must be implemented with the help of an appropriate organizational structure (Geissbauer et al., 2016).

As an organizational structure changes during a digital transformation, new rules and structures are needed to organize collaboration both inside and outside the company to move away from traditional forms of organization towards an agile, adaptive one. The detachment of established structures refers to different areas of organizational structures. In addition to technical replacements (IT systems and communication channels), both leadership principles and interpersonal behavioral structures need to be reviewed.

In order to properly implement digitization and have it be successful, one must prepare a task force within the company, which is purely concerned with this topic, as well as designate a single expert contact person responsible for all corporate operational divisions.

"Many are trying to establish digital products and digital organizations in their old world, and it doesn't work." (Interviewee 8)

New, agile organizational structures that turn away from traditional corporate silo structures promote cross-departmental and cross-company cooperation in the management of digital projects. The replacement of a functional or matrix organization with a network organization is an example of this. These new structures also include flexible communities, centers of excellence, incubators, ideation labs, and acceleration centers.

"Digital organization is maintained above all through functioning processes." (Interviewee 10)

Under the key component "organizational structure", corporate processes are also enhanced. Suitable processes are then digitized in a data-focused manner, using a participatory approach in order to strategically align the organization and employees to new business areas and types of value creation. With the basic idea of agility, business processes can be made more flexible, faster, and more efficient. High levels of digitization of business processes and their interfaces are required to enable vertical process integration within the company and at the same time horizontal integration with partners along the value chain. In addition to agile structures, the agile management of business processes are also required. This can be achieved by establishing methods such as SCRUM, Design Thinking, and DevOps.

"But it is not only digitization which has become a major topic, but also the new working methods made possible by technology, which do not necessarily have anything to do with digitization. Key word: agile." (Interviewee 10)

Furthermore, a digital organizational structure should be coordinated with an overall digitization strategy and adapted for digital value creation.

Strategy

The experts also attributed an important role in the transformation to a digital organization to the "strategy" concept module. For the success and dynamics of the transformation to a digital organization, the development and targeted pursuit of a long-term sustainable digitization strategy is essential (Hess et al., 2016). This prioritizes a strategic focus on the implementation of digital projects and thus ensures both competitiveness and further business development (Berman, 2012). The relevant aspects of a digitization strategy include the definition of clear strategic objectives and digital visions, the company-wide communication and documentation of these visions and objectives, and the definition of concrete measures to achieve aforementioned objectives. It should be noted that a successful digitization strategy not only takes into account disruptive technological developments but also regularly adapts the defined strategy on the basis of new experiences (Puranam et al., 2014).

"IT and digitization should drive the company forward, new business models should improve the service, the internal collaboration, and so on. This is a new way of thinking, because IT used to be a pure support function." (Interviewee 6)

With the use of digital technologies, an organization experiences the possibility to develop new business models. Disruptive, digital business models often focus on additional digital revenue generation and the optimization of customer interaction via a software-based, active customer relationship. There is also a trend towards innovative product and service portfolios that create integrated customer solutions across supply chain boundaries, replacing traditional product-sales business models. Examples are pay-per-use models (e.g. car2go carsharing of Daimler AG), Product-as-a-Service (e.g. Power by the hour of Rolls-Royce Motor Cars Ltd.), and Platform-as-a-Service (e.g. Amazon Web Services).

In addition to business model development, strategic considerations for a digital organization should also take into account an increase in investment. This includes an increased capital investment or a higher project budget in order to enable both material (e.g. new technologies) and personnel resources (skilled workers).

Human Resource Management

Human Resource Management is considered by experts to be the third most relevant key component. The acquisition of digital expertise and the availability of necessary resources are essential for a sustainable transformation into a digital organization (Escher, 2005). Under changed working methods, digital technologies are used to support collaboration, communication, and mobile working by employees, enabling efficient networking while on the move.

Leadership in this sense includes the role of management in the implementation of a digitization strategy. Frequently, the organization's focus on digitization is achieved using a “top management commitment”, which delegates all of a company's executives as a driving force for digitization. To this end, there should be a Chief Digital Officer in top management, who focuses on the digitization strategy and is responsible for planning and managing the digital transformation within the organization.

"Be it an App Developer, the Head of IT, a Digitization Manager, or an Online or Digital Marketing officer, none of these roles existed before." (Interviewee 3)

Furthermore, the willingness of managers to involve employees in the change process has a strong influence on the success of the transformation to a digital organization.

The corporate culture illustrates its relevance in the openness and understanding of an organization towards digital technologies and associated changes (Tschirky, 2003). A kind of "digital culture" is thus created; this is characterized by the employees' trust in the new information systems and processes, which enable greater process stability and rapid role- and context-specific exchanges of knowledge. By raising awareness and involving employees in decision-making processes, an openness to innovation is fostered, leading to active participation in shaping future changes. Furthermore, open communication, using suitable communication technologies, is essential to achieve an exchange of knowledge and to establish an open collaborative culture. The disclosure and goal-oriented analysis of errors promotes a willingness towards change within the company, while fostering data-based learning and encouraging decision-making from employees.

"It's not enough to give a status update or explain why, but you have to keep the whole company fully informed: why you're taking this step, what this step involves, how long this step takes. Communication is the key." (Interviewee 3)

A democratic management style that offers a framework for decision-making from employees requires not only an appreciation of employee skills but also continuous investment into employee development. The decentralization of decisions generates a high degree of autonomy and independence for employees, which can lead to efficiency gains at the customer interface level, for example, by adapting data in real time. New manufacturing technologies and the increased use of ICT require an early recognition of employee training needs.

"Employees who are willing to do so are also willing to be retrained and to stay on top of the changes, but it's obviously a culture change." (Interviewee 9)

In addition, newly emerging positions and responsibilities, especially in the IT sector, require a precise definition of rights and duties. The specification of requirements for new types of activities and roles is necessary for personnel recruitment and a goal-oriented execution of tasks.

New technologies and infrastructure

New digital technologies and infrastructure are also identified as an important key component. Modern technologies enable the creation of an ever larger database, while flexible and agile ICT systems promote the dynamic implementation of strategic measures, thereby forming a basis for a successful digital transformation. ICT infrastructures and information systems enable new digital products, services, communication methods, and transactions. In addition to digital technologies, real-time data and standards should be considered as equally relevant topics (Badescu and Garcés-Ayerbe, 2009).

In order to use new technologies professionally, existing competencies and infrastructures in the company must be expanded. In this context, the skills for data analysis, process automation, and cross-channel management are considered to be crucial for the successful use of new technologies. Digital workplace concepts and the

agility of existing systems determine the type and possible applications of digital technologies in the company.

"Over the decades, many individual system solutions have been set up. Whenever new demands on IT arose, companies would either purchase new software or develop the technology themselves. This IT solution is then often not cohesive, [...], i.e. at some point one the IT infrastructure becomes completely fragmented – not linked at all, very stiff, and not agile." (Interviewee 6)

Digitalization and process automation are necessary for proper digital organization. The creation of a flexible technological environment is the starting point for process digitization and further process automation. In the course of vertical integration, IT is of great importance, since interdepartmental, fully networked IT solutions open up synergies to connect business divisions and create value. Traditional, legacy IT architectures cannot withstand the pressure of increasing customer requirements that digital product innovations demand.

For example, in data management, data analysis strategies under the umbrella of Big Data Analytics, often focus on predictive analytics (prediction of future events: e.g. load forecasts of smart grids, predictive maintenance, etc.), forecasting procedures, and prescriptive analytics (recommendations for action and automated decision making: e.g. planning of resources, ticket prices of airlines, etc.). The enormous amount of data, analysis methods, and algorithms exceed the capacity and functionality of existing Enterprise Resource Planning (ERP) systems. A data integration level is then built up to connect to the ERP system. In addition to optimized “Legacy IT” to support familiar business processes, digital organizations need to swiftly construct a second specialized IT architecture in parallel.

Value chain

The fifth key component focuses on value chains. Companies use digital technologies to develop innovative product and service offerings with significant customer and competitive advantages. The integration of data-based services into the business model leads to "smarter" products and networking with customers. Products are offered completely digitized or enriched with the help of additional digital functions.

"[...] the combination of both automation and the availability of new devices on the market, as well as the subsequent new possibilities of networking, have drastically grown in recent years." (Interviewee 4)

A digital organization should therefore drive the development of so-called smart products. Smart products are physical objects equipped with both extensive ICT add-on functions (e.g. product memory, self-disclosure, networking, and local development) and, thanks to mobile technologies, the ability to collect and communicate data during production and use. Some examples of this are novel digital services, blogs, customer boards, online shops, service platforms, mobile payment, and live chats.

Furthermore, with regard to the digitalization of the value chain, practice often follows the model of a smart factory. The "smart factory" is an intelligent and networked production environment in which production plants and logistics systems communicate with both superimposed IT systems (e.g. ERP, supply chain management systems) and "smart products" to organize itself in a manner where human intervention is replaced with CPS and an unified database.

"There are two main lines of action […] one is the digitalization of the products […] (the so-called top-line activities), and the bottom-line activities i.e., the digitization of the factory." (Interviewee 4)

The networking of people, objects, and systems also allows dynamic, real-time, self-organizing, value-added networks. Legally independent actors are connected to each other via complex mutual relationships in a system of individual value-adding processes. Furthermore, the cooperation of suppliers, business partners, and customers within a global, digitally-integrated network is a form of horizontal integration with the aim of achieving efficient and flexible customer solutions, extending far beyond the corporate boundaries of individual organizations.

Customer-considerations

Customer-considerations represents the sixth key component. Digital transformation is driven by the changing implementation of digital technologies associated with customer expectations, leading to companies gearing their value propositions and offerings to the

behavior of digital customers. So-called "digital natives" are shaping the way in which customers act, consume, and buy digital products and services.

"A digital organization must be strongly customer driven. Technological advances require that we respond incredibly quickly to customer needs, which means expanding product development and services. The process begins with the customer and ends with the customer." (Interviewee 10)

Starting with digital platforms, the horizontal integration of suppliers, customers, and other supply chain partners within the value chain aims to complete the customer ecosystem, consisting of third-party logistics partners, products of other competitors, and control systems. A central tenet of this ecosystem is customer-oriented, integrated solutions which allow for individualization, personalization, flexibility, and anticipation in order to foster a close, software-supported, active customer relationship. There are three areas in particular that are central to the customer relationship processes: information and communication, sales and consulting, and customer relationship management (CRM).

In the area of information and communication, search engine marketing (the use of social media networks and the personalization of advertisements on websites) in online advertising or email marketing is critical. In order to optimize the customer experience in sales and consulting, companies increasingly rely on individual product designs by customers using configuration tools, targeted data management for real-time information on product availability, order, service status, or delivery date or the operation of an online shop with chat functions and e-commerce. CRM can also constitute a web-based self-service/customer portal, customer database, and the integration of external information, such as geodata and data from social networks to enable individualization of customer advice and sales. The design of a successful customer journey is essential to achieve high customer satisfaction (Piller et al., 2011).

Figure 1 summarizes the key components which represent the basic requirements for the transformation into the digital organization.

Conceptual framework for a digital organization

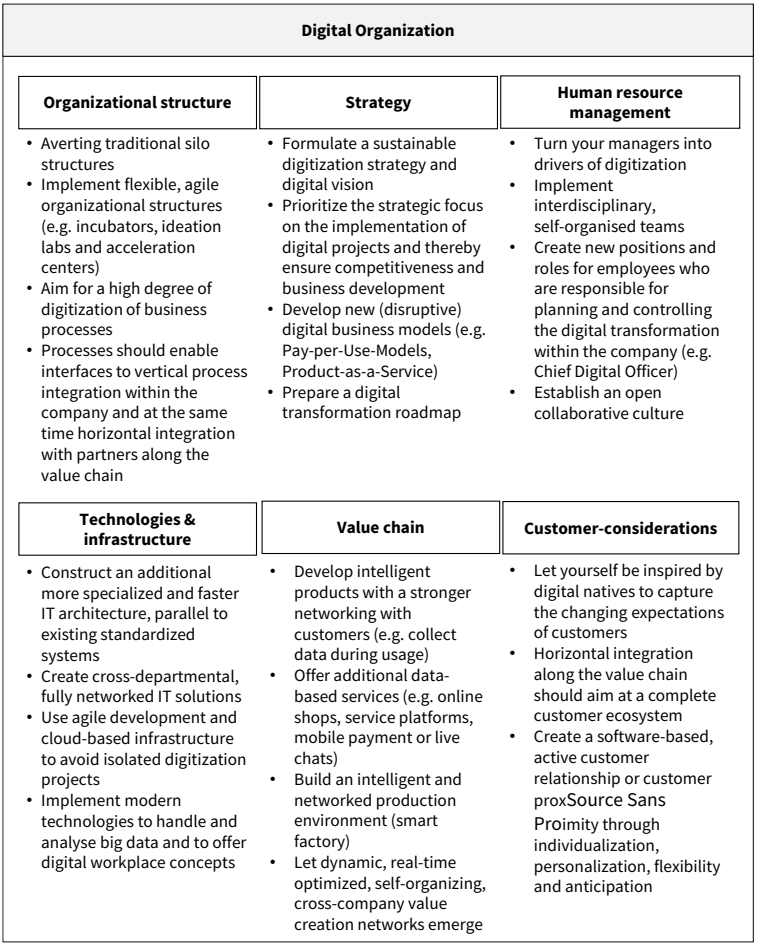

Figure 1: Key components for the transformation into a digital organization

6 Discussion

The results show that different core issues need to be addressed in order to introduce digital organization. The subject areas show a high degree of interdependence with each other, which must be taken into account during implementation.

During the transformation process to a digitally organized company, the firm must also face numerous challenges (Kotter, 1995; Prahalad and Krishnan, 2002). Four challenges are described below, which the interviewed experts regard as the greatest challenges during the transformation process. These are organizational effort, poor change management, lack of knowledge, and innovative technologies.

Organizational effort seems to be one of the most critical challenges in the transformation process, as it results from a reorganization process of the existing organizational relationships. Many organizational functionalities depend on complex, slow, bureaucratic corporate processes as well as old-fashioned IT architectures. In addition, existing legal conditions and low adaptability of employees and infrastructure impede companywide digitization.

The second fundamental challenge organizations must face is change management, which is a term for the systematic approach of change processes within companies, usually resulting in refusal and resistance. This may result from employee's fears, frustrations, and low motivation or from present hierarchical structures. So, a lack of communication, knowledge, and information transparency may hinder employee's awareness of change. Dealing with resistance constructively is crucial for a holistic digital transformation (Groysberg et al., 2018).

Expertise within an organization is an important driving force for the development of innovation and the execution of change processes. In addition, missing experiences in data, innovation, and digitization hinder decision processes and corporate agility. Therefore, the company must counter a lack of workforce and expertise, particularly in the field of information technology, with various sustainable success strategies such as hiring qualified developers and data analysts.

Furthermore, organizations' digital development depends on innovative technologies; however, innovative technologies also often imply vulnerability in organizations, resulting from technical risks such as cybersecurity and loss of control over data. Therefore, the issues of data and risk management should be given high priority within digitizing organizations.

Figure 2 shows a conceptual framework that enables companies to take a holistic approach to digital transformation in order to make digital change successful and sustainable.

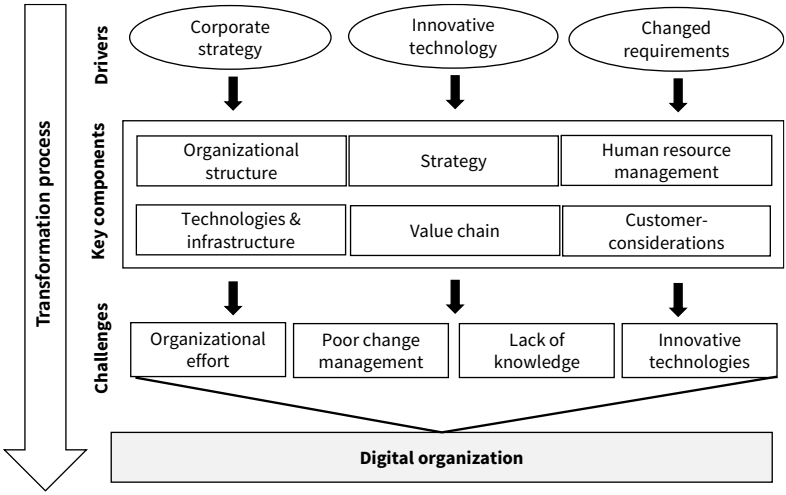

Figure 2: Conceptual framework for a digital organization

Triggered by various drivers, the transformation process is initiated. Examples of triggers can e.g. be the corporate strategy, innovative technology, or changed requirements. The key components previously identified and described in chapter 5 should all be considered in the transformation into a digital organization, but they must be designed individually for each company.

The key components form the foundation of the change process and are triggered by the drivers of the transformation. During the transformation process, the company must overcome various challenges, such as poor change management or lack of knowledge.

7 Conclusions

Numerous innovative technologies and associated increases in digitized value chains are forcing companies to incorporate digitization into their products and value creation processes in order to compete long-term. A transformation to a digital organization is therefore required. This means that all aspects of the organizational structure and processes must be adapted to the digital transformation. In this paper, based on an analysis of the literature, core issues were identified which will need to be addressed during the digital organization transformation. These core topics were examined for their practical relevance in expert interviews. Based on the results, a conceptual framework was developed to help companies take a holistic approach to digital transformation.

Within the framework of further research, the scientifically based framework developed in this paper will be validated within companies.

Lastly, it should be noted that the work is characterized by limitations. The research method used is limited by the small number of expert interviews, which limits the significance and comparability of the results. In addition, the concept development in the context of this paper is based on digital maturity models whose suitability has not yet been comprehensively empirically substantiated. Furthermore, it is evident that organizational change processes are influenced not only by situational factors but also by political and legal framework conditions as well as other companies in the environment. However, these dependencies and influences are not fully captured in the concept developed.

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