

DIGITAL TRANSFORMATION: CHANGES AND CHANCES

PROJECT GROUP BUSINESS AND INFORMATION SYSTEMS ENGINEERING (BISE)



DIGITAL TRANSFORMATION

CHANGES AND CHANCES – INSIGHTS BASED ON AN EMPIRICAL STUDY

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Executive Summary

Digitalization impacts individuals, businesses, and society as a whole. In particular, the fast spread of digital technologies sets enormous change in motion. This implies huge challenges – and at the same time – promising chances for companies.

The successful exploitation of such chances, however, requires many companies to transform appropriately. It is not that businesses need digitalization, but rather if they ignore it, they will be left behind. This particularly concerns well-established companies that are not primarily structured around or operating in the digital economy, and thus do not have native digital structures, yet whose future will depend on successful digital transformation.

Therefore, this study is geared towards managers of well-established companies, presenting them our perspective on the changes and chances associated with digital transformation. Based on the empirical insights from interviews, workshops, and applied research projects, six action fields are identified as relevant for successful digital transformation: Customer, Value Proposition, Operations, Data, Organizations, and Transformation Management. Each field is discussed in detail within this study. Furthermore, we propose a digital transformation self-assessment tool, allowing companies to assess their individual need for action within each field based on their individual prioritization.

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1. DIGITALIZATION FORCES AND ENABLES COMPANIES TO TRANSFORM

Digital products and services have been embraced in the everyday life of individuals, businesses, and society as a whole. The impact of digitalization has been and still is tremendous, forcing companies across the globe to act and react to changing business rules. Today, more people have access to cellphones than to toilets¹ and one out of five people on the planet has an active Facebook account². Needless to say, this phenomenon is associated with extensive changes among companies, who face the question: What does digitalization mean to us? The answer is: a lot. This study provides a comprehensive and holistic overview to engender a successful digital transformation of a company by mastering six fields of action: Customer, Value Proposition, Operations, Data, Organizations, and Transformation Management.

First, digitalization **disrupts established business rules both in the digital and the physical world**. Some recent examples include: Uber, the world's largest taxi company that owns no vehicles; Facebook, the world's most popular media owner that creates no content; Alibaba, the world's most valuable retailer that has no inventory; Airbnb, the world's largest accommodation provider that owns no real estate.

These examples demonstrate the disruptive power of digitalization, which challenges established business rules and environments. For instance, the following becomes apparent: current business models must be reassessed, as they are likely to become outdated in the future digital economy. Furthermore, traditional industry structures will erode or come under pressure. On the one hand, digitalization promotes the winner-take-all effect and, on the other, it offers huge potential for new niche players and micro-businesses that challenge the position of incumbents. Consequently, companies might have to "destroy" their own business models before others do and come up with digital innovations to thrive in the digital race. As there are low entry barriers in many parts of the digital economy, new competitors are more likely to shape and conquer the market. Increasing competitive pressure arises especially from powerful, digital native companies that continuously push forward in a variety of traditional business sectors. Another result is that digital activities largely impact the physical world in terms of embedded systems, smart devices, and sensor networks. Such interdependencies can no longer be ignored. Moreover, digital technologies empower customers, e.g., through fast spreading word-of-mouth effects in social media. Thus, customer focus becomes ever more valuable and mastering the end-user interface becomes critical for companies – and this is largely independent of where a company is in the digital value chain. The need for change is also driven by changing employee behavior and thought patterns that require modern intra-organizational communication and interaction forms. Finally, although digitalization largely affects Business-to-Consumer (B2C) markets – companies should not lose sight of opportunities in Business-to-Business (B2B) markets such as adapting established digital B2C online marketing and sales practices. Overall, the collapse of some established companies confirms the peril of ignoring these changes as well as the need for transformation.

Digitalization:

The increasing penetration of digital technologies in society with the associated changes in the connection of individuals and their behaviors.

Digital Transformation:

Managed adaptation of companies in light of progressing digitalization in order to assure sustainable value creation.

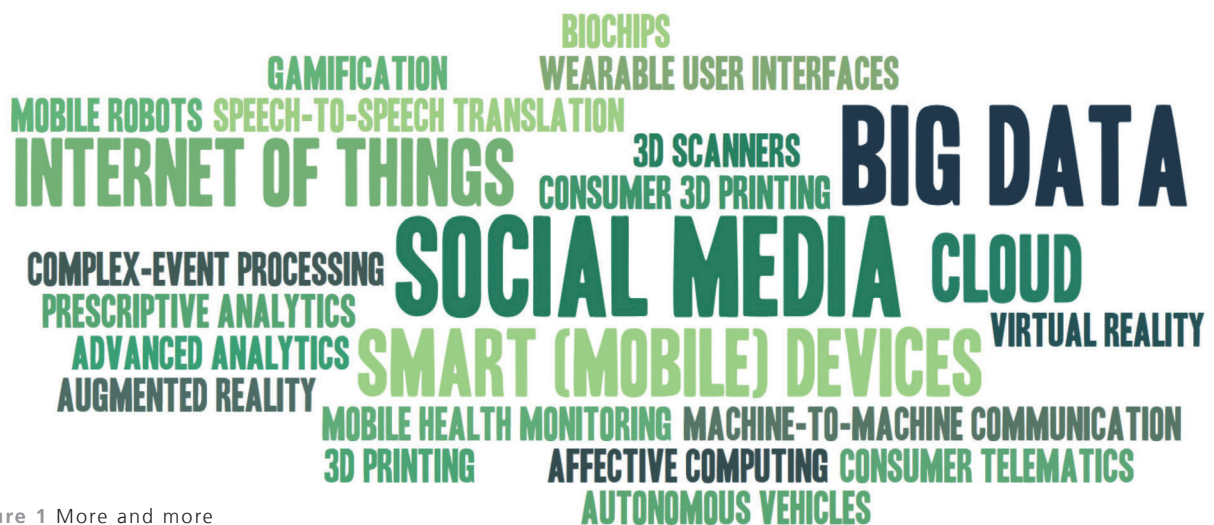


Figure 1 More and more digital technologies and services are available³

These delineated changes are driven and enabled by a **huge variety of new digital technology** that became available in the last few years (see Figure 1). Their rapid growth and commoditization has increasingly pushed the speed and broadened the impact of digitalization. For instance, today users adopt a new technology much more quickly than ever before: While it took 38 years for the radio to reach 50 million people, the iPod reached that number in only four years and Instagram was adopted by that number of users in less than six months (see Figure 2). The number of connected devices will rise to 25 billion by 2020⁴ and will, by far, exceed the world population. This brings with it an enormous economic potential across all industry sectors. Alone the Internet of Things (IoT), i.e., the connection of anything physical with the Internet, has an estimated economic potential of USD 1.9 trillion by 2020⁵.

Digitalization is not an entirely new phenomenon: Data has been processed and exchanged digitally for more than half a century. Early examples include electronic data interchange (EDI) that started in the 1960s. The Internet has been used by the general population since the 1990s and e-commerce was first promoted around the year 2000. However, with the

widespread adoption of smart devices, such as smart phones and tablets, and mobile applications, the current digitalization wave has experienced an excessive boost. In fact, **the new aspect of digitalization is not the usage of information technology per se but the speed of change and the world's level of connectedness**. While formerly digitalization mainly concerned data management and processing within the IT department of companies, today it affects all departments and has moved from administrative and supportive tasks to core business processes. The impacts range from changes in marketing and sales processes, new collaboration and interaction patterns, to newly designed products and services. In the course of this, the interaction with the end-user, as well as their changed behaviors, becomes of particular, vital importance. However, this is not the final focus. The **digital economy is continuously progressing**. The underlying drivers of this phenomenon ever increasing its speed are "Moore's law" and "Metcalfe's law": computing hardware becomes ever more powerful, small, and thus embedded and ubiquitous. Simultaneously, network effects lead to a superlinear increase in value by connecting systems, processes, and users.

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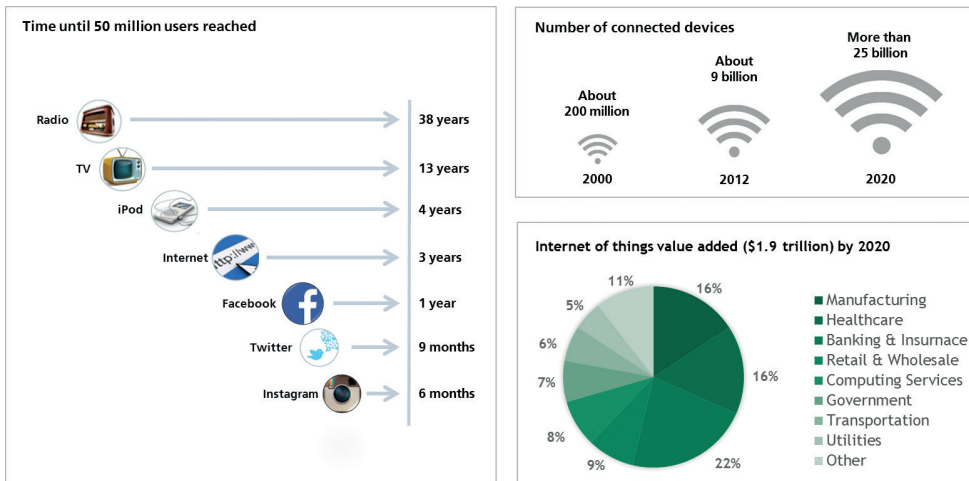
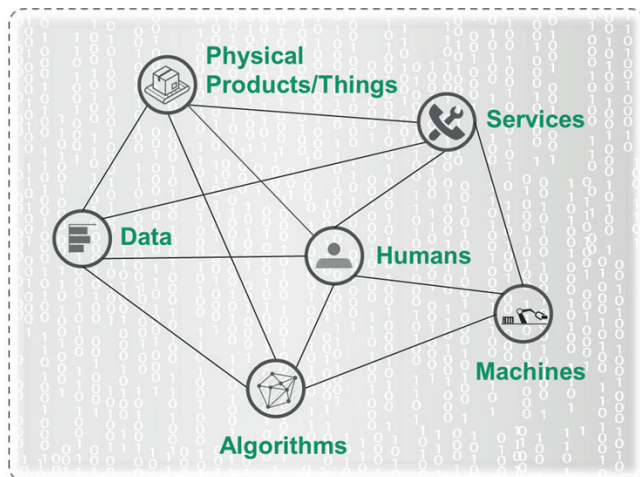


Figure 2 Digitalization is driven by the rapid growth⁶ and commoditization of digital technologies⁷

The digital economy will converge towards an ecosystem of collectively intelligent cyber-physical and cyber-human systems based on ever-increasing connectivity and technological opportunities (see Figure 3). As part of this evolution, the digital and the physical world are continuously merging: **Cyber-physical systems** (CPS) integrate computational and physical capabilities, where the physical components may be mechanical or electronic; embedded systems and networks automatically monitor, communicate, and control physical processes or systems. This cyber system could be, for instance, an intelligent manufacturing line with automated production processes, where each work piece carries digital assembly information and exchanges this autonomously with the relevant machines such as via RFID-tags. The term CPS is often used synonymously with the IoT, which encompasses major technology enabling the connecting of physical entities via the Internet. **Cyber-human systems** (CHS) refer to the increasingly coupled relationships between humans and computing:^{8,9} in recent years, all kinds of computing technology, ranging from traditional computers, mobile devices, wearables, to person-embedded sensors, are constantly merging with human lives. This development is fostered, for example, by new communication patterns or varied and possibly multiple modalities such as innovative computer displays, haptic, audio, and brain-machine interfaces. Thus, cyber and human

systems continuously co-evolve and in the course of this even transform each other. Thereby, the overarching goal of CHS is to advance human capabilities – perceptive and cognitive, physical and virtual, social and societal – through innovative computational and informational capabilities. Whereas, formerly, only IT had a supporting role by facilitating all kinds of processes without direct human contact, nowadays – in the era of digitalization – IT and humans have moved closer together and are collaborating nearly seamlessly. Thus, digitalization now shapes a system that is, at the same time, both the cause and the effect of its major characteristics: **volatility** (i.e., constant and massive changes), **uncertainty** (i.e., lack of predictability), **complexity** (i.e., multitude of interrelated, powerful actors building strong forces, difficult to control), and **ambiguity** (i.e., confounding cause and effect relationships) – in short, a VUCA world.

Thus, the progression of digitalization implies huge changes – but at the same time brings along promising opportunities for companies. However, many companies have to transform appropriately to leverage these opportunities: it is not that businesses need digitalization, but rather if they ignore it, they will be left behind. Thereby, the development of digital technologies itself is not the business need necessarily, but rather the challenge is how such technologies can be best used to



System Characteristics

- Volatility
- Complexity
- Uncertainty
- Ambiguity

Figure 3 Cyber-Physical-Cyber-Human Systems

generate the highest possible value and to improve existing processes. This particularly concerns companies that do not neglect or deny the potential effects of digitalization (i.e., see the need for digitalization transformation) and are not in any way digitally native. Digitally native refers to companies founded and operating primarily in the digital economy, and thus inherently featuring the necessary digital mindset, skilled employees, and the digital operating and sales processes. Consequently, this study focuses on the group of well-established companies that have to and are eager to master the digital transformation of their organizations.

Study Design

To sharpen our understanding of digital transformation, we conducted semi-structured interviews and workshops, and incorporated experiences from applied research projects with various industry partners. We approached B2C and B2B companies of various industries including automotive, engineering, chemicals, transportation and logistics, telecommunication, healthcare, and financial services. Overall, we conducted interviews and workshops with representatives of more than 50 companies. See Figure 4 for characteristics of the sample. We approached companies and asked to interview the person responsible for digital transformation. This resulted in a broad spectrum of interview partners including chief information officers, chief digital officers, and chief innovation officers as well as managing partners, heads of IT, digitalization program leads, and people from strategy, business development, and communication departments. The interviews took between one and two hours, and were recorded and analyzed in detail.

Revenue	10 mn EUR	70 bn EUR
Employees	<100	>300.000
Nationality	German	International
Customer Focus	B2C	B2B
Sector	Service	Manufacturing
Typical interview partners		
• CIO / Chief Digital Officer / Chief Innovation Officer • Managing Director / Head of IT • Program Lead Digitalization • Strategy, Business Development, Communication		
Sources		
• Interviews • Workshops & discussion forums • Applied research projects		

Figure 4 Feature range of our interview partners at a glance

2. DIGITALIZATION REQUIRES MASTERING SIX FIELDS OF ACTION

2.1 Overview of the Six Fields of Action and the Self-Assessment Tool

With companies facing tremendous change, challenges, and opportunities due to digitalization, we analyzed the interview and workshop results, synthesized the findings, and distilled six fields of action. Mastering these six fields of action (see Figure 5) is critical for companies who want to succeed in the digital revolution. Surprising to us was how broadly applicable our model could be across industries and positions in the value chain. Nevertheless, not all fields are equally important for each company as the company progress in its digital journey, and industry- and company-specific characteristics should also be considered.

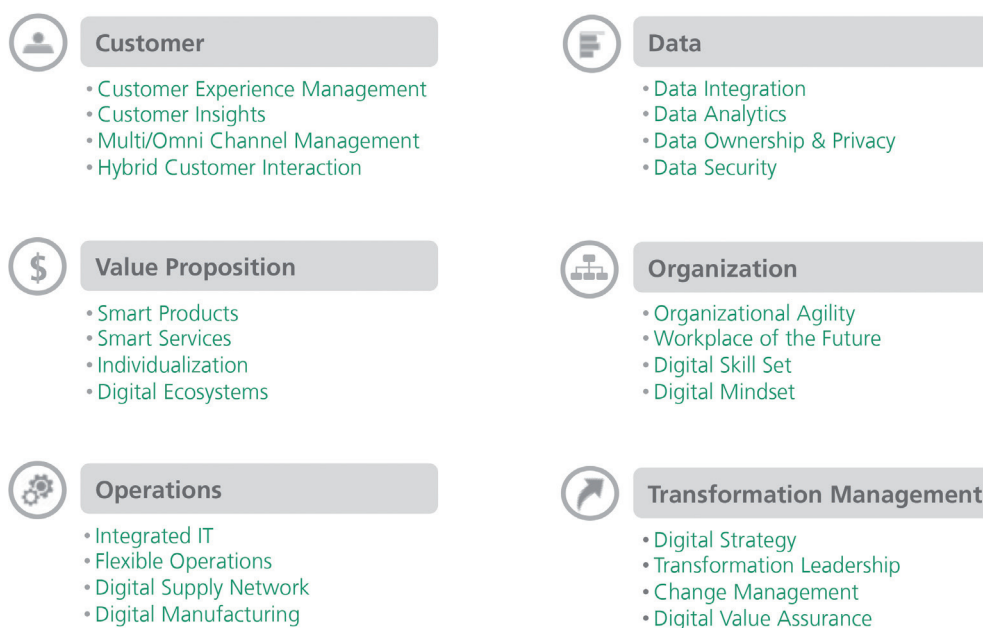


Figure 5 Digitalization requires mastering six fields of action

Based on the fields of action, we provide a self-assessment tool that enables a company to pinpoint the current status of its digitalization to contrast it with its target status, and to derive a priority list and roadmap for its digital transformation. A competitive benchmark can be added as well. The tool presents the six fields of action with subordinated key points, which in a first step have to be prioritized according to the individual company setting. Second, for each subordinated key point, the current as well as the target status (measured in maturity levels on a scale of 1 to 5) have to be assessed. Figure 6 illustrates the results of such a self-assessment application; a divergence reveals the gap an organization needs to address for successful digital transformation. Subsequently, concrete activities can be derived. If you are interested in applying the self-assessment tool and need assistance in successful digital transformation, please do not hesitate to contact us (see our information at the end of the study).

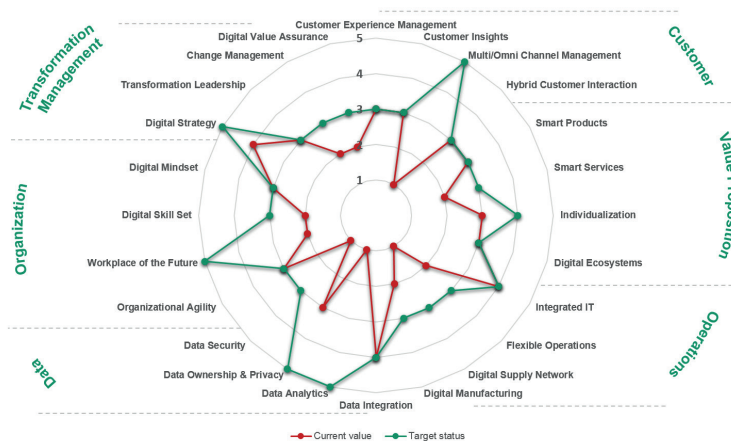


Figure 6 Exemplary result of the application of the self-assessment tool

2.2 Customer

Digitalization empowers customers. New digital technologies significantly change customers' behaviors in terms of how they become informed, evaluate, and purchase. Customers are not only better informed but also more self-confident; they become more connected – with each other as well as with companies. Mastering the end-user interface becomes ever more critical for companies – and this is largely independent from where a company is in the digital value chain. Our interview partners confirmed that digitalization heavily affects established customer relationships as well as processes and, thus, concentrating on customer needs and customer experience is more important than ever.

First, offering a holistic and seamless satisfactory customer experience, instead of striving for mere efficiency improvements, is vital in the digital competition to gain and retain the new “digital,” powerful customer and build strong and loyal relationships. Customer experience refers to the subjective experience that a customer has through diverse direct or indirect interactions with a company. These experiences are personal and implicate customer involvement on different levels (rational, emotional, sensory, physical, or spiritual)¹⁰. A prerequisite is to establish and conduct targeted 360-degree **customer experience management**, for instance, by means of design guidelines based on comprehensive customer analytics. Customer analytics are moreover essential to gain important **customer insights** that help a company understand and

properly address customer needs and thus monetize digital engagements – both for B2C and B2B markets. Therefore, companies have to leverage the myriad of new customer data opportunities along the customer journey, which are generated at various new digital touch points (e.g., mobile transactions, self-tracking data, and social data). The increasing amount and variety of new available data can provide the basis for understanding changing mindsets, moods, motivations, desires, and aspirations that trigger novel actions and expectations of customers. That is important as new digital interaction patterns, as well as new arising competitors, can disrupt traditional customer interactions and customer journeys. Appropriately analyzing digital customer data, and thus gaining insights into novel customer needs, allows for individually tailored products and services, more precise customer behavior forecasts, and eventually enhanced customer experience, satisfaction, and value. Furthermore, seamless and real-time access to customer insights across all customer touch points can improve customer relations and leverage cross-selling opportunities. A huge challenge to overcome is consolidating and managing customer information from diverse sources including contact details, customer valuation data, and information gathered through interactions such as direct marketing or via affiliated dealers. Moreover, customers today use multiple digital and traditional channels simultaneously, which enables and forces companies into interacting with customers in a more target-oriented manner to meet their desires for individual treatment. Thus,

digitalization also heavily shapes **multi- and omni-channel management**. Moreover, the study revealed that the majority of customers engage in new digital channels for sales and customer service. Companies struggle with providing an omni-channel strategy that aims for a unified customer experience across all channels. Furthermore, digitalization offers new ways of **hybrid customer interaction**, taking place on a strategic level (convergence of channels), process level (customers as part of company processes and a company as part of customer processes), and a systems level (a multitude of applied digital technologies)¹¹. For instance, digitalization provides the environment to integrate customers into core business processes by means of co-creation using online platforms. Companies thus can enrich product and service innovation processes or decrease costs and shorten process times by means of online customer self-service. This calls for a revolution in customer relationship management processes and touch points, integrating aligned device management.

2.3 Value Proposition

The explosion of digital technologies and changing customer behaviors offer many opportunities for innovative business models and value propositions. However, the study revealed that realizing the benefits associated with digitalization is challenging. On the one hand, there are the ubiquitous demands by customers for integrated, intuitive, and strongly customized solutions; on the other, we can observe the increasing degradation of traditional competitive advantages as new competitors easily access markets due to low entry barriers. This has even intensified in areas in with low customer switching costs. Furthermore, it is especially challenging to keep pace with the accelerating speed of product launches in the digital economy – or to try to outpace it. Particularly, well-established companies are under pressure to accelerate as digital native companies generally quickly adopt innovations in computer hardware, software, and connectivity within short development cycles. Hence, well-established companies need to exploit new digital resources by developing new IT capabilities, and challenging their present value propositions or even “destroying” their business models.

Redesigning the experience and engaging the front line – selected examples

A worldwide, traditional luxury brand enriched its offline customer experience through extensive online activities. For instance, in one region, it launched an official Twitter account designated to directly collect and respond to customer service requests online, available 24x7. As the Twitter account found such great acceptance among its customers, it is also being launched in various other international regions.

An international manufacturing company uses mobile apps to collect user needs at its customers operating sites, with automatic transmission to its headquarters, saving a huge amount of time and enabling prompt analyses and actions. The company furthermore provides smart tools with automatic sensors that transmit use and technical data to its IT hubs where it is analyzed to identify customer needs and to improve products and services.

A media content provider collects and analyzes every bite of online traffic and social data of its users. Based on the obtained customer insights, it optimizes its offerings and personalized recommendations to meet their users’ desire for individual treatment, resulting in an increase of their customer base and revenues.

Our interview partners see huge potential associated with so-called **smart products**, resulting from an integration of physical products with digital innovations such as mobile applications and sensor technologies. Likewise, companies can broaden their value propositions by designing **smart services** that are based on or enabled through digital technologies. Such services can include either new solutions that extend existing service offerings, digital services that enrich physical products, or hybrid product-service bundles. In this regard, IT is an integral part of the product itself. The study shows that the increasing servitization offers companies a promising way to

succeed in the digital economy, particularly in the manufacturing sector. In this context, we can observe that the boundaries between products and services are blurring. Current value chain activities can also be extended by moving from mere B2B to B2C activities, facilitated by diverse digital innovations. Moreover, the current **individualization** trend brings along new opportunities for novel value propositions. Many of the interview partners highlighted that increasingly customers expect individually tailored or self-designed products, which cover their needs exactly, or demand personal services. As a consequence, companies should offer customizable products or product parts by integrating existing customers in the design process (e.g., tailored banking products) or by offering individual services identified through customer analytics (e.g., individual book recommendations). This is enabled, for instance, through new digital manufacturing technologies allowing for small batch sizes or newly generated, gathered and analyzed customer data (e.g., demographics, preferences, product or service use patterns, online activities). Creating **digital ecosystems** through connecting and collaborating with diverse partners or even customers can also leverage enormous additional benefits. Products or services could be improved or enhanced many times by integrating offerings from several businesses not achievable by a single company. For instance, by exchanging usage data or needed product specifications on platforms, companies can partner in the innovation process. Such a shift is enabled by the rapidly growing interconnection within the CPS and CHS of the digital economy. This requires, however, openness, consistent interfaces, and data repositories as well as technological compatibility.

2.4 Operations

Digitalization heavily changes the external business environment at unprecedented speed. The interviews showed that companies struggle to respond to these changes properly in terms of adapting their internal operations. The study results highlight that a central area, currently challenging a majority of companies is the provision of an **integrated IT** infrastructure. This means that different parts, systems, and networks need to work in unity, constituting a necessary and preliminary

Services and products have to reflect the needs of tomorrow – selected examples

A manufacturing company of construction tools enriches its physical products by means of new 360° service solutions, which involve the provision of an entire tool fleet management for a monthly fee including online inventory, repair service, and further project services. In addition, the manufacturer offers a comprehensive software tool that allows its users to organize its tools – regardless of the specific vendor.

A medical technology company that manufactures and markets diagnostic products provides smarter procedures for the early detection of disorders. For instance, in order to avoid unpleasant colonoscopy procedures the company developed a battery-powered disposable camera pill that patients can swallow. This enables high-speed pictures of the intestinal tract. Accordingly, photographs can be sent by the pill to a second device worn around the patient's waist. Subsequently, a doctor has the ability to review the images on a digital device.

A leading electricity and gas utility uses digitalization to combine value propositions and operations. It provides a "Smart Home" service, which offers customers the opportunity to substantially lower energy costs by having end-user devices that communicate with several household appliances or even the entire energy system in their home.

– but not sufficient – requirement to capitalize on digitalization. It has even been suggested that new digital technologies only provide additional value when a solid foundation of IT already exists. Specifically, offering smart products and services and a holistic customer experience highly depend on seamless data processing and provision. Therefore, with respect to digitalization, many companies leading in their respective fields have put their focus on projects aimed at the seamless alignment of different technologies. At the same time, the supporting IT infrastructure has to be designed flexibly such that it can

easily respond to the short technology cycles inherent in the digital era. Time to market is in general a critical factor in the competition for delivering digital innovations quickly to the customer. Hence, companies have to achieve flexible operations by designing internal business and production processes accordingly; this capability is also vital for realizing the trend towards ever-smaller batch sizes due to individualized products or services demanded by the modern customer. Flexible operations are largely supported by the emergence of **digital supply networks** during the last several years. To tap the potential of rapid digital change, companies have to create a comprehensively connected, smart, and fast supply network, integrating all affected partners, suppliers and customers, for instance, by drawing on integrated and compatible IT enabled systems. Thus, resources, products, services, and data can be exchanged seamlessly, end-to-end. A further operations area offering huge potential is **digital manufacturing**. It enables companies to enhance their quality and efficiency of manufacturing through computer-based processes, employing additive fabrication technology (e.g., 3D printing) in the production of end-user items, intelligent production systems, or machine-to-machine communication in the IoT. Interview partners pointed out repeatedly that the velocity in establishing such intelligent processes is crucial to stay competitive.

2.5 Data

Forecasts regarding the growth of data worldwide in the near future frequently trump each other in size, defining new scales to capture the potential magnitude. New sources like digital transactions, social media usage, embedded sensors, mobile devices, and RFID-tags all are part of the digital data production explosion. Some studies reveal that 90% of the data available today have been produced in no more than the last two years¹². However, it often feels as if knowledge itself has not substantially increased during that same time – at least not by a factor of 10. Thus, some people say that we face an enormous garbage heap of data. Most of our interview partners are convinced that veritable gems can be found in the mass of data. Companies, however, need to learn how to efficiently

Integrated operations: benefits on all sites – selected examples

A bank could reduce its process for opening a bank account to less than 10 minutes by iteratively automating standard, recurring process steps. Moreover, a bank could integrate an online calculator in the mortgage-application process with its credit-scoring models to instantly present preliminary offers to customers. These integrated, automated process steps could not only cut costs but also enhance customer satisfaction.

A provider of mobile devices reshaped its logistic network by vertically integrating its logistic service providers into its own organization. After reorganization, the planning and monitoring of the complete product flow is carried out centrally and assisted by automated processes. In addition, these processes allow the company to retrieve cost data automatically and almost in real-time. Thus, the company benefits from the integration of its logistic providers not solely by making its value chain more flexible, but also as the integrated information of product flow helps it respond better to customer needs.

absorb and analyze the available data and information. Yet, the reality is much more difficult and competitors are already on the threshold with new techniques and business models.

One challenge concerns the raw data. Not only the volume but also the velocity has risen with unbelievable speed and variety, and veracity can be challenging. **Data integration** is one of the key requirements and qualifications to be successful in a digital transformation. Well-organized data that is integrated into a homogenous database or accessible via a standardized access layer is fundamental for meaningful data analysis. Sophisticated technologies such as recommendation systems and predictive modeling require data not only to be integrated but also to exhibit high quality, which calls for appropriate business maintenance. Once achieved, companies

have to choose the best possible and suitable approaches to analyze the data in order to derive important insights. **Data analytics**, using the right techniques to process data, is now more important than ever to efficiently connect and analyze the exploding amount of data pushed by digital products, services, and connections. Extracting and categorizing information helps not only to identify behavioral patterns but also to evaluate ideas, to optimize internal operations, and to identify new sources of revenue. Companies have been collecting data for decades, but they fail in terms of how to efficiently use and leverage these. As a result of the “new” value, the question of who actually owns which data, tracked on chips, blogs, and mobile devices, for example, constitutes a major issue that has to be clarified. **Data ownership and privacy**, the rights and/or complete control over data, are already relevant factors in determining competitive positioning. Companies have to defend their customer touch points in order to own or access relevant data. Local regulations and customer awareness of data privacy and security add additional complexity. A sensitive approach towards data privacy and security is on the radar among our interviewees. Therefore, most companies we talked to prioritized **data security** as one of the major challenges due to strict regulations and unpredictable consequences in the case of data loss. Scandals and growing cyber-crime irritate and upset customers, leading to a higher sensitivity to hand over data and, moreover, damage the reputation of the company in the case of the mishandling of sensitive data. Transparent and secure mechanisms not only stop this phenomenon but also boost reputation and trust by supporting a company's role as a reliable partner in the digital world.

2.6 Organization

Connected consumers, automated processes, and advanced analytics place unprecedented demands on an organization. Many companies still struggle to cope with and meet the demands for new digital services. Temporary, ad-hoc solutions and adjustments to existing operations are often seen as a quick fix. Yet, what is really required, as revealed by our interviews, is that the organization itself be scrutinized.

The goal is to turn data into information, and information into insight – selected examples

A healthcare service provider specializes in being a new source of health information. The company aggregates reports on patient experiences from the Internet and organizes them into usable insights for patients, healthcare professionals, pharmaceutical companies, and other healthcare organizations. The company uses „big data“ techniques to collect enormous amounts of data from diverse healthcare social media sites and forums. By drawing on advanced natural language processing, it analyzes information and is able to provide a window into patients' thoughts and attitudes.

A logistics company aims to reduce and optimize its costly truck idle time by keeping its trucks in meaningful motion and performing predictive maintenance. To do so, the company tracks vehicle movements by analyzing up to 900 data items on vehicle status, which are transferred to its operative and analytical systems in real-time. The analysis and smooth flow of information allows for a better picture of vehicle movement and idle time and eventually leads to reduced fuel consumption as well as better delivery times.

Change and reinvention can help incumbents compete against digital attackers and create a new strategic edge. This sounds easier than it is. It requires far-reaching changes, from talent to infrastructure.

A solid core that brings efficiency through standardization, modularization, and automation of processes, complemented by flexible boundaries and capabilities for quick adjustments to react to new technologies and business opportunities can build the foundation. Companies require an appropriate organizational agility, which we define as the capability to identify and implement opportunities more quickly than rivals can. **Organizational agility** is an essential requirement for being successful in the fast-moving digital world. Companies

not only require bimodal IT but also a bimodal organization, ensuring both stability and agility. Companies need to foster creativity and the desire for digital products and services. It is a tough effort, if not impossible, to wow customers if the staff is not enthusiastic about the new products, business model, and visionary goals. Delivering high-quality digital products and services requires new ways of working. This includes agile development approaches, rapid release cycles, a two-speed IT function, automated testing, iterative “test and learn” approaches like design thinking and lean start up, integrated development and operations as well as continuous deployment of IT services. Apart from the incorporation and installation of new methods, the workplace has to adapt accordingly as well. The **workplace of the future** requires flexibility in place and time for new ideas, and new forms of collaboration (e.g., organizations should focus more on the promotion of autonomous teams). Team and project culture, instead of top-down processes and inflexible hierarchical structures, foster new potential for innovation. A workforce with a **digital skill set**, which possesses interdisciplinary skills and is continuously in touch with and strives after the latest developments and technologies, with an influx of new digital talent, can best ensure the leveraging of digital demands. Complementing long time experience with external stimulation will boost creativity and innovation. Therefore, management has to establish a digital mindset – a mindset for digital needs and chances that reflects throughout the whole company and different hierarchy levels. A transformative vision has to infuse the entire organization. This **digital mindset** is what most companies still lack, as we experienced during our interviews. Companies that want to compete with, or even outperform, digital attackers have to create an appropriate digital mindset and pave their digital way. The digital spirit is what helps companies be successful in what they do, with the whole team becoming a driving force behind the organizational transformation processes.

New organizational models pave the way – selected examples

A health insurance company used to stick to its golden rule, “trust is a good thing, but control a better one.” However, acknowledging the need for transforming into a digital enterprise, the organization had to change. To compete in the digital world, it identified two major goals: increasing its innovative power and the speed of the decision process. To achieve these goals, more and more liberties and responsibilities were given to frontline employees as well as the elimination of bureaucratic and organizational obstacles impacting frontline decision power. To foster creativity and innovation, new teams were formed with bundled competences and cross-functional cooperation.

A major telecommunication provider pushed agility projects to defend its role as a pioneer in digital services. Being quick in adopting new technologies, new services, and new customer habits, is what determines success or failure in the telecommunication industry. Revolutionary product development reduced time to market tremendously. Entering a new market by handing out beta versions of applications and web pages, allowed for prompt feedback, and was one of the steps that made such success possible.

2.7 Transformation Management

Most of our interview partners share an important challenge: how to move beyond the value they capture today by looking at the digital impact across the whole value chain. Therefore, companies have to consider both how to defend as well as how to expand their current positions as the spread of digital technologies set an enormous change process in motion. Most companies fear the disruptive nature of digital transformation. In parallel, many realize the new opportunities it presents. Finding the digital sweet spot is the first challenge and starting point for rolling out a **digital strategy**, which incorporates an organization's vision, goals, opportunities, and related activities to maximize the business benefits of digital initiatives. Companies have to recognize that they can never attain a 100% clear, invariable digital-target state due to ever-changing technologies, customer needs, and competition. Thus, it is more important to follow a suitable digital strategy that points the way ahead and allows for a controlled process, agile and iterative, towards a moving digital target. However, whose job is it to define the digital strategy? How does **transformation leadership** manifest? Is it the responsibility of the Chief Executive Officer (CEO), Chief Information Officer (CIO), Chief Technical Officer (CTO), Chief Innovation Officer (CInO), or Chief Strategy Officer (CSO) to manage digital transformation? Or does digitalization call for a new role of Chief Digital Officer (CDO)? As a result of the major impact of digitalization, important questions must be answered in terms of both the business as a whole and IT. Our interviews revealed that there is no universally valid best solution: the best allocation of responsibility for digital transformation strongly depends on the corporate history, business model, structure, and – last but not the least – the individual people holding key positions. In any case, ensuring a holistic corporate overview is essential, as different perspectives have to be integrated to foster integrated thinking. Furthermore, **change management** is crucial for successful digital transformation. Digital transformation is a journey that requires a managed evolution that takes along all employees, changing the way they work and think. Taking employees along includes fostering their understanding of digitalization and the required change, improving their skills

to enable them to adapt and to proactively contribute to the change, providing role models and success examples, and, finally, providing formal mechanisms like reward structures that reinforce the desired change. At the same time, companies have to evaluate and monitor the benefits of (ongoing) digital initiatives. **Digital value assurance** is a comprehensive approach to actively ensure that the company benefits from the digital transformation. Especially, the scope, progress, interactions, and realized benefits of all digitalization endeavors must be tracked to allow for a managed evolution.

What is a best practice for a digital strategy? – selected examples

- A high-tech company identifies the flagship projects across its divisions to prominently communicate them across the company and foster self-confidence in the company's ability to master digital transformation.
- A healthcare payor lets its employees compete for a position in the digital strategy team.
- Another healthcare payor is approaching digital products and services by using new techniques and services, like social media, internally first before going externally. Therefore, its employees first get used to the new rules and processes in its digital communications.

How do you anchor your digital responsibility within your company? – selected examples

- A leading machinery manufacturer splits the responsibility for digital transformation among the roles of the CIO, CTO, and CInO.
- A global high-tech player chose to build a team for digitalization in the strategy department reporting to the CEO.
- A leader in communication systems defined digitalization as a topic of an appointed specialist team.
- In a mid-sized company specializing in cleaning products, digital transformation is part of the IT department.

3. MANAGEMENT TIPS FOR DIGITAL TRANSFORMATION

1. Wherever you are in the supply chain, focus on the end-user.
2. Check your customer touch points for potential disruptions by digital natives.
3. No customer benefits? No Action! Assure that there is a customer-centric use case for your digital initiatives.
4. Focus on people (i.e., users and employees), not on technology.
5. The winner takes all? Maybe, but also look for the niche that opens up.
6. Smartify your products and extend them by services.
7. "All digital" will seldom be the winning model; it is about smart digital-physical fusion.
8. Destroy your business model, before others do.
9. Being digital is much more than having an app; it is back-end to front-end.
10. Utilize the collective intelligence of your staff, and then augment it by the wisdom of your customers and partners.
11. On your journey towards the digital enterprise, integrate both your digital affine and non-affine employees.
12. Everything that can be digitalized, will be digitalized. Everything that can get connected, will get connected. Certainly, not everything will pay off. Make data a usable asset.
13. Resist the blind data collecting mania – trash in, trash out.
14. Digital transformation is about creativity and implementation; technology is not the limiting factor.
15. Tidy up your room before playing outside – smooth processes, data, and infrastructure are must-haves.
16. Get it together quickly; time is a critical factor.
17. Do not turn everything upside down; digital transformation requires a managed evolution.
18. Continuously reassess your digital transformation with an eye on the moving target.

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5. ABOUT US

Fraunhofer

Fraunhofer is Europe's largest application-oriented research organization. Our research efforts are geared entirely to people's needs: health, security, communication, energy, and the environment. As a result, the work undertaken by our researchers and developers has a significant impact on people's lives. We are creative. We shape technology. We design products. We improve methods and techniques.

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The Fraunhofer Institute for Applied Information Technology FIT helps to shape the future with novel, market-oriented products. Our researchers work in interdisciplinary teams and combine insights from computer science with questions from other fields. Thus, the institute invents and develops applications custom-tailored to support people in their jobs and to enrich their leisure time. Our specific strength is a comprehensive system design process, from test and validation of concepts to the handover of well-implemented systems.

Project Group Business & Information Systems Engineering of Fraunhofer FIT

The Project Group Business & Information Systems Engineering (BISE), which is located at the University of Augsburg and the University of Bayreuth, focuses on supporting industry partners in analyzing, designing, and utilizing digital technologies and mastering digital transformation. In our interdisciplinary research, knowledge transfer, and projects with industry partners, we deal with challenging and visionary projects in the following research areas: Customer Relationship Management, Innovation Management, Value-based Business Process Management, Communication and IT-based Collaboration, Strategic IT-Management, IT Security and Privacy, Computer-aided Financial Management as well as Energy and Critical Infrastructures.

The project Group BISE closely collaborates with the Research Center Finance & Information Management (FIM), the University of Augsburg, and the University of Bayreuth. FIM combines research, practice, and teaching in a unique way at the intersection of finance management, information management, and business & information systems engineering. In this regard, the Universities of Augsburg and Bayreuth put a high emphasis on the synergetic linkage of research and teaching, thereby educating young talents such as in the areas of business information systems, industrial engineering and management, or business administration that brings along a digital mindset and respective competences.

