

Transform to Succeed: An Empirical Analysis of Digital Transformation in Firms

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Abstract—Despite all progress firms are facing the increasing need to adapt and assimilate digital technologies to transform their business activities in order to pursue business development. By using new digital technologies, firms can implement major business improvements in order to stay competitive and foster new growth potentials. The corresponding phenomenon of digital transformation has received some attention in previous literature in respect to industries such as media and publishing. Nevertheless, there is a lack of understanding of the concept and its organization within firms. With the help of twenty-three in-depth field interviews with German experts responsible for their company's digital transformation, we examined what digital transformation encompasses, how it is organized and which opportunities and challenges arise within firms. Our results indicate that digital transformation is an inevitable task for all firms, as it bears the potential to comprehensively optimize and reshape established business activities and can thus be seen as a strategy of business development.

Keywords—Business development, digitalization, digital strategies, digital transformation.

I. INTRODUCTION

AS new digital technologies are becoming ubiquitous firms must adapt and assimilate them in order to gain and sustain their competitive advantage and to foster new growth potentials [1], [2]. Due to digital technologies, the business environment has become increasingly interconnected with its processes, products, services, firms and even entire industries [3] which often blur established lines between business structures. Under the term digital technologies, combinations of information systems, computing, communication and connectivity technologies can be subsumed [3] and these combinations are fundamentally transforming entire businesses. The alignment of business and information technology is the process of achieving competitive advantage by developing a sustaining and coordinating relationship between both [4], and thus offers the potential to be a promising strategy for a firm's business development.

In general, innovation, the acknowledgement of significant trends and the sensing of changing customer needs are essential requirements for growth and even for the continuous survival of firms [5], [6]. Digitalization and its associated

potential for realizing growth is one of these “megatrends” [7]. Buzzwords, such as Internet of Things, Connectivity and Big Data are omnipresent and can be included under the term digitalization. Through the implementation of digital technologies firms can enhance their competitiveness, increase both their flexibility and market reach and improve the effectiveness and efficiency of their processes and operations [8]. Further, entire business models can be reshaped or even replaced as benefits of digitalization [9].

In order to achieve organizational goals and driving performance firms are thus increasingly considering taking advantage of technical innovations [10]. But while radical digital innovation such as the internet has transformed “the rules of competition” [11, p. 494], the general conditions of industries have changed as a result of totally different principals and work rules [12]. Contemporary fitness apps, such as Freeletics or Runtastic, are examples of how digital technologies have enabled new entrants or start-ups to challenge established firms by using digital technology [10]. Digitalization has already transformed entire industries, such as the publishing and music industries in their basic foundations [13], and it becomes obvious that digital technologies and their assimilation will affect all firms regardless of industry [14]. Integrating digital technologies into business activities often involves a transformation of central business operations, as these technologies have radically changed the traditional way of doing business [12]. As a consequence, products and processes, as well as entire structures of organizations are being modified [15]. In this matter, information systems are considered to be the main catalyst for stimulating business transformations [16]. Since digitalization offers a major potential to transform businesses radically, it is often referred to as digital transformation, and this topic increasingly attracts the interest of scholars, as well as practitioners [10], [17].

Digital transformation is a concept which has been recently discussed in management literature and affects B2B, as well as B2C companies [18]. Under the term digital transformation “the use of new digital technologies to enable major business improvements” [19, p. 4] is subsumed. Despite the growing awareness of the importance of digital technologies and their impact of reshaping entire business activities, most companies are struggling to assimilate digital technologies and to fully utilize the benefits gained through their investments in these technologies [19]. Further, as firms engage in digital innovation, they face a number of uncertainties [20]. Nevertheless, most firms are striving to determine the best approach for establishing and conducting business in a digital

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environment [3]. Considering the comprehensive potential of digital transformation as a source of a firm's competitive performance on the one hand, and the scant number of academic studies dealing with the topic on the other hand, it becomes obvious that further research is necessary to investigate the concept digital transformation and its management in firms from a holistic point of view.

Based on a literature review on current studies in academic journals regarding digital transformation, this paper aims to contribute a holistic overview of the concept of digital transformation with the help of 23 in-depth field interviews with experts from German companies who are responsible for digital transformation in their companies.

In particular, we seek answers to the following research questions: (1) What encompasses the understanding of digital transformation in firms? (2) What is the current status of digital transformation in firms? (3) How is the digital transformation organized? And, (4) What are major opportunities and challenges of digital transformation?

The goal of this paper is to provide an overview concerning the organization of digital transformation in business practice and further to contribute to a better understanding of the phenomenon of digital transformation as a strategic form of a firm's business development by giving essential insights into the organization.

II. THEORETICAL BACKGROUND

A. Digital Transformation in Academic Literature

To date, the concept of digital transformation has received little attention in academic research [15]. In addition to a non-uniformed definition, research on this topic is predominantly conducted from a managerial point of view. Nevertheless, researchers have defined digital transformation in their academic works. Referring to [15], digital transformation focuses on the transformation of products, processes and the organization structure triggered by new arising technologies. If a business is developed using "technology to radically improve performance or reach of enterprises", this is referred to by [21, p.5] as digital transformation. Further, [17, p.93] refine this concept by stating that digital transformation is "the digitization of previously analog machine and service operations, organizational tasks, and managerial processes" which enables both start-ups and established players to "compete in new ways". Taking the existing definitions into account, it can be summarized that digital transformation is all about connectivity and re-combination of assets, as previously separate devices, activities, people and firms become interconnected [17], [19], [22].

Digital technology generates highly complex innovation challenges [20] which will lead to organizational changes and altered structures of entire businesses. Hence new strategies of how to implement information technologies, in order to promote innovations for business development need to be applied [3], [15]. In this manner, [15] identified four dimensions of digital transformation strategies, namely the use of technologies, changes in the company's value creation,

structural changes regarding the organizational setup within the company, as well as financial aspects. By using new technologies, the company's focus shifts towards the application of these new technologies, as well as the general internal acceptance of information systems. Changes in the company's chain will have an effect on the company's value creation. Through digital transformation the foundation and business logic of an established business are altered and new products and services can be developed and commercialized. As a consequence of new technologies, as well as of new value chains, structural changes in the organization of companies become necessary. Through the integration of digital activities, a company's organizational structure, e.g. production processes, internal collaborations and customer approaches are affected. Financial aspects need to be considered as transforming a business often requires major investments in new technologies, such as new information and communication systems, paired with the funding of presently existing business activities.

When enriching the value creation of a firm by using information technologies, the technical infrastructure and the information systems are of strategic significance [23]. In many companies, information systems are seen as strategic assets and unite information technology, as well as people, processes and structures [24], [25]. Furthermore, according to [26, p.191] "information systems are used to support or shape an organization's competitive strategy, its plan for gaining and maintaining competitive advantage," which can be seen as a prerequisite for a digital business development strategy.

B. Digital Transformation as a Business Development Strategy

The examples of the music and publishing industries show that digital innovations and digital transformation are not merely a strategic choice, but rather an inevitable task all firms have to face [27]. As digital transformation is characterized by the use of new digital technologies to enable significant business improvements [19] it can be seen as an unavoidable opportunity for a firm's business development, as opposed to being merely an emerging trend. By introducing digital technologies firms can achieve their business goals because digital innovation can enable established firms to move into new domains and thus develop their existing business [10]. The pursuance of business development enables firms to identify new growth potentials and to target this knowledge on creating new drivers for growth while simultaneously continuing established business activities [28]. Business development encompasses four key dimensions for discovering new growth potentials, namely, processes, products, markets and business models [29]. There has been a growing interest in the role of information technology in creating opportunities for business development in firms [30]. The line of reasoning is that digital technologies transforms not only how the company is controlled, but also the way the business activities are operated, both internally and externally with regard to customers and suppliers. The question whether information technology contributes to competitive advantage

reveals controversial evidence in literature [1], [31], [32]. Nevertheless, IT has transformed several industries in dramatic ways during the last decades [33]. Not only processes, but also products, entire organizations and boundaries of single firms have changed because of digitalization [30].

Consequently, universal digitalization offers new opportunities to innovate “by creating experiences, relationships, processes and organizational firms” [14, p. 1,399]. This however, requires firms to reinvent themselves in order to stay competitive [34]. This revitalization can be achieved by continually reshaping the established business model, in order to identify possible approaches aimed at integrating new opportunities of digital technology for creating and capturing value [17], [35], [36]. According to

[21], the goal of digital transformation is to achieve streamlined operational processes and entirely new business models either individually or in combination with better customer experiences and engagement. This is in line with the general understanding of business development [29]. Such a fundamental transformation is challenging for firms, as it alters established structures which are often compounded by an inert organizational culture and structures [37].

Summing this up, digital transformation is not about incremental improvements [38] but rather a holistic approach towards a fully digital business based on digital technologies. By linking business development literature with information systems and technology, a transformation of businesses can be pursued bearing in mind the key dimensions of processes, products, markets and business models.

TABLE I
 INFORMATION ON EXPERTS, FIRMS AND DIGITAL TRANSFORMATION PROJECT

Expert	Industry	Turnover (million euro)	Number of Employees	Digital Transformation project	Major focus in DT project
E1	Automotive	4800.6	118,000	Networking of data, production, humans and cooperation	New Processes
E2	Chemical industry	18	153	Integration of information and communication technology in production	New Processes
E3	Chemical industry	25	200	Digitize production control	New Processes
E4	Consulting	0.3	5	Re-organize IT-infrastructure	New Processes
E5	Consulting	11	80	Data Analytics	New Processes
E6	Electrical appliance	3490	10,349	Digitize customer journey	New Processes
E7	Financial industry	557609	52,100	Digitize customer touch-points and customer journey	New Processes
E8	Machine and plant engineering	5000.6	33,700	Industry 4.0 in production and logistic	New Processes
E9	Software	1	10	Digitize processes	New Processes
E10	Software	6	40	Digitize processes	New Processes
E11	Software	4.5	25,000	Production control	New Processes
E12	Software	92793	379,600	Digitize processes in particular in technical sales	New Processes
E13	Telecommunication	62700	282,250	Digitize customer touch-points and customer journey	New Processes
E14	Consulting	10.1	150	Introduction of digital applications	New Products
E15	Consulting	0.3	5	Digitize services	New Products
E16	Machine and plant engineering	1.4	25	Develop applications	New Products
E17	Machine and plant engineering	44	150	Digitize products and processes	New Products
E18	Trade and Services	12057	54,307	Digitize products	New Products
E19	Automotive	80410	116,320	Digitize business models, data analytics, applications	New Business models
E20	Machine and plant engineering	23.01	2135	Digitize business models and products	New Business models
E21	Optics	4290	10,773	Digitize processes and business model	New Business models
E22	Software	92793	379,600	Industry 4.0 use cases	New Business models
E23	Software	92793	379,600	Digital market development	New Business models

III. RESEARCH DESIGN

Due to the early stage of research on digital transformation and its topicality in practice, as well as the lack of research conducted on this topic, we chose a qualitative explorative research design. Qualitative research design offers the advantage of an explorative design with the emphasis on discovery over confirmation [39]. In-depth interviews allow the interviewees to integrate the participant’s knowledge and background into the interview’s context [40]. By doing so, we aimed at gaining insights on the management of digital transformation in the business world. For that, we conducted in-depth field interviews with 23 German experts, all of whom

are responsible for digital transformation projects in their companies. Further a mandatory prerequisite for being chosen as an expert was that the firms had already started to pursue digital transformation projects. The experts work in different industries, namely in machine and plant engineering, automotive, electrical appliance, telecommunications, trade and services, optics, software, financial and consulting. By selecting a variety of different industries, we obtained a diversified sample of firms that are in the process of pursuing a digital transformation by implementing and integrating new digital technologies. As digital transformation is both relevant to firms and industries, we chose to analyze B2B, as well as B2C companies, to cover different facets of transformation

intentions. Other characteristics describing the sample are the size of company, the turnover and the transformation project (see Table I). Regarding the size of the companies, the number of employees ranges from five to 379,600. Accordingly, the turnover also varies among companies. The smallest mentioned turnover was 0.3 million euros, whereas the highest mentioned turnover amounted to 92,793 billion euros. In respect to the job position of the experts the majority are at top management level: of the experts, seven are managing directors, five specifically work in the staff function assigned to digital transformation in their companies, four are responsible for software and IT transformation, four operate in the field of Industry 4.0, one is chief of digital marketing and two experts work as consultants. The interviews were based on a semi-structured interview guideline that consisted of open-ended questions. The interviews lasted between 20 minutes and 45 minutes and took place in September and October 2015. The researchers recorded and transcribed the audio material into written transcripts to assure unaltered results. Two researchers separately analyzed and clustered the answers by applying codes with the help of a qualitative data analysis tool (MAXQDA) to analyze the interviews systematically. The codes were derived from our underlying research questions. The chosen codes were (1) understanding of digitalization, (2) current status of digitalization in companies, (3) organization of digital transformation, as well as (4) opportunities and challenges of digital transformation.

IV. EMPIRICAL FINDINGS

A. Understanding of Digital Transformation

First, the experts were asked to describe their understanding of digital transformation. The minimum consensus of all experts is that digital transformation will fundamentally change business activities in the long run. Despite this consensus the understanding of digital transformation varies among the experts. In firms where digital transformation is used to promote distinct units, with focus of the projects pursued lying in leveraging digital transformation. This leverage either streamlines existing or develops new processes; it improves existing or creates new products. In addition, it alters company interaction with stakeholders by means of the new technology. In other firms where the digital transformation project will change the entire business model, the focus lies on altering components of the business model with the goal to either improving the customer experience or expanding the value proposition.

The emergence of new technologies is the main driver for digital transformation which is performed over three strategic levels in the investigated firms, namely processes, products and business models [29]. Fig. 1 illustrates the three strategic levels of digital transformation.

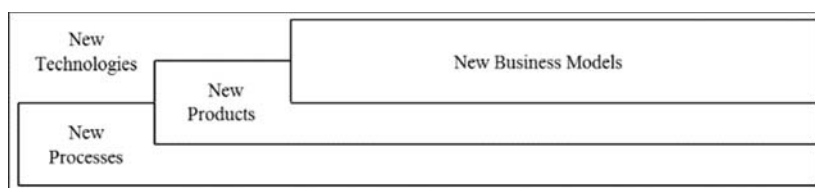


Fig. 1 Strategic levels of digital transformation

After evaluating all experts' statements, the main driver for initiating digital transformation projects is the emergence of new technologies in general. The technical development and the therefrom resulting new possibilities lead to a strengthened employment of digital technologies in business. However, the implementation and usage of information and communication technologies often require a modification of business strategies in order to attain their full potential within the organization. According to all of our experts, aligning the entire corporation towards the increasing use of new technologies by defining a digital strategy is a prerequisite to realize benefits from the implementation of new technologies. By doing so, companies need to translate their strategic goals into processes, product portfolios and business models in order to retrieve benefits of digitalization from each level.

The experts stated that digital transformation has a major impact on internal and external *processes*, which can be identified as the first strategic level. Digital transformation is often seen as the opportunity to revise the process landscape in companies, as well as to build up an entire new process structure. The dominant question is how to arrange processes

more efficiently and how to improve these processes for daily business activities. This is especially true for companies engaging in the software industry and consultancy. Aiming at efficiency the most common benefit resulting from the use of information technology and this practice is consistent with information found [41]. According to our experts, if processes are digitally connected and are horizontally, as well as vertically integrated into the company's value creation chain, a comprehensive digital transformation of companies' processes can be achieved. Every part of the value chain from research and development, to after sales, is connected and information can be shared. This leads to a full transparency and an accessible data basis within the company.

"To have access to all data, which is collected along the value chain, gives us power to enrich the customer journey with customized offers for a fully-integrated customer experience." (Financial industry expert)

The second strategic level of how companies implement digital transformation is via *products*. On this level, the employment of digital technologies can be approached under two aspects. First, most companies aim at improving their

existing products through digital services, and thus achieving new levels of quality and customer satisfaction. This is especially observable in the machine and plant engineering industry, as well as in the chemical industry. Second, products themselves are being digitalized. By, for example, integrating sensors or through the development of totally new products with digital features, companies are able to transform their products or their complete product portfolio. Altered or innovated products, e.g. in the automotive or machine and plant engineering industry, are only possible as a result of changes in underlying processes. The third strategic level yields at transforming entire *business models*. In companies in our sample, the transformation is triggered by new technologies, modified or entire new products and by the change and implementation of processes which leads to an adaption or a total transformation of their business models. A business model represents a company's logic, in which manner, its value creation and appropriation is organized [42]. By taking advantage of new possibilities, companies reshape their value proposition towards customers or restructure the internal value creation. All experts in our sample are convinced that in the future companies will have to adjust or fundamentally change their business models in order to stay competitive, to further develop their business and to address customers' needs adequately.

Taking our experts' understanding of digital transformation into consideration, it becomes obvious that digital transformation is a multifaceted concept in practice. As there is no uniform definition of digital transformation in both literature and practice, we derive a definition based on both the existing literature, as well as based on the experts' statements, and propose the following definition in order to grasp the full scope of the term digital transformation:

Digital transformation refers to the implementation and application of information and communication technology into a company's existing business activities leading to altered or completely new processes, products or business models in order to capture new opportunities and growth potential from technological developments.

B. Current Status of Digital Transformation

Second, the current status of digital transformation in companies is of interest, in order to identify the initiation point, the main drivers of digital transformation in the firms and the current influence on the business activities caused by the increasing digitalization in the business environment.

The results are heterogeneous, taking the time evolution of digital transformation within the sample into consideration. Companies, which are providers of software and hardware, or which do consulting in the field of digital transformation, have dealt with the topic for 15 years to 25 years, and for these companies, it has often been the foundation for starting their business. On the contrary, companies that implement digital technologies, and are thus users of the latter, have dealt with the topic for one to five years on average. Their involvement in the topic can be linked to the perception of increasingly overlapping value chains, the blurring of established market

boundaries and the negative examples of containment strategies in the music and publishing industries [13]. In order to evaluate the specific trigger for companies to implement new technologies, we asked the experts to identify the main drivers of digital transformation. The aggregated results are illustrated in Table II.

TABLE II
 MAIN DRIVERS OF DIGITAL TRANSFORMATION LISTED BY FREQUENCY OF REPLIES (MULTIPLE INDICATIONS POSSIBLE)

Driver	Counts
Competition	13
Customers	12
Initiative of one's own/ Intrinsic motivation	6
Innovation/technical progress	4
Strategic consideration	2

Competition is the strongest force that stimulates investments in digital technologies, independent of industry and the identified strategic level of digital transformation. In a competitive landscape companies are forced to steadily improve and secure their market position [43]. With the emergence of new technologies and increasing digitalization, new entrants with innovative business models endanger established business models and change the rules of competition. As mentioned by experts, e.g. from the automotive, and machine and plant engineering industries, the competitive environment in Germany, and the cost and time pressures, force companies to rethink their business activities and to include new technologies which may help to maintain and strengthen a company's service offering.

"We are facing a highly competitive environment which forces us to initially rethink our established business processes in order to provide a better customer journey." (Automotive industry expert)

Furthermore, customers play a role of almost equal importance. Given the speed and quality of technical developments, the firms noticed that in order to meet changing customer demands they have had to increasingly customize their products, offer a customer service that is faster and available around-the-clock, as well as a meaningful interconnection between offline and online channels.

"We can achieve higher quality with digitized processes. This is not only related to the quality of our services, but also to our responsiveness. With regard to our customer relationship, 24-hour availability of our service plays an important role, too. We become more efficient with totally digitized processes and are thus no longer dependent on the work shifts of our employees." (Telecommunication industry expert)

In addition, some experts named their own personal initiative, as well as the intrinsic motivation of the company, as a driver for a company's digital transformation initiative. In some cases, the decision for integrating digital technology is triggered by the identification of optimization potential.

"In my opinion there is great potential in optimizing inner working processes. There is really much potential in optimizing the speed of processes and the collaboration

among employees.” (Software industry expert)

Other companies in the sample are driven by the idea of being a leader in some part or all parts of their business. These companies are pioneers and have the intrinsic motivation to make processes better and faster, to reduce costs, to use resources in a better way and to be ahead of time and their competitors.

“We also feel that there is a fear of new competitors we do not yet know. That’s why we need to overlook everything at a glance in order to be faster and better than our current and future competitors.” (Automotive industry expert)

Besides the drivers already mentioned, innovation and technical change play an important role in the decision process concerning digital transformation. Innovation based on new technologies is indispensable for a successful digital transformation. With new technologies connectivity can be pursued, objects like products or machines will become more intelligent, and will, for example, be able to make decisions independently, thus, traceability can easily be attained and data can be captured more easily. Moreover, strategic considerations and reflections on upcoming developments encourage companies to think about the future and their need to change business to remain competitive in the future. While doing so, business model reflection and adaption play a major role.

In addition to determining the drivers of digital transformation, the experts were also asked to evaluate to what extent increasing digitalization and its impacts have affected established business activities. The consensus of all interviewees is that innovation in the field of information and communication technologies is the main trigger for adaptations in business activities.

“Digital transformation is described as an intervention into the company’s DNA.” (Consultancy services expert)

Digital transformation affects the entire value chain and thereby changes the underlying structure of the established business model at different positions. Evaluating this from an organizational perspective interfaces between positions and departments vanish, departments need to reorganize themselves, and thus, a company needs to modernize and diversify its concepts. Through new digital technologies the market structure itself is changed. Information is provided faster and is more transparent. In particular, processes within companies are altered. New products e.g. Smart products like smart watches and new services, like service via Apps, emerge. According to experts from the telecommunication and financial industries, this requires both different marketing, e.g. new and digital customer touch-points, as well as sales of products, e.g. offering e-commerce and the integration of digital technologies in stationary points of sales. An exemplary quote to expound the experts’ statements concerning the changes of business activities is:

“Digital transformation changed our entire business model and will still massively change it in the next five years.” (Trade and services industry expert)

“The trend of business model change is not over yet. It

has just begun.” (Optics industry experts)

To get an overview pertaining to a company’s current progress concerning digital transformation, the experts were asked to evaluate their company’s progress in digital transformation in general. According to the experts, digital transformation is not a new phenomenon but rather an ongoing process that has steadily changed underlying processes over a period of many years. We asked the experts to self-evaluate their company’s progress in digital transformation in general on a scale from one (not digitalized at all) to 10 (fully digitalized). Taking into account that experts from the firms that are the providers of hardware and software contributed to this question by assessing their clients’ progress, the evaluation ranged from two to seven, with a mean of 5.7. This shows that firms have already made an initial step, but are not leveraged to their full digital potential. However, many experts said that they wished to be further along the way to digitally transform their business.

“If I compare the status quo with five years ago, I would say we have realized some progress, but the benchmark should not be our position five ago, but rather the performance of the digital natives. And they are miles ahead of us.” (Electrical appliance industry expert)

When considering the strategic levels of digital transformation (processes, products or business models), our data reveals that companies that focus on digital business models tend to evaluate their performance higher on the scale than the remaining companies.

In summary, the experts link their statements to the fact that they have to consider the evolution of the firm and cannot extract themselves from their firm. Yet, they have started to transform parts of their business and created digital solutions, and have thereby begun preparation for a digital future.

C. Organization of Digital Transformation

Third, concerning the organization of digital transformation in companies, the experts were asked to indicate the organizational structure and responsibility of digitalization in their companies. This is a two-fold question. On the one hand, the initiator or idea provider of transformational projects, and on the other hand, the person responsible for managing the transformation projects was of interest.

TABLE III
 INITIATOR OF DIGITAL TRANSFORMATION

Initiator	Counts
Top Management	6
Middle Management	5
Employees	5
Joint initiative	4

In reference to the experts’ statements regarding the initiator of transformation processes, the answers are nearly all balanced between top management, middle management, employees and joint initiatives, as can be seen in Table III.

In accordance to experts working in consultancy, the top management is responsible for the strategic road map, acts as a progressive thinker and must create an awareness concerning

the implementation and use of digital technologies. Moreover, top management is in charge of creating the corresponding positions in respect to job profiles for the implementation of digital transformation into business. One practitioner said:

*“The CEO or CIO, one of them needs to take responsibility so that digital transformation works.”
 (Consultancy industry expert)*

TABLE IV
 CHALLENGES AND OPPORTUNITIES OF DIGITAL TRANSFORMATION

Category	Opportunities	Challenges
Market-orientation	<p><i>Customers</i></p> <ul style="list-style-type: none"> • increase in customer loyalty • strengthened customer relationships • possibility to create better (contextual) offers <p><i>Market position</i></p> <ul style="list-style-type: none"> • increase in attention and awareness • increase in market visibility • tap new market potentials • development into entirely new markets • strengthened competitive position 	<p><i>Customers</i></p> <ul style="list-style-type: none"> • adapting to customer requirements to ensure long-term survival on the market • targeting customers through the adequate communication channel <p><i>Competitor</i></p> <ul style="list-style-type: none"> • new competitors (with new business models) arise <p><i>Market position</i></p> <ul style="list-style-type: none"> • radical transformation of industries possible
Process-orientation	<ul style="list-style-type: none"> • faster processes • streamlined processes • more flexible processes • optimization of internal workflows • improved resource allocation • fully-integrated value chain • increase in efficiency 	<ul style="list-style-type: none"> • increased complexity • need for continuous development • established processes must be transformed as soon as possible • breaking up old structures • comprehensive knowledge of the process landscape is needed • managing and matching multiple interfaces between information systems
Technology-orientation	<ul style="list-style-type: none"> • higher quality throughout the value chain • comprehensively optimized business activities 	<ul style="list-style-type: none"> • missing know-how concerning the application of information systems • benefit of new technologies is not predictable • high initial effort to build up IT infrastructure • internal organization of diverse IT systems • high investment costs • development of a legal framework for use and exchange data • development of standards and a common language between companies • non-intuitive, high quality products need to be explained • reduced life cycle of products • simultaneously managing the interconnection of product's hardware and software
Product-orientation	<ul style="list-style-type: none"> • individualization (lot size one) • improved product-service 	<ul style="list-style-type: none"> • simultaneously managing the interconnection of product's hardware and software
Company-orientation	<ul style="list-style-type: none"> • business models improvement will lead to higher profitability • intensified collaboration among employees • increase in transparency • reduced resource-input • achievement of both monetary and time savings 	<p><i>People</i></p> <ul style="list-style-type: none"> • corporate culture and transformation must interlock • informing employees about digital transformation and its consequences • foster acceptance among employees • face resistance and fear among employees • changing the digital mind-set of employees <p><i>Organization</i></p> <ul style="list-style-type: none"> • review of established competencies and their sustainability for a digital future • develop a feasible digital strategy • achieving a balance between exploitation and exploration of digital technologies • speak a common language within the company (IT, management, other positions) • organizational change; classical line functions waver • no top management support • modifying job descriptions as new skills are necessary <p><i>IT-related</i></p> <ul style="list-style-type: none"> • data security, data protection, know-how protection

Middle management was named as an initiator of the digital transformation processes. These are managers of certain specialized fields or business units that have ideas which they delegate. The specific role of middle management in strategic decision-making processes is described as supporting initiatives from operating levels, combining these with firm strengths, and conceptualizing new strategies [44]. In addition, the financial industry expert reported on middle management initiating Think Tanks, which are instituted to create new ideas and to transfer these into the organization. Due to their position, employees have a connection to customers and their needs and thus generate ideas for new digital developments. Attendance at exhibitions and fairs gives employees new input and they may inform their superiors about new developments. Alongside the individual initiators, joint initiatives were also

mentioned. Some experts report on an active exchange of ideas between top or middle management and employees. Often the strategic input is given by the higher management levels which operate as project leaders. Some of our experts could not name a distinct initiator. In summary, a slender majority of experts said that the top management has been the initiator of the digital transformation processes and that these processes must be a top down approach.

The responsibility of the transformation process itself is mainly anchored at the top management level. Experts explain the reasons with the following statements:

“We need the highest sponsor possible.” (Software industry expert)

“It has to be a C-level sponsor - most favorable the CIO himself.” (Software industry expert)

This is further strengthened by the fact that the integration and implementation of new technology often requires a modification of the underlying business strategy, and this lies within the responsibility of top managers.

According to an expert working in the machine and plant engineering industry, the best team to be responsible for a digital transformation strategy consists of the CEO, the CIO, a controller and the head of production. With this combination the most important decision makers of digital transformation are included. Other possibilities to anchor the responsibility for digital transformation processes are in the respective business units or to form a special project group that manages the process of digital transformation inter-divisional.

Concerning the implementation of digital technologies in the context of digital transformation, our data shows that firms pursue a two-step approach. In the first step, the status quo is analyzed and the firm's digital readiness is ascertained. This means that companies analyze their capabilities towards digital technologies, the technical infrastructure, and the qualification and competences, such as IT skills, of their employees, as well as the employees' and managers' attitude towards digitalization. In the second step, projects which will be of high relevance within the next two to three years must be configured for digital transformation. Parallel to the roll out of the projects, a digital transformation must be monitored and evaluated.

For a digital transformation of firms, an enabler can be seen as an accelerator and guardian alike. According to all experts, the decision to transform with the help of digital technologies requires strength, as well as the willingness to take risks and to tackle topics in new and different ways. Furthermore, the experts stressed that a new leadership style is essential to successfully face the challenges, as a digital culture within the firm has to be established and acceptance for the digital change must be achieved. Experts, especially from the software industry, agree that a buy-in of a high-level sponsor is the most powerful enabler for successful digital transformation.

D. Opportunities and Challenges of Digital Transformation

Fourth, it was of interest to investigate a firm's challenges and opportunities when facing a digital transformation. A broad variety of opportunities and challenges could be detected within our data. In the process of coding the data, encompassing the opportunities and challenges were further divided into the following five sub-categories: market-orientation, process-orientation, technology-orientation, company-orientation and product-orientation, in order to further differentiate opportunities and challenges. The results are displayed in Table IV. When analyzing the variety of opportunities mentioned by the experts, the general approach to question established business activities with respect to their optimization potential can be seen as the major opportunity for digital transformation. Through this, firms leverage the potential to fully improve and restructure their business operations. This is true for all firms in the sample. Our experts see further opportunities in an interactive and more

comprehensive relationship to their customers, and through that a strengthened position in the market. Additionally, major potential is seen in streamlined processes and the achievement of higher quality in the production.

In summary, the technology-orientated challenges are frequently highlighted by our experts and can be found in literature as well [15]. Our experts view counteracting the currently insufficient knowledge regarding the application of digital technologies, in order to achieve growth and competitive advantage, as a major challenge.

Although all experts agree on the fact that the awareness for the importance of digitalization within their companies exists, collaboration between IT and general management is not sufficiently addressed. Digital technologies and the management of information systems have always been the responsibility of the IT department in corporations [45]. Established structures between the IT department and other departments within the company are often blurred as a result of increasing digitalization. As digital technologies are no longer a means to an end, but rather the promising strategy to restructure a business in order to capture value and growth, the organization and responsibilities within a corporation need to be assessed.

V. CONCLUSION

The goal of this paper was to conduct a status quo on digital transformation in firms in order to gain deeper insights into the concept from a managerial view. To our knowledge, our paper is the first to combine the theoretical basis of digital transformation in academic literature and the insights concerning the transformation in firms. For a comprehensive picture we analyzed the (1) understanding, (2) the current status, (3) the organization, as well as (4) opportunities and challenges of digital transformation relating to specific projects on the basis of 23 in-depth field interviews with experts who are responsible for the digital transformation of their companies.

Our study shows that the scope regarding the perception of digital transformation is quite heterogeneous. However, all experts agree on the fact that dealing with the emergence of new technologies and their impact on conducting business is not merely an option for firms, but rather a necessity in order to stay competitive in the future, which is also in line with the concept of business development [29]. Digital transformation in the investigated firms is triggered by the emergence of new digital technologies and its management can be traced back on three strategic levels, namely processes, products and business models.

Concerning the current status of digital transformation in firms, our results reveal that the main drivers for transforming business activities are competition, customers, intrinsic motivation, technical innovation, as well as the strategic considerations of the firms. Further, the majority of companies have just recently started to assimilate new technologies in order to improve and enhance their business activities. The self-evaluation shed light on the fact that while firms have started their digital transformation, they have not yet leveraged

its full potential.

When considering the organization of digital transformation, all experts agree on the fact that top management support is mandatory for transformation projects to succeed. For implementing digital transformation projects firms first need to assess their digital readiness in terms of technical capabilities, human resources and knowledge, and in a follow-up, they must select strategically relevant projects to focus on.

Taking opportunities and challenges into account, it becomes obvious that all experts evaluate digital transformation as an overriding requirement for firms and expect major benefits from optimization potentials. However, firms face a variety of challenges while transforming their business in regard to digital technologies. One of the major challenges for firms is the question of how to fundamentally change the traditional business, as well as the corporate culture, as digital transformation challenges established views about the way to conduct business. Additionally, insufficient capability to identify promising starting points, inadequate knowledge about the application of digital technologies, and further, high resistance within the firm, are seen as critical factors within our sample.

Based on our empirical findings, we can derive several implications for academia and management. For scholars, our work offers deeper insights into the concept of digital transformation in general. Identifying the strategic levels (processes, products and business models) of how digital technologies are assimilated, in order to digitally transform a business, can be seen as a new perspective in research on digital transformation. Comparing the identified strategic levels with the key dimensions of business development (processes, products, markets and business models), a strong overlap of the concepts can be detected. Our results show that since digital transformation offers major improvements in performance and reach of enterprises, the concept can be evaluated as a promising strategy for business development. The embedding of the concept of digital transformation in IT and business development literature offers new opportunities for research, as it bridges the two research fields with the goal of investigating how companies can achieve new growth potentials through investments in information technology and its assimilation. Further research is required to describe specific digital transformation practices, to provide in-depth insights into the sequence of digital transformation processes and to identify optimal company-individual strategies for a digital transformation. For management practice, our research implies that through digital transformation firms can improve their internal processes, as well as capture growth outside established business activities. The results of this study reveal that managers need to identify strategically relevant projects that promote a digital transformation on one or more of the strategic levels which are processes, products or business models. Top management is responsible for stimulating the process of digital transformation in a top-down approach and is responsible for the development of a digital strategy. Leadership is essential to drive a digital culture within the firm

and to enable acceptance and ideas for a digital change. A prerequisite for this are managers with sufficient IT skills enabling them to conceive, develop and exploit the information systems. Through the revelation and clustering of the variety of challenges, we can provide managers dealing with a digital transformation with a detailed overview of tasks to be considered.

Although our study offers valuable insights, some limitations should be mentioned. For instance, restraints based on the methodological approach resulting from the qualitative research design and the data collection must be considered. Although it has been an objective to survey a mixed sample, the conducted interviews allow only a restricted insight into a digital transformation. For generalization purposes a quantitative analysis on a greater scale must be conducted.

This paper can be seen as a starting point for developing knowledge about digital transformation, in general, and its correspondence with the business development concept, in particular.

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