2

Welcome to the Digital Business World

Digital disruption, Industry 4.0, Social Media Marketing—one could almost endlessly extend and constantly expand the list of terms and concepts used in the context of digital transformation. This chapter should bring some order to the hardly comprehensible set of terms. The two central features of digital transformation will be highlighted. Furthermore, the terms digitalization and digital transformation will be embedded in the logic of digital innovations. For the basic understanding of the topic, however, it is just as important to take a look at the current technological developments and the resulting basic questions for companies. An overview of this will also be given .

2.1 Potential of Digital Technologies: From Automated Accounting to the Self-Driving Car

For a long time now, new digital technologies have led to new business concepts. Below we show the development in two industries as an example and present a general model with which the effects of new digital technologies can be recorded.

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2.1.1 Music Industry: The Napster Shock and its Consequences

For a long time, the sale of music has been a lucrative business. The profits were considerable and the central challenge for the music industry was to reliably identify the next top sellers. Until the end of the 1990s, four internationally active publishers divided the market among themselves (one of which belonged to the German Bertelsmann group), and smaller regional players occupied the niche markets. At this time, IT was only used to increase efficiency in the so-called back office.

But suddenly everything changed. The start-up Napster came to the market. Napster was the first to use the potential of "peer-to-peer technology" for the exchange of music files. The decisive factor is that this now takes place directly between the computers and not via a central unit. Figure 2.1 shows the basic principle of networking, as it is also used for the exchange of music files.

Although this obviously violated existing copyrights, the service quickly gained popularity, which was reflected in the rapidly increasing number of users. Napster, in its original form, was shut down a few years after its launch as a result of numerous lawsuits initiated by the music industry. However, together with other music sharing sites, the service had already caused significant sales loss for the major music labels in this relatively short period of time. IT was no longer exclusively a back-office issue for music publishers, but was on the strategic agenda of all music publishers overnight.

As a result of this development, the music industry was forced to rethink and began testing digital distribution concepts in the early 2000s.

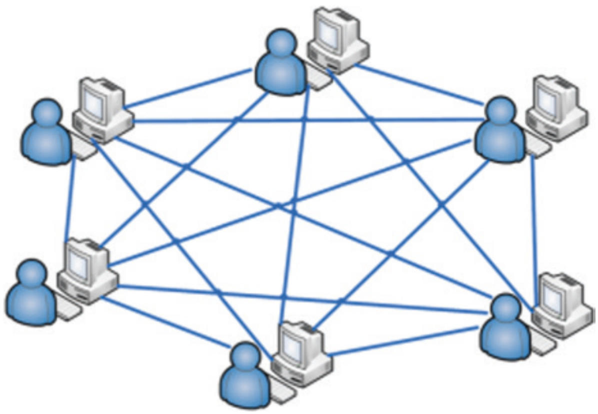

Fig. 2.1 Peer-to-Peer Music Exchange Network

One of the first forms of these new distribution methods was the concept of "download-to-own", i.e. a form of one-time purchase of downloads for entire albums or individual songs. At first, the music publishers tried to sell their available albums and songs via their own websites—but the success remained largely absent.

The music industry was more successful when cooperating with Apple. In 2001, Apple launched its iTunes internet service. For the first time, consumers could easily buy and download music files. The so-called rights protection systems ensured that consumers could not freely share a music file they had purchased. The music publishers receive a share of the profits from the sales of the files, the rest goes to the platform operator Apple. Thanks to a special storage format, the files could only be used on Apple devices. With this, Apple had found an important entry point to support the sale of its own hardware. Later, more providers of download services were added, and eventually Apple also allowed users to play the files on other devices.

Today, music is consumed increasingly via streaming. With streaming, a new distribution method has been added, in which the music files are only transmitted over the (mobile) internet for the moment of use and are no longer stored locally on the computer or on mobile devices. One of the best-known streaming providers in Germany is Spotify. Streaming services like Spotify are typically paid through a monthly fee. Some providers also follow a so-called "freemium" revenue model, which in addition to selling subscriptions as part of a premium version of the service also includes a free but limited offer. Some providers even try to integrate their content into new usage contexts such as connected homes or connected cars. Today, the music industry in Germany already generates around two-thirds of its sales through online channels, with a trend towards growth (Bundesverband der Musikindustrie, 2021).

Within 20 years, the music industry has changed fundamentally. The formerly dominant CD has become a niche product. Music is now offered as a file or as a service, embedded in a technical context. The fundamental change is also in the sources of revenue. The music publishers now receive revenue for songs sold or played on streaming services and have therefore significantly expanded their competence in the areas of IT and digitization. The attractive bundle offers that are found, for example, on CDs are thus largely gone. For music publishers, the market power of platform operators such as Apple and Spotify is risky because they occupy the interface to the customer and are active worldwide—something that the music or media industry has not been able to do. This gives them a good negotiating position vis-à-vis the publishers and allows them to invest more in technological innovation, for example in better systems that offer the customer the most suitable content.

2.1.2 Automotive Industry: From Process Optimization in Production to New Mobility and New Vehicle Architecture

The automotive industry is one of the pillars of the German economy. In recent years, it has greatly increased its global market share and celebrated success after success. Nevertheless, there is no company in the automotive industry that has not yet written digitalization and digital transformation on its flag, both among vehicle manufacturers and among suppliers. This can be surprising at first glance—because unlike a piece of music, a car cannot be digitized at its core. But even here, the industry is currently undergoing a fundamental change.

The digitalization also started with the vehicle manufacturers in the administrative area. The topic of digitalization gained more attention when digital technologies became the lever for changing value-added processes. The focus was on improvements in product development and, in particular, in the management of supply chains. The efficient exchange of data with suppliers is a central requirement for the functionality of the multi-tier supplier networks set up by the vehicle manufacturers. The Internet quickly became the technical basis for this exchange. Operatively, these networks allow for the coordinated planning across the boundaries of the individual company. With specific investments, they bind the suppliers to the vehicle manufacturers. Together with the cross-site optimization of production and logistics, digitalization thus became a step-by-step strategically important topic for vehicle manufacturers. In parts, the Internet offer for customers was also extended in this phase and thus the monopoly of the classical distribution was questioned.

The topic of digital transformation has recently gained considerable importance, because now it is closer to the product. Under the keyword "Connected Car", all major automobile manufacturers are striving to integrate the vehicles into the Internet; digital technologies thus provide an important supplement to the core product. However, creating such a "Connected Car" is a great technical challenge, because it requires significantly increased computing power. While it was previously sufficient to provide this in the up to 100 distributed control units ("mini-computers") in the vehicle, the next generation of vehicles will require one or more central high-performance computers. This in turn requires a complete change in the entire electrical and electronic architecture—the "nervous system"—of the vehicle. The manufacturers are moving away from independent components to a central architecture. Figure 2.2 shows an example of BMW's approach to the Connected Car.

The topic is now no longer in the classical IT departments, but in product development and in the strategy departments as well as in the newly founded digitalization units. Many manufacturers are trying to provide attractive additional services, such as specific suspension settings or an intelligent headlight assistant, and thus to generate additional revenue after the purchase of a car and even during the operation of cars. It is precisely at this point that new players enter the market. Some of them, like Tesla, want to produce cars themselves and differentiate themselves both through digital services and through a new drive technology. Others, like Google, rely more on their multiple relevance to customers and the knowledge they have gathered about customers through various application areas.

A connected car, in turn, is the basis for two scenarios with which vehicle manufacturers are currently dealing. It is foreseeable that the role of the human driver will be gradually replaced by the computer using so-called assistance systems. When such systems can completely replace the driver, when this will be accepted and honored by the customer and when the

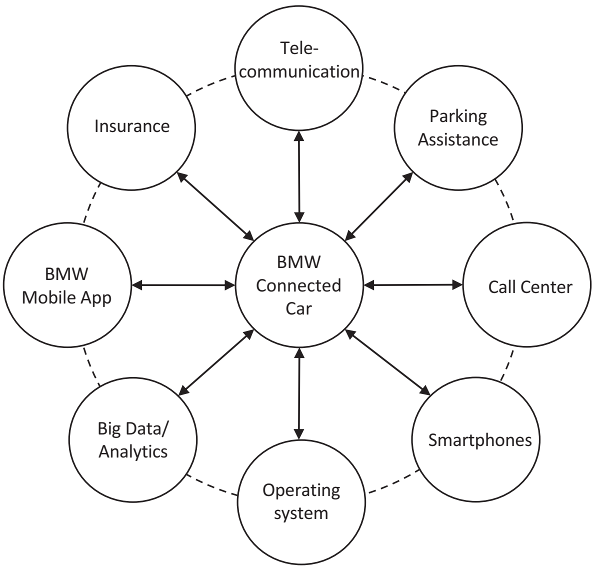

Fig. 2.2 "Connected Car" at BMW (2018)

legal framework will be created for this, this is not foreseeable today. In any case, this scenario requires to further equipping the car with digital technologies—digital technologies become a central element of the product, the product becomes hybrid.

In parallel to autonomous driving, the automotive industry is still dealing with a second scenario. So far, the automotive industry has produced products (cars) that essentially support the individual mobility of a person or a small group of people. However, these use the car relatively rarely, i.e. the car is unused for a long time. In addition, it can be observed that younger generations in general and also specifically assign less importance to the ownership of a car. In addition, the car is losing its status as a status symbol. Both together lead to the testing of so-called car-sharing concepts. The basic idea of car-sharing is that manufacturers no longer sell a car, but become providers of mobility solutions. Carsharing users do not buy the car, but pay essentially for the kilometers traveled by a car.

The efforts of the major vehicle manufacturers to adapt their organizational structures are also noteworthy. For this one must know that vehicle manufacturers are traditionally very hierarchical and centralized—for an efficient mass production in a stable environment this is certainly also the right organizational form. But this stable environment does not exist anymore—many manufacturers want and have to take this into account.

If you compare a vehicle manufacturer 20 years ago with a vehicle manufacturer today, digital technologies have so far caused gradual changes, especially in processes. The networking of vehicles and even more the concepts of car sharing based on this are presenting vehicle manufacturers with completely new challenges today, both in terms of products, processes and organizational structures. The networking makes digital technologies part of the actually analog product. Car-sharing concepts—if they are accepted by the general public—would call the traditional self-image of a vehicle manufacturer fundamentally into question.

2.1.3 The Five Stages of Digital Transformation

Venkatraman (1994) has early on presented a systematization of the stages of change of companies through digital transformation. Venkatraman distinguishes five stages of digital transformation (see Fig. 2.3). He refers to changes in the local area (e.g. through a software solution in a single department) and also to the company-wide integration (e.g. through uniform

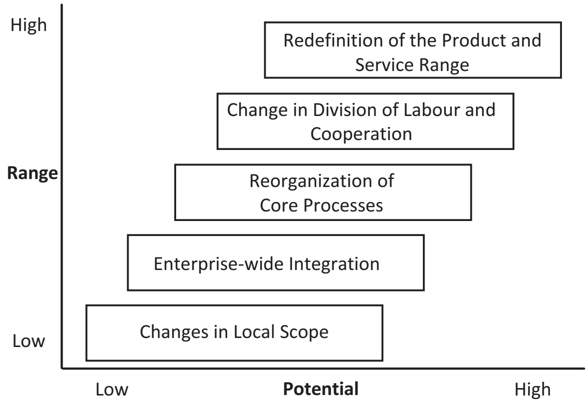

Fig. 2.3 Five Stages of the Scope of Digital Transformation (based on Venkatraman, 1994)

commercial systems) as evolutionary (stage 1 and 2). He refers to the changes driven by digital technologies in the area of important processes, the division of labor between companies and the product and service range of a company as revolutionary (stages 3 to 5). Revolutionary changes undoubtedly have a significant impact on the competitive position of a company. These are typically in the focus of digital transformation.

2.2 Important Terms and Concepts

In the context of our topic, there is an almost unmanageable number of terms. If one were to create one of the word clouds commonly used today, it could quickly fill several pages. This diversity often leads to uncertainty and possibly even confusion. The following should therefore shed some light on the amount of terms (Hess, 2019).

2.2.1 Digitalization and Digital Transformation

"Digitalization" describes the introduction of new, digitally based solutions. "Digitalization" can be easily confused with "Digitization"; the latter refers to the transfer of information from an analog to a digital storage form and thus a very specific form of "Digitalization".

One step further is the term "Digital Transformation". This term describes the change caused by digital technologies and the digital innovations based on them, with fundamental importance for the company. It emphasizes the introduction of a professional solution (e.g. a new sales control concept), but also emphasizes the driving role of new digital technologies.

Examples of digital transformation can be found in almost all areas of life, i.e. in companies, in state institutions and in private households—although in very different manifestations. In companies, for example, products and processes change. Governments adapt regulations (e.g. in the form of new regulations on internet crime in criminal law) and also simplify their processes. A private household, for example, increasingly buys online and submits its tax return online. The Corona crisis has intensified the pressure for digital transformation and has led to an additional digitalization boost in both companies and private households. All of this is only possible with the digital storage of information and its processing by machines and thus by digitalization. Nevertheless, in all of the examples just mentioned, the professional solutions are the focus, the technology is a means to an end.

The focus of this book is on the perspective of a company, i.e. it is about the **digital transformation *of companies*** (Vial, 2019). Of course, this includes how customers and other business partners as well as the state are digitized, but the view is always from the perspective of a company. Österle was the first to introduce this perspective into the German-speaking world under the term **"information-based corporate management"** (Österle, 1987).

Digital transformation includes fundamental changes that are caused by digital technologies in companies. Accordingly, it should also be approached as a strategic issue, which requires the development of cross-cutting governance structures and the creation of conditions across the company. Some authors even go so far as to only speak of digital transformation if the identity and value creation process of a company changes completely (e.g. Wessel et al., 2021). What is right about this perspective is that it emphasizes the far-reaching consequences of digital transformation. However, it does partly go past the lived reality of digital transformation. This book therefore also takes into account far-reaching changes that do not lead to a completely new company identity and a completely new value proposition.

2.2.2 Digital Transformation as a Specific Management Concept

In the two cases introduced at the beginning of this section, new digital technologies were and are the drivers of development. In the case of the music industry, it is about the availability of consumers via the Internet, supplemented by specific technological solutions such as peer-to-peer networks, shop systems, rights systems and streaming. In the case of vehicle manufacturers, it is about the Internet as a tool for networking cars and companies, for driver assistance systems or for platforms for transport services. This means: Digitization and digital transformation are **"technology-driven".** Technology as a starting point is therefore the first characteristic.

At first glance, this is hardly surprising. However, a perspective originating from technology is by no means as self-evident as it may sound at first, because it is not a question of simply digitizing existing solutions. From an inefficient analog process, only an inefficient digital process results. It was also rarely convincing to simply transfer an existing product, e.g. in the media sector, to a new medium. Rather, it is about exploiting new technologies to create new approaches. The term "Techno-Change" is occasionally used in the literature for this technology-driven change (Markus, 2004)—this brings the idea clearly to the point without, of course, postulating the omnipotence of technologies in a naive way.

A second attribute is also characteristic. In Chap. 1 it was shown that the digital transformation must be controlled and flanked. Controlled means that a company must approach the digital transformation systematically, e.g. by introducing new management roles or formulating special strategies for the digital transformation. Flanked means that a company's focus must not only be on transformation projects. Rather, a complete adaptation of the management structures or a new orientation of important resources is required. In this sense, for example, automobile manufacturers have introduced more flexible organizational structures and music publishers have significantly expanded their competencies in the field of digital technologies. Digital transformation is driven by technological development, but goes far beyond the introduction of new IT systems. The digital transformation is therefore a **broad management approach**—this is the second characteristic.

A third, equally important characteristic lies in the importance of change for the organization. For many years, digital technologies have been gradually changing the organization, but this is often no longer the case. We therefore speak of digital transformation when the IT-induced change is fundamental for the company. This is particularly evident in the fact that the attention of top management is required. **Fundamental importance** is therefore the third characteristic.

The effects of digital technologies are very different in this context. In the two cases considered above, in the case of music publishers and automobile manufacturers, it was initially—as in almost all industries—only about efficiency gains in the administrative area. These are undoubtedly desirable, but for the competitiveness of a company they are only rarely really decisive. At the beginning, digitalization and the digital transformation based on it were therefore not a topic for general management. However, the two cases mentioned above also show that this has changed in the meantime. In the case of the media industry, it is today essentially about the product itself, in the case of automobile manufacturers at least about important product features.

Around the year 2000, the term "E-Business" was particularly popular. From the perspective of the terminology just presented, this also meant the digital transformation of companies, but with a very strong focus on the Internet as a driver of change and with a much narrower understanding of the range of possible impacts.

2.2.3 Digital Innovations and Disruptive Innovations

Digital innovation and digital disruption are terms that are also often used in the context of digital change. The term digital innovation was already introduced in Sect. 1.3. Digital innovations arise from new digital technologies. To understand and implement them, an integrated, i.e. coordinated view of the technical and the subject-specific aspects of an innovation is essential (Wiesböck & Hess, 2020). So it is—to take an example from sales—not "just" about the app and its user interface, but also about its integration into a new sales concept.

A special form of (digital) innovation is disruption, more precisely disruptive (digital) product innovation. According to Christensen (1997), who introduced this term, it is a special form of technology-driven product innovation. This product innovation is characterized by offering new product features that the customer has not yet considered relevant. A typical example of such a digital product innovation was the smartphone. Although users cannot make phone calls much better with a smartphone than with a mobile phone, a smartphone has features that are interesting for mobile users, such as easy access to many interesting Internet services.

Occasionally, the term disruption is also equated with radicality. This is intended to highlight the high degree of change—but this does not correspond to Christensen's original intention.

2.2.4 Industry 4.0, Social Media Marketing and Similar Concepts

"Social Media Marketing" and "Industry 4.0" are new professional concepts that are embedded in digital innovation. A central theme of social media marketing, for example, is the inclusion of the previously purely passive, receptive customer as a source of ideas for the development of products. Presentation models and success indicators are also presented. An industrial company in the mode 4.0 is characterized by the close integration of customers and other business partners into its own business processes. Drivers include, for example, the improved possibilities for networking of machines and companies as well as other special solutions, e.g. in production control and data acquisition.

At this point, one could still present at least ten comparable concepts that have individual aspects of the technology-induced change of companies as their subject. But often they are difficult to delimit and, as the two examples above have already shown, serve more to transport an idea than to precisely describe a concept. For example, in Table 2.1 a few selected professional concepts are presented, which have arisen in the last 25 years.

2.2.5 Add-on: Theoretical Classification of Digital Transformation

A specific branch of research deals with the interaction between an organization (and thus a company as a special variant of an organization) and technology. The basic approaches (Orlikowski, 1992) were the **organizational imperative,** the **technological imperative** and an **integrative approach** worked out. The first approach emphasizes the dominant role of the human being in the decision-making process on the use of technology. The second approach emphasizes the role of technology as a driver of change in organizations. The third approach, often anchored in "structuration theory", tries to connect the two approaches.

With the emphasis on the role of new digital technologies as drivers, the concept of digital transformation is certainly primarily attributable to the

Table 2.1 Specific Concepts for Digital Change

Concept	Business Process Optimization	Mass Customization	Social Media Marketing	Industry 4.0
Relevant business area	Core processes of a company	Marketing and production	Marketing	Production
Core idea	Processes as "forgotten" dimension that can only be unfolded through new potentials of technology	Individualized production at low costs	Activation of the previously passive user	Networking of all devices and systems
Technical Drivers	Basically all, with a focus on ERP systems	Customer internet access, flexible production systems	Social media platforms on the internet	Networking of machines and possibly smaller devices based on the Internet
Origin	Around 1995	Around 2000	Around 2005	Around 2010

second approach. This does not in any way question the mutual influence of specialist and technical solutions—the starting point is simply the new technology.

2.3 Digitalization: How Digital Innovations Arise Today

In the sections 2.1 and 2.2 ,the most important conceptual and conceptual basics were presented. But just as important for a basic understanding are also the relevant "contents", i.e. the most important technological trends and the resulting changes in the environment of companies and the options for their structuring. The technological trends begin.

For this, a step back is required. In essence, a computer can only do one thing: it can process information. But it can do it well, especially much faster than the human being. Over the years, this skill has gradually and sometimes abruptly improved. Step by step he replaces the human brain—just as the machine can replace the human muscle power.

A computer consists of three components at its core (Mertens et al., 2017; see Fig. 2.4). The **hardware** refers to all those parts that can be touched. The **software** contains the commands that tell the hardware what to do. A special role is played by the way a computer interacts with a human and with its

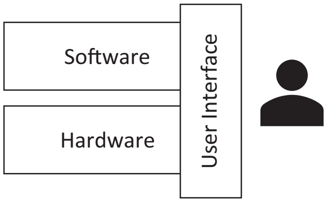

Fig. 2.4 The Three Logical Components of a Single Computer

environment in general, the so-called **user interface.** Specific combinations of hardware (such as a screen or a sensor) and software (for controlling the screen and sensors) are used at the user interface. The following describes the basic developments in hardware, software and user interface.

2.3.1 Trends in Hardware

It all started with a single computer. This was still very limited in its processing speed—every calculator can process more information today. In addition, the computers were not connected, i.e. each computer worked independent from others.

Huge advances in information technology have greatly improved a computer's processing capacity over the past few decades. Moore's Law is still in effect here. It states that the processing speed of an integrated circuit in a computer, and thus the **computational speed** of a computer, will double at least every two years. If we go back just 20 years, it becomes clear how much faster a computer has become. There have also been significant advances in the technologies used to **store** data. All data that is not currently being processed and that is to be kept long-term is stored in memory.

The advances made in networking computers over the past few decades are at least as important. Today, almost every computer can be reached by another computer via the Internet. This became possible because the Internet found a standard in the 80s that made exchanging information between any two computers much simpler. The importance of this infrastructure progress cannot be overestimated. Once the necessary conditions were in place, the physical networks were expanded. The **transmission capacity** was increased year after year. In addition, more and more private households were connected—which was not so long ago still an exception, today is self-evident. A second major breakthrough was the expansion and, above all, the opening of the **mobile networks.** Originally, these were only intended for telephone calls. Today, mobile networks are also used primarily for network computers—which of course do not always have to be stationary.

The development of hardware is by no means already completed. There will be noticeable progress in both computing power and the capacity and availability of networks in the coming years. One important development in recent years has been the so-called **"cloud computing".** Cloud computing means that the data or software required is no longer on the user's own computer, but on another person's computer. For example, if a doctor wants to use complex software to analyze medical images, the software and data required for this are usually stored on his or her local computer. With cloud computing, both the data and the software would be stored on another computer. The doctor accesses this via the Internet and the networks above it, his or her own computer is largely "stupid". This reduces the technical complexity on his or her terminal considerably. On the other hand, his or her data is no longer under his or her control. He or she is also dependent on the availability of a connection to the Internet.

A second current development is the emergence of the **"Internet of Things"**. So far, the Internet and the networks below have served as a platform for the networking of a considerable number of terminals. However, these terminals, usually dedicated computers, are operated by a human being, ranging from the desktop PC to the tablet PC to the smartphone. The idea behind the Internet of Things is that it makes sense to connect a variety of technical devices beyond dedicated computers, and that a human being does not necessarily have to control these devices. "Candidates" for this can be found in both companies and in private households. In companies, this involves a variety of machines, possibly also mobile goods. In private households, the range extends from the most important household appliances such as heating, blinds and lamps to cars and fitness trackers. The necessary technical requirements are usually in place today, both for the terminals and for the organization of the Internet.

2.3.2 Trends in Software

System software coordinates the interaction of the individual components of a computer and takes over overarching, rather technical functions. For a long time, not much had happened in this area. However, in recent years there have been significant improvements in software for managing large amounts of data. For a long time there has been software that comprehensively supported the management of large amounts of data. However, these data had to be structured in the same way. In addition, the evaluation options were rather limited. Newer software allows, under the term **Big Data**, both the merging of heterogeneous data sets (for example, from the log files of a web shop, a customer database and a market research institute) and their comprehensive evaluation. The latter includes the construction of user-related profiles, the search for previously unknown relationships (for example, the drivers of the purchasing habits of consumers of a certain product) as well as the somewhat target-oriented prediction of the behavior of individual users or user groups. The latter mentioned systems are used, inter alia, to control police patrols in the context of the statistically determined risk of residential burglaries.

The **blockchain technology** can also be counted among the innovations in data management. The core idea is to distribute a data set as a linked list over a large number of computers. Blockchains are thus a completely new form of a distributed database. Whether and, if so, which applications beyond virtual currencies will prevail, is not yet foreseeable today.

Application software is directly important for digital transformation. It is developed specifically for a specific application area and relies on system software and hardware. It all started with software to support the administrative functions in a company, such as those found in accounting and payroll. Gradually, more and more tasks and processes were supported in companies, for example, the ERP systems mentioned above, supply chain management systems (SCM systems) or CRM systems.

With the increasing availability of inexpensive devices and their connection to the Internet, a second segment for software developed for applications in the private context. It started with simple, familiar from the business environment software, such as for e-mail or for word processing. Meanwhile, there are specific software, such as media consumption, for managing personal finances, or in the form of games. In addition, there are now some types of software that are used in both the professional and private context, such as various communication tools such as **social networks** or **messaging services** as well as the aforementioned word processing software.

In recent years, progress has also been observed in the field of **artificial intelligence**. Attempts to put a computer in a position to solve a problem not only by processing a clearly defined sequence have been made repeatedly. The often high expectations have been partially fulfilled so far. In some cases, for example in image recognition or prediction, remarkable success has been achieved. Based on the large amount of data available today, systems are currently being tested that learn constantly. In the field of image processing, first success has already been achieved. It is also possible to use computers as communication partners in simple dialogues without the human communication partner immediately recognizing the machine as such (social bots). These systems also learn constantly.

2.3.3 Trends at the User Interface

Until well into the 1980s, a computer's user interface was very similar to a typewriter's. The user had a classic keyboard available to enter commands into the system sequentially. On the screen, the user saw letters, numbers, and a few special characters. And that was it. A significant improvement was the **graphical interfaces,** which began appearing in the early 1990s. Instead of just simple letters and characters, the screen now also showes graphical symbols, and in color too. The mouse could now be used for navigation. Meanwhile, all computers have such interfaces.

In recent years, we've seen the addition of **touch-sensitive screens** and **specific glasses.** Also in practical use, a large number of **sensors** report environmental conditions back to a computer. Another typical application can be found in warehousing. In the connected home, sensors report room temperatures back to the user.

There have also been advances in user interfaces on the software side. Particularly important are advances in **speech recognition.** Today, for example, most smartphones have applications that allow for simple dialogues in natural language. For example, Amazon has brought the Alexa assistant system to market, which is designed to allow for the control of the home using natural language.

2.3.4 Conclusion

Computers can now be operated relatively intuitively and no longer require the study of extensive manuals—an important prerequisite, among other things, for the use of computers by private individuals.

The trends mentioned are summarized in Table 2.2.

If you take the trends in the three components of a computer together, then there is a general trend towards **autonomous systems** overall. Unlike with traditional IT systems, the behaviour of such systems is not fully defined in advance, i.e. the system further develops its internal logic based on the reception of the environment. The most tangible example of this are human-like robots, as they are at least already being tested today.

Table 2.2 Current Technical Trends at a Glance

Area	Trend
Hardware	Cloud computing: shifting of software components "into the cloud"
	Internet of Things: connection of various "things" to the internet
Software	Simplification of the merging and evaluation of large, heterogeneous data sets
	New forms of distributed databases in blockchains
	Use of newer methods of artificial intelligence (AI) in application systems
User interface	Improved sensorics
	Improved interaction in human language based on methods of AI

2.4 Digital Transformation: Where Digital Innovations are Taking Place Today

Of course, every company has to find its own way for the digital transformation. This depends on the starting situation, the specific opportunities and risks of digital technologies in the particular case, the investment funds available, and many other factors. It can also take longer for basic innovations such as the Internet to be transferred into concrete solutions—social networks, for example, were not available when the Internet was created in the 1990s. Nevertheless, a few typical starting points can be worked out, which are currently relevant for a larger number of companies. These can be found in the market and value creation structure as well as in the individual companies.

2.4.1 Current Changes in the Company Environment

Intermediaries between suppliers and customers have always existed. Just think of retailers and banks. With the operators of **internet platforms**, a new class of intermediaries has arisen (Parker et al., 2017). They bring together suppliers and customers—just like a classic intermediary. However, such platforms do not require expensive sales rooms and thus also no large amounts of capital. Rather, they have relationships with customers and suppliers as well as a comprehensive database of their customers. The latter leads to high switching costs for customers who want to access products quickly and easily. The switching barriers are particularly high when the attractiveness of an offer of a platform increases not only with the number of suppliers, but also with the number of users.

Internet platforms are therefore something like huge department stores, but without the typical investment volumes and the typical costs of a department store, with efficient customer communication and very loyal customers. They position themselves between customers and producers and can play their market power both against producers and (!) against customers. The danger of monopoly formation is obvious. This is particularly true for communication-oriented platforms. Every additional user, e.g. of a social network, is potentially interesting for another user—the so-called direct network effects become virulent.

One of the first platforms of this kind was developed by Apple with the iTunes system for the online distribution of music in the form of music files. With this, Apple—as a company from another industry—has established an important position in the music business. Google, Uber, Amazon, eBay and Meta are other companies that have already positioned themselves as platforms for consumers. They all have a wide user base and position themselves between user and producers. This is exactly what is currently also occupied by the vehicle manufacturers. They want to avoid that a company like Google or Amazon is positioned between them and the vehicle user—a quite realistic danger.

In addition to establishing platforms, **cooperation** also plays an important role in the digitalizing world (Picot et al., 2003). This was not the case in the analog world. Typically, a company had market relationships with its customers and suppliers. If another company became interesting, it tried to buy and integrate it. Cooperation, on the other hand, is a hybrid construct: the actors remain independent, but at the same time work together in selected areas over a longer period of time.

Cooperation first gained greater importance in the automotive industry's supplier networks, and this was many years ago. In the classical industrial sector, inter-company optimization systems were also established. For example, some retailers report their sales figures early, which allows manufacturers more accurate production planning. There are also such cooperation in the air traffic. There the airlines have joined forces in two international alliances (Star Alliance and One World). In these alliances they coordinate flight plans, cooperate within frequent flyer programs and operationally provide increased comfort for travelers. The latter is unthinkable today without IT systems.

Currently, new forms of cooperation are emerging. One important manifestation of this are the so-called **ecosystems** (Moore, 1997). Ecosystems are often developed around a specific product and often form in the environment of the Internet platforms already outlined. All companies that can add value to the product at the center are included. They agree on a long-term cooperation. For example, the manufacturers of a heating system, the manufacturers of radiators, the operator of an app and possibly the operator of a home network must coordinate their solutions in order to offer an integrated solution for digital heating control. They cannot offer an attractive product on their own. But if they align their solutions with each other, then an offer that is interesting from the customer's point of view can arise. Such coordination is only possible on the basis of a long-term cooperation. The central subject is the agreement on a cross-system architecture as well as standards for the communication between the components of different manufacturers involved in the system. The so-called **"network effects"** (Shapiro & Varian, 1998) come into play here. Direct network effects arise when a customer has an advantage as soon as the number of customers using similar products increases. Indirect network effects arise when the consumer has an advantage because a complementary product is available.

However, new digital technologies such as the Internet of Things, blockchain or artificial intelligence are giving rise to ecosystems in which not only a product is at the center, but digital spaces with a variety of different actors who, depending on each other, nevertheless try to create, offer and exploit value independently. Such digital ecosystems are often characterized by a high rate of technical change, which sometimes brings radical uncertainty with it. Digital technologies enable the quick linking with a variety of actors, while at the same time the linking can be dissolved just as quickly. This trend is particularly important to consider in software development, as the technical possibilities are almost permanently changing. New tools, libraries, automation or interfaces enable the embedding of various applications and integration with solutions from other providers and thus form a far-reaching digital ecosystem. The potential possibilities of networking are so diverse that decision-makers actively limit and weigh them.

2.4.2 Typical Changes on the Market Side

In the analog world, a company usually had little direct contact with its customers. In addition, traditional industrial production required large quantities. Both have now changed. A company can now communicate extensively and for a long time directly with its (potential) customers via the Internet. The customer can thus express his preferences, or his preferences can be derived from his behavior. Based on these preferences, the customer can be provided with **individualized products** as a second approach.

This approach is used, for example, by the search engine provider Google. It collects information about the preferences of its customers and allows this to flow into the calculation of the relevance of websites. In addition, it uses this information to place advertising that best meets the user's preferences. Plakativ and strongly simplified this means: Whoever searches for cars in the search engine will also receive advertising for cars in a very short time. As a result, the scattering losses are reduced and the prices for placing the advertising go up. But even with material goods, individualization is now possible. For example, manufacturers of sports shoes offer the configuration of an individualized running shoe. Manufacturers of T-shirts make it possible to print any text. Flexible production systems up to 3-D printers make this possible. And the customer thanks him with a higher willingness to pay.

Insurance companies use a similar approach and are currently testing individualized tariffs for damage insurance. In these tariff models, for example, the customer of a car insurance receives a bonus if he does not exceed a certain driving performance or drives particularly defensively. However, such tiered tariffs require detailed information about the driving behavior.

In addition to adapting existing products and services, digital technologies are also **part of many analog products.** Examples can be found among both investment and consumer goods. In the field of investment goods, remote maintenance is a typical example. In this scenario, a classic machine is supplemented by specific software and equipped with a connection to the Internet (the Internet of Things mentioned above is created). The software recognizes when a defect is imminent or a consumable part needs to be replaced soon. Via the Internet connection, it sends a corresponding message to the manufacturer. In this way, the manufacturer of the machine can position itself as a service provider. He also learns something about the use of his machines in everyday work life. But there are also corresponding examples among consumer goods. Ravensburger, for example, is a successful manufacturer of classic children games. The company has now equipped its books with contact points and offers a pen for control. If a small child points to a spot in one of these books, he or she learns what kind of animal it is and what kind of sound is typical for the animal. Further examples can be found in the connected household. For example, by attaching a control module, a heating system can be better adapted to the needs, for example in the event of a delayed return.

2.4.3 Typical Changes in the Organization

The most classical starting point for the use of digital innovations in companies lies in the transfer of tasks to the computer that were previously carried out by a human—the third major area of digital technology within companies. Clearly structured tasks and processes can be described quite easily in software and transferred to the computer. This has happened to a large extent in recent years. For example, the complex task of payroll was almost completely transferred to the machine. In addition, companies can also use procedures that could not (or at least not at reasonable cost) be carried out by humans thanks to the computer. For example, modern sales support software allows the calculation of customer-specific coverage ratios. Just as modern optimization software can, for example, calculate the best possible routes in logistics.

The new artificial intelligence methods mentioned above now also make it possible to transfer less structured tasks to the computer. Typical examples can be found in customer dialogues or in the creation of texts in media companies. Interesting options also arise through the improvement of robots. Step by step, a robot can take over more complex tasks, for example in industrial production or in private households. However, computers and robots are still (so far) subject to clear limits. Tasks that require empathy can probably not be transferred to them for a long time. Another area of activity lies in the organizational structure of a company. Traditionally, companies have been more hierarchical and static in structure. For a classic industrialized production, be it in the processing industry or in the service sector, this is the most appropriate organizational form in many areas. If markets change due to digital technologies, to a very great or frequent extent, such structural organizations represent a barrier. That is why many companies are testing more flexible forms of cooperation within the company. The trend towards more flexible organizational forms also applies to cooperation with other companies. An extreme form are the so-called **virtual companies,** a special case of the company networks already mentioned above. For a virtual company, companies with complementary competencies and capacities join together. They agree on rules for cooperation in individual cases, as a rule on the basis of technically supported communication and coordination. However, they do not lose their independence.

Table 2.3 Current Economic Trends at a Glance

Starting point	Trend
Environment of companies	Industry platforms as a new business model More cooperation, also in innovative form, e.g. as ecosystems
Market side of companies	Individualization of customer approach and products Supplementing of analogue products by digital solutions
Organization of companies	Automation of less structured tasks More flexible company structures and cooperation

2.4.4 Conclusion

The current trends in the three areas just mentioned are summarized in Table 2.3.

2.4.5 Add-on: Data Economy as a Cross-Cutting Issue

Almost all of the approaches described previously have one thing in common: it is always about the improved **availability of data.** Platforms are based in particular on the data they have collected about their users. Cooperation only becomes attractive when data can be exchanged efficiently between the parties involved. Personalization of products, as well as a comprehensive view of the customer and further automation of processes, are based on improved data availability. The provision and use of data is therefore a cross-cutting issue. Companies are currently carrying out a number of projects to first identify existing data and to identify the opportunities for data consolidation. Many questions, such as the value of data or the benefits of data consolidation, are still largely unresolved. The focus is often strongly on personal data. The associated questions (for example in the context of social networks, but also simple e-mail newsletters) are interesting. But the processing of non-personal data, for example in the interaction of companies, is at least equally interesting.

2.5 When Digital Innovations Become Effective: Towards the Acceptance of New Systems

New technical solutions and the associated business concepts must be seen as interim results of transformation projects. In the end, what is of sole importance is how these technical and business innovations are accepted and thus used. **Acceptance models** show which factors have a major impact on the acceptance and thus the use of technical and business solutions. They also make it clear which levers companies can use to promote the acceptance of solutions by customers or employees. The following is an overview of the most important approaches. Unfortunately, the presentation is limited to new technical solutions. For new technical concepts (such as products, processes or business models), such models do not yet exist.

One of the best-known models for explaining the acceptance of new technical solutions is the **"Technology Acceptance Model"** (TAM), developed by Davis and colleagues (Davis et al., 1989). It is shown in Fig. 2.5.

The TAM is aimed at the actual use of new technical solutions in an organizational context and thus also within companies. A prerequisite for this actual use is a corresponding intention. This intention in turn requires a corresponding attitude. This attitude in turn results from a weighing up of the potential user between the perceived usefulness of a technical solution on the one hand and the perceived ease of use on the other. In other words: What is decisive is that a system is useful in the work context (for example, because tasks can be processed more quickly) and that the user comfort is high (for example, because the user interface is very intuitive). This leads to a positive attitude, which in turn leads to the intention to use and then to the use—almost automatically.

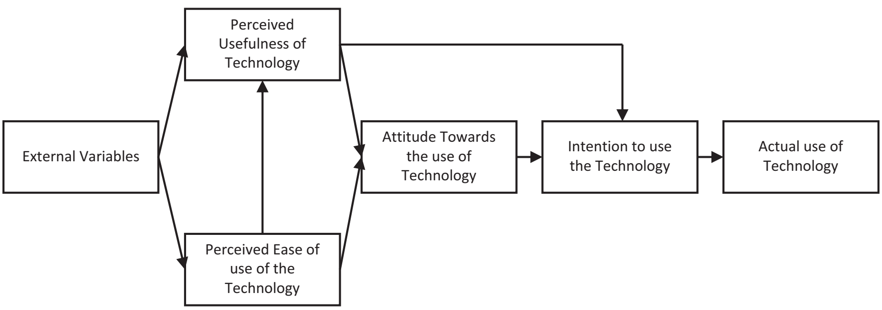

Fig. 2.5 Technology Acceptance Model (Davis et al., 1989)

The decisive levers for a company therefore lie in improving the usefulness perceived by the user and the perceived ease of use. This can of course be influenced in the development of the system, for example by taking strong account of the features of a system demanded by users or by an sophisticated design of the interface or by a strong involvement of the user in the development of the system (as demanded by newer proposals for the design of systems). In addition, there are a whole series of measures which can positively influence the usefulness perceived or the perceived ease of use of a given system. In Fig. 2.5 these factors are somewhat generally referred to as external factors. Thus, training, workshops and active user support help to positively influence the usefulness perceived or the ease of use of a new technical solution. By conveying an effective use of a new system and the communication of its added value in the work environment, the acceptance and use of a new technical solution in the company can also be promoted.

However, acceptance models do not only offer companies a suitable aid in the introduction of a new technical solution within their own company. In order to investigate user acceptance and thus the use of new technical solutions in the end consumer context, the **"Unified Theory of Acceptance and Use of Technology 2"** (UTAUT2, Venkatesh et al., 2012) was developed. UTAUT2 (see Fig. 2.6) thus has the determinant factors of the intention to use known from the TAM model. Thus, the perceived usefulness—here in the form of the expected performance of a technology—and the perceived

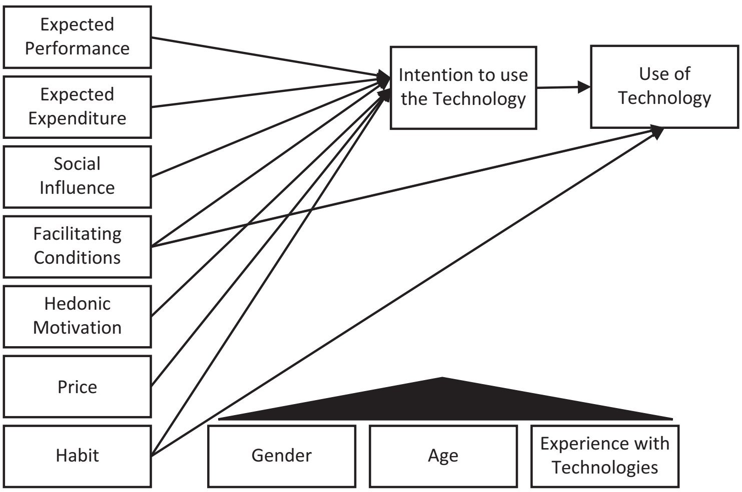

Fig. 2.6 Unified Theory of Acceptance and Use of Technology 2 (Venkatesh et al., 2012)

ease of use of a technology—represented in the model by the expected effort of using a technology—play an important role in the acceptance of a new technical solution. Furthermore, the social influence, that is, the degree to which an end user is influenced in his acceptance decision by his social environment, is taken into account. The fourth main determinant of the UTAUT2 model, the facilitating conditions, is new. These describe environmental factors that are perceived by consumers helpful in using a new technology, such as the technical support offered by the manufacturer for a new technology. UTAUT2 also includes factors that relate specifically to the consumer context. These include the hedonic motivation—that is, the pleasure of using a technology—and the cost-benefit ratio when using a technology. The perception that the use of a technology becomes a habit is also part of the model.

The already known determining factors allow the conclusion for companies that—not surprisingly—the expected added value of a new technical solution is also of great importance for the end user. Furthermore, the operation of the system should be as intuitive as possible in order to keep the initial effort low before the first use. In addition, good technical support from the manufacturer can also influence the users in their technology acceptance. However, it appears to be of particular importance that the customers have a positive cost-benefit perception in relation to the product and that the use is fun. Especially in connection with the relevance of the social influence, a positive as well as a negative attitude towards a technology can spread quickly among potential customers. Furthermore, targeted marketing campaigns can, for example, show different usage scenarios of a technology, which makes it easier to habituate the use of technology.

The UTAUT2 model also includes three so-called **moderator variables:** gender, age and (prior) experience with the solution (Venkatesh et al., 2012). Moderator variables amplify or reduce the effect of a relationship and are therefore particularly interesting for specific strategies. For example, it can be shown that the individual experience in dealing with technology reduces the influence of the expected effort when using a new technology on the intention to use it. It can also be shown that young men are mainly influenced by the fun of using technology. Older women, on the other hand, need continuous technology support in order to use a new technical solution permanently. Furthermore, older women are more price-sensitive than other user groups.

2.6 Is More Always Better? From the "Optimal" Degree of Digitalization

All the examples presented above are steps on the way to more digitalization, i.e. an increase in the transfer of tasks to the computer. A number of articles, studies and books convey the impression directly or indirectly that more digital change is always better. Of course this is wrong, and it can even be dangerous.

From a purely technical perspective, a digitalization rate of 100% would of course be fascinating. This would mean that a company has transferred all of its tasks, both value-creating (primary) and value-supporting (secondary) tasks as well as management tasks, completely to the computer. In extreme cases, there are already examples of this for primary tasks today—just think of the internet search engines. Each request is processed automatically, and the required data is also obtained automatically (by means of a continuously operating crawler). There are also individual examples of a fully automated factory in the processing industry. In this, machines produce the products. The procurement of raw materials and semi-finished products is also carried out completely automatically. However, it is not yet foreseeable to transfer the secondary activities completely to the computer. Even in the extreme case of the search engines, improvements in the algorithm are still being developed by humans today. Even the development of a product and the procurement of personnel or the further development of the IT infrastructure can only be partially transferred to computers. So far, it has also not been possible to completely transfer complex management tasks (such as the formulation of a strategy) to a computer.

From an economic perspective, the picture quickly relativizes itself, even if one only deals with the meaningfulness of an increase in the degree of digitalization, and not yet with the rather utopian goal of full automation. From the perspective of a single actor (a company, a private household), an investment in a digital technology is only then meaningful if its positive effects (e.g. in the form of reduced production costs) exceed its negative effects (such as the costs for the introduction and operation of a system). For example, a company only invests in a new solution for customer management if the attributable benefits (e.g. in the form of more customers or reduced process costs) exceed the attributable costs (e.g. for the development and operation of the system). It is obvious that this calculation does not always work out positively—practical problems of cost and benefit capture aside. Nor is it automatically meaningful for a company to transfer work from humans to machines. At a low wage level, it may make more sense to leave the work with humans. In addition, the cost structure of a company also changes with an increased degree of automation. The more tasks are transferred to machines, the less a company can flexibly adjust its costs to utilization.

Overall, it must be said that, from the perspective of a company, digitalization and the digital transformation based on it can only ever be about the question of to what extent the use of digital technologies leads to an improvement in the economic situation. By no means is this always the case with an increase in the degree of digitalization. No new insight—but still important!

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