can focus on their core areas of operation. Netflix can concentrate on content production and delivery, while Amazon can continue to develop its cloud platform and offer it to other companies. This reaping of benefits by market rivals through strategic cooperation in areas that offer mutual advantages holds particularly true for sectors that require substantial investments in technology and infrastructure. It also affirms that in today`s business world, competition does not always have to entail complete isolation from competitors, and collaboration can be advantageous for all parties.

Reviewing the fundamental lessons of this chapter, in the context of the automotive market, we noted that the traditional division between competitors and cooperators is losing its relevance. Players are competing for customers but also collaborating to produce new technologies, which accelerates industry progress. The chapter provides a clear signal that the traditional division between competition and cooperation is being torn down. Today, it is increasingly evident that we can achieve much more by leveraging the strengths of partners than by only competing. This means that strategic cooperation is becoming a key tool for success in the modern market. However, to fully capitalize on this change, organizations must transform their strategies and management approaches. Leaders must be open to new business models that assume not only competition but also cooperation with other entities in specific areas. This requires courage and adaptability from managers and a change in organizational culture to promote collaboration and agility.

Theme 8: The Navigation Toolkit

To borrow from the lexicon of life philosophies, digital transformation is not a destination – it is a path. It requires the adoption of a new outlook on what it means to run a business. Nor is it something to be undertaken piecemeal – rather, it requires careful preparation and constant monitoring. So in our final chapters, we will introduce a new digital paradigm for building an effective organizational strategy and we will work with a more detailed digital transformation model that helps us understand how to effectively manage the process.

The strategy is the north star of every organization. It is the furthest, highest point we fix our eyes upon as we set the direction for our employees` daily activities, and it sends a clear message to the outside world about the company`s plans and actions. But what should we do when the durability of its assumptions is no longer guaranteed? How can we make decisions with long-term impacts on our organization when we already know that our assumptions are flawed? What is needed is a completely new paradigm for building and, most importantly, implementing organizational strategy. This paradigm must, of course, take into account the continuous transformation of both the environment and the organization, and that is what we will address in the first of the chapters that follow.

The transformation affects the entire organization and must be implemented in accordance with the principles of process thinking. Methods of managing change in organizations have been developed over the years, but they are now being revised. The most important revision is the move away from the belief that the change management process ever ends. For digital transformation, which is a never-ending process, we need to update our approach to managing it. That is the objective of the next chapter, where I present tool one, Digital Change Management.

A key part of preparing for transformational changes is to identify the factors that cause them, to determine their directions, and to determine the moment when the actions taken will bring optimal results. It is worth noting that the currents affecting companies are rarely the result of unpredictable events.

Technological, business and societal trends alike need to be identified in advance so that our company is not taken unawares, and to that end, in the next chapter, I will present tool two, the Megatrend Tracker.

The changes an organization must undergo extend far beyond investments in automation. The scope of these changes is much broader, permeating nearly every facet of the organization, from hard business aspects like revenue streams and cost optimization to significantly softer aspects such as organizational culture and leadership styles. A transformation plan can only be implemented effectively and yield the expected results if it comprehensively addresses the entire organization. Tool three, the Digital Roadmap, is designed to be used for precisely that purpose. Its use is described in detail in the chapter of the same name, and the tool is provided in full in the appendix at the back of the book.

The key figure in the transformation process must be a leader. The era of digital transformation poses new challenges for managers and leaders. The effectiveness of digital transformation activities depends on the leader`s attitude and courage. The organizational culture, which is a high-level description of the behaviours that characterize the organization, primarily depends on the attitudes demonstrated by its leader. If the leader does not approach changes with an open mind, nor too will anyone else. Change always begins with the leader`s sense of the need for transformation. Change begins in our minds. Accordingly, in the final chapter of the book, having presented new approaches to strategy and change management and delivered the tools to implement them, I create a concrete list that we as leaders should each pin to the wall over our desks if we want to grow and to serve our organization while delivering exceptional results.

44. Business strategy in the world of Hyperreality

As we have seen throughout this book, it is hard now to assume that any fixed strategy can sustain a competitive advantage. The world of Hyperreality therefore no longer has room for traditional approaches. The business environment today is too volatile and unpredictable for conventional methods of strategic planning, which are not built to foresee or adapt to rapid changes in technology, business and society. Corporate strategy is often emphasized for its role in building a sustainable competitive advantage – a market position that is difficult for competitors to match because the business possesses unique resources, competencies or innovations that allow it to thrive for a long time.

The management literature presents corporate strategy as a crucial document and organizational plan. It is a map that sets out the direction, objectives and actions a company will adopt to achieve success. However, it is not just a document on paper; it shapes the actions of the entire organization. The strategy defines how a company will compete, its short- and long-term goals, and the steps to reach those goals. It is the foundation of all company activities, translating vision into concrete actions. The plan defines the necessary competencies, influences hiring and guides personnel policies to strengthen critical areas and skills for the future. The strategic plan also influences investment decisions, identifies critical areas for goal achievement, and guides R&D (or C&D) by specifying essential innovations and technologies. This determines the allocation of resources for research and long-term investments. It also shapes marketing by identifying the target markets, customer segments and competitive advantages that enable effective strategies. And if the argument that 'strategy determines factors that determine strategy' sounds circular, welcome to Hyperreality: expect that, as you execute your plan, you will find out things that feed back into the iterative process of modifying your strategy.

However, technology is advancing at an exponential rate, which means that innovations can quickly render existing strategies obsolete. Not only is the business environment changing, but the speed and complexity of these changes are also increasing. It is safe to say that there is no longer a person

in the world who can track and understand all the technological and business changes occurring around us. Never in the history of mankind have we faced such a vast number of megatrends each of which could so dramatically alter our lives and businesses.

An excellent example of the immense uncertainty in the area of business strategy can be seen in startups and funds that invested in the development of services based on GPT-4 technology. Projects that showed great promise as they launched at the end of 2023 – such as software to support project teams in analysing their tasks and many others – found that they might be forced to declare bankruptcy by May 2024, as they were made obsolescent by the release of the next version of OpenAI`s product, GPT-4o. Experts have claimed that this next version of OpenAI`s world-changing technology, which is available on the market for free, might kill off about thirty per cent of the startups that ambitiously entered the market with products utilizing ChatGPT over the previous year, as the solutions they offered are now freely available through OpenAI`s product. How, then, can we build strategies using this groundbreaking technology?

Does this mean that business strategies are impossible to create or pointless in the digital world? Or maybe the question should be asked differently: is it possible for a company to operate and develop without a long-term strategy? In my opinion, it is not possible. However, the vast majority of methods for developing, implementing and executing strategic plans that we learned about a decade ago and earlier need to be consigned to the dustbin. But what should we be doing instead?

The question of what should replace traditional strategizing is no trivial matter. Much of the secret lies in a lesson derived from our understanding of disruption innovation. Leaders in a given technology are almost never the leader in the technology that replaces it because they become overly focused on squeezing the most they can out of their winning product. Meanwhile, its successor is working on an initially unprofitable product that may be entirely unlike the market leader but that meets the same need. And it is the digital disruptor`s winning focus on need satisfaction that sits at the heart of the new paradigm.

A hyperreal strategy needs to answer the fundamental question: 'What customer need does the company want to satisfy?' Put more broadly, what value do we want to offer in the market? Defining the organizational goal in these terms shifts the company`s focus from products or technologies to the specific needs of customers. It emphasizes understanding the problems that customers are trying to solve with current market solutions and then offering a better, more tailored or cheaper way to meet those needs. In other words, the mission of the organization should be to meet the specific needs of the customer in a way that aligns with the most appropriate technology on the market, by offering products or services that adhere to current business megatrends while taking into account the individual social needs of the recipient. A strategy constructed in this way will always consider the main megatrends of the surrounding changes.

This laser-focused definition will have clear implications for how you go about the practical reality of developing a strategy. The first fundamental consequence is that you will be constantly revising the strategic plan. Let us forget once and for all the formula of operating businesses based on developing, announcing, implementing and then executing a fixed strategic plan over five or seven years. Whether we like it or not, the stability of long-term planning is already history. In its place, we must propose a new paradigm of strategic planning.

The new business strategy concept appropriate to Hyperreality is one that I have formulated through both leading and supporting a wide range of companies. According to the new paradigm, job number one is to address the paramount question of what value you want to offer in the market or what significant customer need you intend to meet in the long term. This requires that you begin by discussing what mission the company wants to accomplish in the market and whether that mission will provide value to the segment of customers that interests you. If the problem you aim to solve for customers is valuable to them, then, provided the product you use to solve it and the technology you apply are selected wisely, you will achieve the required financial satisfaction in the end. However, if what you offer is not perceived to be valuable by the customer, then, regardless of the product you come up

with or the type of technology you use – however advanced – this strategy will not yield the desired profitability.

The second important step in working on a strategy is to answer the question of where you expect your company to be at a specific point in the future. For example, how do you envision the company in five or seven years? At this point, one might ask a provocative question: can we predict and describe the development of our company in such a volatile market? Of course, you cannot, but the fact that you cannot do so precisely does not mean that you should not try. For the answer that you land upon, though subject to change as you move forward, will provide the vision that serves as the driving force within the organization and the compass pointing to your true north. In more colloquial terms, you`ve got to have a plan; otherwise, what are you going to deviate from?

Once you know where you are headed and why, it is time to ask yourself how you want to get there. In the analogue world, this question usually meant working on a list of strategic initiatives, extensive analyses and charts that culminated in the preparation of a financial model. In the world of volatility I describe, this is instead the point at which you decide what kind of organization you want to be to achieve your mission and vision. The values of the organization and its culture are now more important a part of the company`s strategic actions than ever. The coherence of these elements is required both by the external world, meaning all the organization partners, and by the internal world, meaning its employees. We live in a world where leadership is based on authentic authority. Therefore, only genuine belief and actions consistent with a declared set of values can ensure success. It is values that serve as the guardian of your actions in implementing the strategy to achieve the company`s mission and vision. This is the most enduring element of your plans because all initiatives and actions you undertake must align with them.

Next, it is time to set strategic directions that will allow you to achieve the intended mission and reach the organization`s goals. It is crucial that strategic objectives can be communicated both internally and externally. While the mission or vision usually has a long-term or even sometimes abstract nature,

it is the strategic priorities, of which a company can declare several, that make the long-term business strategy understandable to its environment.

With changes in technologies and markets coming at us ever faster, strategy is not only a tool for building competitive advantage – it is a tool for survival. Companies that do not adjust their strategies as their environment evolves will struggle to maintain their place. To ensure that you are not caught off guard, it is essential to observe both the near and distant horizons of technological changes and their potential impact on the industry in which you operate. An ideal tool for this task is the Megatrend Tracker. As laid out in the next chapter, this tool will help you identify the types of technological megatrends forming on the horizon; some of them may soon have a direct impact on industries and your business. Companies that make effective use of this tool are far less likely to be left standing in the dust as the market suddenly speeds off in some new direction.

Experience shows that the strategic pillars of a company usually consist of three to seven main priorities. Among them are aspects such as new products or services and new areas of operation. This is where you will conceptualize new digital products or digital business models to be introduced along with the new strategy. Then there are initiatives related to improving the efficiency of the organization`s work. In this area, actions to digitalize internal processes are usually planned. The third group of strategic goals usually concerns the organization itself and focuses on ensuring that the organization is ready to operate effectively and efficiently in a volatile digital world. Of course, every organization is different, so strategic priorities will also differ. However, an analysis of the strategies of multiple organizations suggests that the elements of development are similar across organizations. This is because every organization striving for financial results must attend to revenues, costs and development.

Under such strategically constructed priorities, you will need to create a series of initiatives whose implementation will contribute to the company`s mission and move it towards the set goal in line with the defined strategic priorities. Unfortunately, the initiatives themselves will be characterized by high variability and instability. It is at this level of strategic action that

continuous adaptation to technological, business and societal megatrends is needed. These trends affect the industry you operate in, the customers whose needs you aim to meet, and you directly.

A tool that can streamline and systematize the work of developing and implementing initiatives is the Digital Roadmap. This strategic tool will help you identify where your organization is at in its digital development, and this analysis will be surprisingly broad and deep. With this map, you will not only identify where you currently stand but also create a list of change initiatives that will allow your company to develop in a way that systematically addresses your obligations to all stakeholders and guarantees market success. The Digital Roadmap tool is essential for building transformational strategies for many manufacturing and service enterprises.

Crucially, such an approach to strategy therefore means that we can no longer answer the question of what product you will offer on the market and what technology will be dominant in your company soon. Instead, you must primarily answer the question of what utility you want to offer the customer and what problem or challenge you want to solve for them. And you must take care that all subsequent decisions flow from the clarity of that vision.

Therefore, from the very first day of working on the development and implementation of a digital strategy, it is essential to incorporate a set of tools that make variability an integral part of the organization`s strategic elements. For this purpose, the Digital Change Management process is invaluable. This tool constitutes an entirely new approach to managing changes in the organization as you adapt to the highly competitive and fluid world of Hyperreality. To defend against the negative effects of new realities while simultaneously exploiting the potential they offer you, you must embrace a new paradigm of change management that assumes this process never ends.

45. Tool 1: Digital Change Management: free, not freezing

In this chapter, I will present how to organize the entire procedure for a digital transformation that achieves the desired results. This will involve soaring back up to the heights to take a bird`s-eye view of the digital transformation of the enterprise and assembling all the snapshots of our long digital journey into one cohesive story.

For over two decades, Kotter`s eight-step model has been considered the gold standard in change management methodology. It posits that change should be an orderly process, not a series of random actions. In his research, Professor Kotter identifies eight common reasons for unsuccessful transformations in businesses.[49] According to the studies mentioned, the first is a lack of understanding of and justification for the change; when members of the organization do not understand why the change is necessary and what benefits it will bring, they may remain indifferent to it – or even resist. The next reason is a lack of engagement from key members of the organization; those individuals or groups whose support is essential need to be identified – and that support then secured – if the change is to succeed. Another typical problem is the lack of a defined vision of the future; if there is no clear and inspiring vision, it is hard to convince people to change. Inadequate communication is another common cause of failure; improper communication and insufficient information about the change can lead to resistance and misinformation. Next, the lack of an action plan is problematic; without a specific change plan, chaos and resistance can ensue. The under-provision of key resources can also doom a project to failure; without the right people, technology or financial means, an otherwise well-conducted change process can come to little. Another reason is the failure to eliminate obstacles to change; barriers hindering the implementation of change will delay or block the process. Finally, the change may not be embedded into the organization; implementing the change is only the beginning, and ongoing planned efforts are needed to ensure that it becomes an integral part of how the company operates.

Kotter`s model, like many other change management methods, assumes that the process comprises three main phases: unfreezing, changing and freezing. It is a closed action plan. I contend that, in the digital world, where changes

are fast-paced and relentless, it is hard to determine when the change begins and ends, making this model obsolete. That is why a more flexible approach to change management is needed.

As I discussed in the chapter on megatrends, it is no longer effective to build even three-year strategic plans to manage a company. In a nutshell, this is because the future is now impossible to predict. We know that unpredictable events such as pandemics or financial crises can completely change the business context, but it is the pace of technological and data-driven change that has made the contemporary economic world inherently more volatile than ever before, and those changes are only getting faster. In such a world, sticking to a rigid plan for years makes it hard to make sudden changes or seize market opportunities. New technologies or changing customer preferences may require a quick response, and a strategic plan can become an obstacle. As I have shown several times in this book, the pace of change in today`s economic world is only accelerating. Technologies, globalization and changing customer expectations demand that companies be prepared for constant change. Therefore, static strategic plans can be not only ineffective but also risky. More flexible and responsive approaches to strategic management are required.

It may seem daring to consider managing a company without a long-term strategic plan, much like driving a car without having a destination or route in mind. The strategic plan has traditionally been considered a crucial feature for guiding operational actions and determining the company`s direction.

However, once we accept that Hyperreality is making long-term strategic plans less effective, we can only conclude that change-management models such as Kotter`s eight-step model need updating. We need to build-in a constant readiness for adaptation, the ability to react quickly to new circumstances, and the ability to create strategies based on today`s threats and opportunities. Only then will the company be able to effectively move towards the future despite the absence of a traditional strategic plan. This new reality and the demands of the digital transformation itself are why I am proposing a completely new approach to change management in organizations undergoing digital transformation.

The new approach I am proposing is based on several fundamental requirements that a change implementation plan must meet in the hyperreal world. All of these make the previously used change management model inadequate.

The first and most important is that change is continuous. Technological, business and social trends are constantly changing. Organizations must be ready for continuous transformations. This necessitates the development of an organizational culture that embraces flexibility and proactive change management. Moreover, leaders within these organizations must cultivate an environment that encourages innovation and quick response to emerging trends.

Secondly, openness to external ideas is essential. The team responsible for changes cannot rely solely on company employees. It is necessary to embrace initiatives and ideas from the outside to be flexible and open to new directions. This involves cultivating partnerships and collaborations with startups, academic institutions and industry experts who can provide fresh perspectives and innovative solutions that might not be generated internally. Furthermore, actively seeking feedback from your customers and involving them in the development process can lead to more customer-centric products and services, enhancing overall satisfaction and loyalty.

Thirdly, even the vision of change will need constant revision. It must be regularly and proactively reviewed. It is not enough to react to changes; we must actively scan megatrends and update the vision accordingly. This way, we can better (though not entirely) prepare for sudden changes in the world around us. Leaders should implement a systematic approach to monitoring global and local trends that could impact the organization, ensuring that strategic plans remain relevant and effective. Additionally, this process should include a feedback mechanism that allows insights from these observations to be quickly integrated into the organizational strategy, enabling real-time responsiveness and strategic agility. Another requirement is precision in communication; in the era of unlimited access to information, there is no room for misunderstandings. The new change plan for implementing the digital strategy must be based on multidirectional and constant communication of intentions and actions.

Next, we must accept that the scope of change will be broad. Digital transformation must cover all areas of the organization, both those related to business and those related to structure and culture. It is a global change in the organization, not a fragmented improvement. The plan must be broad and deep; in other words, it must cover all processes in the organization but also anticipate actions for at least two to three years ahead. Of course, those plans will be reviewed and changed, but they should anticipate the future consequences of current decisions. This comprehensive approach ensures that digital transformation permeates every level of the organization, creating a unified strategy that aligns with long-term objectives and the commercial landscape. Furthermore, it is crucial that this plan not only reacts to current trends but also prepares the organization for future technological megatrends and business shifts, thereby securing a sustainable competitive edge.

This brings us to our final assumption – we must also access the motivating power of self-realization. Motivating for change is no longer just about promising rewards. Instead, it is now exceptionally important to create a culture that enables employees to pursue self-realization and development, even beyond their comfort zone. This change is particularly important due to the increasing popularity of working in dispersed teams. Here, the motivation that lies in a sense of self-realization is far stronger than that derived from traditional forms of reward. By fostering an environment that prioritizes personal growth and career development, organizations can enhance employee engagement and productivity. Furthermore, empowering employees to take ownership of their roles and outcomes can lead to innovative ideas and approaches, driving the organization forward in its transformation efforts.

All these assumptions make up the modern way of managing change in the context of digital transformation, which is dynamic, flexible and ready for constant transformations.

So, how do we manage all this digital change? Let me start with three fundamental new assumptions:

First, and fearing that I may be repeating myself one time too many, digital change is not a destination but a journey. It may even turn out that individual initiatives fail because they become outdated or need modification. The

strategic plan changes as it is implemented – and change it must. The path is charted 'on the go', and the ultimate goal and working principles must be known to everyone.

Second, failure to change is worse than failures in changing. We know that learning necessarily involves both successes and failures. We often say that mistakes and failures result in better learning than do successes. However, every management team I have worked with on strategy has been most afraid of taking actions or directions that might prove to be wrong. The fear should not be of wrong decisions but of doing nothing. To do nothing is to neither approach the goal nor to evaluate solutions and learn. And it makes us a sitting duck for our competition.

Third, change begins with the organizational culture – openness to knowledge, ideas and changes in our environments and priorities. Digital transformation is as profound a change in the organization as was introducing steam engines or production lines to workplaces. It is not just a product change or a change in the production line equipment – it is such a deep change that it will dismantle and reassemble all parts of the organization, from its softest to its most rigid parts. And to make this possible, a change in the attitude of the organization`s members is essential. Without a change in the organizational culture, the actual profound change will not even begin.

Okay, so we have an understanding of the general principles, but you have to start somewhere, and somehow you have to plan these actions. You cannot simply wake up every day terrified that some competitor or technology is going to take away your market, customers and profit forever. An open organizational culture is therefore the foundation of the new Digital Change Management process. Despite our human nature, which favours routine, it is necessary to overcome resistance to change. In the digital world, we cannot wait for crises such as market loss or financial declines before we take action. By the time these signals become visible, it may be too late. One must be hyper-receptive to signals of change well in advance.

The process of digital transformation thus consists of seven activities that are sequential but partly parallel. You should therefore expect to start them in the order I present here, but you need not expect any one of them to be

completed before setting about beginning the next. This is precisely one of the fundamental changes with respect to the previously mentioned eight-step model. In the digital world, boundaries are being blurred, and actions require significantly more flexibility.
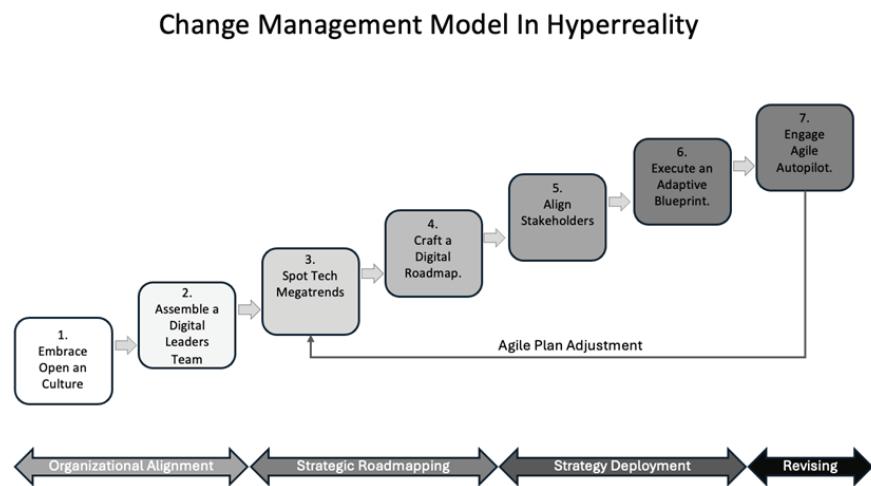

Figure 7

First is changing the culture. The change must start with the minds of leaders, both formal and informal, who see that Hyperreality is taking over their industry. The first step is to transform the organizational culture from one that is closed and traditional to one that is open to change and highly responsive to its environment. To ensure an organization is ready for digital transformation, its culture must embody several key attributes. Firstly, it must foster a readiness for change, with leaders and employees alike embracing the necessity and inevitability of evolving practices and processes. This involves cultivating a mindset that perceives change as an opportunity for growth rather than a threat to the status quo. The organization must demonstrate a willingness to tackle obstacles head-on, viewing them as chances to innovate and improve rather than as insurmountable barriers. This proactive approach encourages resilience and adaptability in the face of uncertainty. The culture should prioritize the continuous learning of new skills while also being open to unlearning old habits and beliefs that may hinder progress. This involves cultivating a culture of curiosity, where employees are encouraged to explore

emerging technologies and methodologies while being empowered to discard outdated practices that no longer serve the organization`s goals. By fostering a culture of readiness for change, a willingness to embrace challenges, and a commitment to continuous learning and unlearning, organizations can position themselves effectively for successful digital transformation.

The second step involves building a team of change leaders who play a creative, advocacy, and partially executive role within the organization. This team should consist of individuals who hold both formal and informal influence and exhibit essential characteristics crucial for effective change management. Diversity is key; the team should be varied in competencies, experience, culture and beliefs to ensure that you gain a comprehensive perspective and a range of innovative problem-solving approaches. Openness is also critical, as team members must be receptive to change and collaboration, demonstrating a willingness to incorporate ideas and solutions from external sources. Furthermore, readiness to experiment is vital in digital transformation, where experiments are necessary, and failures are part of the learning process. The team should not fear taking risks and must be adept at learning from the successful and unsuccessful outcomes of their decisions. Additionally, strong analytical skills are indispensable in a hyperreal world where data plays a crucial role; understanding and analysing data is as essential today as computer literacy or having a driver`s license was a decade ago.

The third step in the strategy for the survival and growth of a business in the digital era is seeing the relevant trends, mainly technological. Changes of a scale that once took decades can now occur in just a few short years, making it essential to regularly track significant megatrends. For this purpose, it is best to use the Megatrend Tracker. This helps you understand which factors will soon influence the organization and what risks may arise. This in turn allows preventive actions to be taken that will minimize potential threats to the organization. The value of trend tracking lies in better preparing the organization to adapt to incoming environmental changes and therefore to operate more flexibly.

Fourth, after identifying technological trends relevant to the organization, it is time to prepare an action plan – the Digital Roadmap. This is a fundamental

element of the organization`s digital transformation process. It is a holistic plan that takes into account the entire company structure and is built on the assumption that isolated actions will not bring the desired long-term results. Numerous initiatives are defined by the Digital Roadmap. They comprise an action plan for the organization in the context of the six main axes of digitalization. Each axis has five to nine areas in which the degree of digital readiness is assessed. By navigating within these areas, the company can easily identify the development initiatives it needs to focus on next. This plan includes areas crucial to sustained growth and financial results. The key lies in logically and coherently arranging initiatives into an integrated sequence of actions aimed at achieving the business`s digital transformation goals. The Digital Roadmap is the tool for continually navigating the organization`s long-term pathway to success.

Fifth is effective stakeholder management. In today`s complex digital environment, many individuals and entities have a direct or indirect impact on ongoing projects and initiatives. Stakeholders are not only the obvious groups, such as owners, management and employees, but also suppliers, partners, regulatory institutions, financial institutions and, of course, our current and future customers. It is therefore essential to understand that today`s stakeholders expect more detailed information and engagement from organizations. This means that it is crucial to map out who your stakeholders are, identify their needs and expectations, and develop an effective communication strategy for each audience group separately. This applies not only to direct stakeholders but also to those less obvious players who may influence the course of digital transformation. Effective stakeholder management involves building trust, communicating goals and benefits derived from digital transformation, and taking their opinions and feedback into account in the decision-making process. This can win strong support from stakeholders, significantly increasing the chances of success in digital transformation.

Having created an organization ready for change, a team of change leaders, a detailed Megatrend Tracker, a Digital Roadmap and a view of stakeholders, it is time to start implementing the mapped initiatives. Here it is the effectiveness and efficiency of your implementation teams that will determine whether the final digital strategy has the desired outcome. The first step in this area is

to define a person responsible for each initiative and assign tasks and roles in the project team. It is also essential to establish a schedule of activities to have a clear implementation plan. During the process, risk management should be actively undertaken that considers possible unforeseen events and prepares for various scenarios. It is also important to monitor progress and implementation to track whether initiatives are being implemented according to assumptions. Communication plays a significant role here – it is essential to keep stakeholders informed about results, progress and any changes. Any conclusions you draw from the results should be used to continuously improve how you are implementing initiatives. It should also be emphasized that the list of transformation initiatives includes both technology-related actions and those concerning the soft aspects of the organization, such as competencies, motivation and organizational culture. Only the success of every one of these initiatives can bring the success of the digital transformation as a whole. The change primarily concerns people, so the entire organization must be involved in the change process.

Seventh, it is crucial to implement and institutionalize the habit of reviewing and responding to changing conditions and technological, business and societal megatrends. It cannot be assumed that, having implemented all transformation initiatives, the world will settle into some comfortably stable state. The inclusion of this process as the last in the list may mislead you into thinking that it is something to be done at the end of the change management process, but it is not. Given the rate of change in the hyperreal world, the capacity to adjust and adapt needs to be built into the routine operations of the company from the beginning. It is necessary to maintain flexibility in approaching the transformation itself. Therefore, in the digital transformation model, it is worth introducing mechanisms that will calibrate or even renegotiate the strategic transformation plan to align with changing realities.

In practice, this means establishing an interdisciplinary team, which can be additionally supported by the expertise of external professionals. This team will be responsible for regular analyses of technological and societal megatrends, at least once every three months. After preparing updates to the Megatrend Tracker, decision-makers responsible for digital transformation can assess whether specific transformation initiatives need to be replaced or

adjusted. If a technological breakthrough appears on the horizon that may impact the organization, this team will be adequately prepared to adjust the strategy and transformation activities to the new reality. This ensures greater resilience to changes and enables more effective responses to the ever-evolving digital market.

To conclude our chapter, let us recapitulate the key points. The digital transformation process comprises seven essential elements that form a coherent whole and constitute the foundation of a successful organizational transformation.

1. **Embrace an Open Culture.** Ready for change and flexible in responding to new challenges, an open culture becomes the basis for other actions and influences how the organization undertakes digital transformation initiatives.

2. **Assemble a Digital Leadership Team.** Comprising both formal and informal leaders of the organization, the team directs the transformation process. Diversity, openness to innovation, willingness to experiment and analytical skills are the characteristics that distinguish this team.

3. **Spot Tech Megatrends.** This involves tracking and analysing trends that relate to the industry and the company`s market. This knowledge helps adjust the strategy to the changing reality.

4. **Craft a Digital Roadmap.** This involves determining the list of change initiatives and creating a cohesive action plan. This tool ensures that all actions are logically coordinated and aligned with the transformation goals.

5. **Align Stakeholders.** The engagement of all organization stakeholders is crucial to the success of digital transformation, as the needs and expectations of different groups must be met.

6. **Execute an Adaptive Blueprint.** This encompasses processes for managing individual projects and initiatives. This is where plans become reality and the effectiveness and efficiency of actions are crucial.

7. **Engage Agile Autopilot.** This introduces flexibility into the strategy and allows actions to be adjusted on the fly. It is a control and adaptation mechanism that keeps the organization on course to achieve the goal of digital transformation.

These seven elements together comprise a comprehensive digital transformation process that is flexible, adaptive and tailored to changing reality. It is this coherence and collaboration between all elements that determines the success of the organization in the modern, digital world.

Therefore, a crucial element is a full understanding of the organization`s goals, its vision, mission and values. In a digital environment, the change-management system must be dynamic and flexible so that you can change the direction and pace of specific undertakings to achieve your goal. There is no longer room for meticulous long-term plans – the landscape is simply changing too quickly.

The values that guide the organization are a point of reference in the change process. They tell us how the organization wants to operate and how it wants to be perceived by its stakeholders. These values and organizational goals form the foundation on which the digital transformation strategy is built.

In the hyperreal world, full of uncertainty and constant changes, you must be ready to flexibly adjust your actions and plans to the changing reality. This requires courage, adaptability and a readiness for continuous improvement – this last being the most crucial element of success in modern business. Defining the organization`s mission and vision and forging its culture based on promoted values is therefore the responsibility of the leader or the organization`s leadership team, and it is to this matter that we now turn in our final chapter.

46. Tool 2: The Megatrend Tracker: spotting the black swan in time

The primary goal of the Megatrend Tracker is to identify well in advance any technological changes that might impact both the industry in which the company operates and the company itself. The premise is quite clear: when building a long-term strategic plan, we must be able to predict with a high degree of probability the direction in which customer needs, market behaviours and related technological changes will evolve. Therefore, a structured tool is needed to keep an eye on the emerging black swans that could quickly redefine the rules our enterprise is bound by.

Today, the lifecycle of a strategy is much shorter than it was; it is often measured in months rather than years. The introduction of new tools, technologies or business models can very quickly transform an industry`s competitiveness. The time it takes for a new technology to alter a company`s strategy is diminishing. On a larger scale, this can be seen in the progression from Industry 1.0, when the Industrial Revolution first introduced mass production, to Industry 4.0, which encompasses full digitalization and process automation. The time between each successive revolution was significantly shorter than the last.

Tracking this progression more fully, Industrial Revolution 1.0 of the eighteenth and nineteenth centuries primarily involved mechanizing production with steam engines. These changes developed over many decades and were felt only gradually by the economy. Here, strategy was stable for many generations. More than a century after the first revolution had begun came the second. Industrial Revolution 2.0 occurred in the late-nineteenth and early-twentieth centuries with a rapid growth in production thanks to the development of railways, electricity and complex machinery. These changes took place over a few decades and contributed to the explosive growth of industry. Strategic decisions made during this period were significant for the working lives of one generation. Industrial Revolution 3.0, the Information Revolution, began in the 1960s, a century after its predecessor had begun, and was brought in by the development of computers and digital technology. Its economic repercussions were felt even more quickly than in previous revolutions, with entire new industries like IT being created within just a

few decades. At that time, we began to think in terms of a five- to seven-year strategic horizon. And today, just six decades after the third revolution, Industrial Revolution 4.0 is encompassing full digitalization, automation and the development of artificial intelligence, and changes are happening at an unprecedented pace. For example, machine-learning-based artificial intelligence technologies have been dramatically affecting many fields such as medicine, finance and industry within mere months.

So, we are witnessing firsthand the profound impact that conversing with advanced language models like ChatGPT and the development of products based on these models is having on many industries. This one technology is the most seismic event since the advent of the Internet. The difference is that the Internet`s effects were only apparent after decades, whereas the impact of language models on company strategies and efficiency became evident in just weeks. This is further evidence of how rapidly the business environment is moving in the digital era. And additional, far-reaching market changes driven by technological progress are now inevitable. Technological megatrends such as artificial intelligence, the Internet of Things, blockchain and 5G technology are radically transforming many markets. They are rewriting the rules of the game, creating new opportunities and throwing yesterday`s business practices in the air.

Technological megatrends have deeply affected many industries in the last decade. Here are a few specific examples; each one demonstrates how modern technologies have transformed traditional sectors virtually overnight. In logistics, robots and automated warehousing systems have become the key to effective inventory management. Companies like Amazon have achieved unprecedented levels of efficiency through these innovations. The entertainment industry has been revolutionized by the shift from traditional television to streaming. Mobile games such as Pokémon Go have become a significant segment of the gaming market, and advanced VR headsets like Oculus have transformed the user experience. AR and VR are also being used in the education sector for interactive teaching, providing engaging and innovative knowledge dissemination methods. In medicine, AI supports disease diagnosis and prediction. Meanwhile, genetic research supported by simulation technologies may usher in breakthroughs in disease treatment, and

biotechnology will be pivotal in shaping the future of healthcare. In the financial sector, AI algorithms are used for fraud detection and automated advice. This personalizes offers for customers and enhances transaction security. And then there is the emergence of cryptocurrencies that have revolutionized our perception of transactions. Blockchain technology is harnessed to verify contracts and property rights, offering enhanced transparency and security. In the automotive sector, in addition to the thorough transformations that automation, robotization and digitalization have brought about, there is a surge in the popularity of electric vehicles that is influencing the entire supply chain, from batteries to charging infrastructure.

We can therefore only conclude that the era of digital transformation is very much upon us, and it is reshaping the business landscape in profound ways. The long-term stability that traditional strategies once offered is now a pipe dream. Companies must learn to navigate the rapid changes that technological megatrends are bringing. Those who can adapt and innovate will thrive, while those who remain attached to their traditional strategies risk being left behind. Each of the examples above has seen many meticulously devised and implemented strategies tossed in the waste bin. Firms whose strategies remained indifferent to these changes were simply left behind.

Never before have we witnessed the simultaneous emergence of so many potentially disruptive technologies. These technologies are intensifying competition, forcing companies to embrace the associated risks and uncertainties. Simultaneously, new business opportunities are arising with substantial promise for those who can adeptly harness these technologies and modify their strategies to track the evolving market reality.

The value of agility has thus never been greater. The volatile nature of customer preferences and technological advances demand adaptability. Firms must respond swiftly to evolving customer behaviour, adjusting their marketing and production strategies accordingly. Happily, real-time data analysis means that these changes in customer behaviour and preferences can be monitored and that essential adjustments to strategy can be made. Customers have come to expect the kind of immediate responses to their needs and expectations that demand access to data and the capability to analyse them in real-time.

Customer preferences have become the primary guide for suppliers, and tracking their requirements is now a priority. This is shortening product and technology lifecycles. Firms must recognize that what is popular and desirable today might not be tomorrow, and corporate strategies must acknowledge this short-termness. Real-time data analysis is not only helpful in understanding customers but is also pivotal in maintaining market competitiveness.

Additionally, the globalization of markets and products is spreading as digital solutions become more prevalent. Modern technologies allow products to be made more cheaply and to be made profitable more quickly, making competition global rather than local. AI, the Internet of Things and blockchain are just a few of the technologies speeding product development. And more are undoubtedly coming.

This built-in short-termness should be driving your company towards an iterative approach to strategy. Instead of devising a single long-term strategy, you will increasingly need to opt for more general goals and framework strategies and revise them routinely every six months or less as new leading technological megatrends and other market changes emerge.

But for an iterative strategy to be genuinely effective in responding to market variability, it must be based on accurate predictions of megatrends. And here we are talking almost exclusively about technological megatrends, as it is these that have by far the greatest potential, like a tsunami, to creep up on us slowly, almost invisible, only to then hit us all at once, reshaping the landscape as they go and washing us away. Erroneous assessments or a failure to consider key trends can therefore lead to failure, meaning that tracking and prediction are crucial elements of effective strategic management. Such predictions must consider two critical parameters.

The first thing to assess is technological maturity – the extent to which a technology of relevance to your business is already developed and ready for practical application. New solutions often pass through various development stages, from experimental testing and refinement to commercial availability. The ultimate goal is to achieve technological stability with a well-tested, reliable solution. Incidentally, the technology must also, of course, not entail risks to data, privacy or customer security, so appropriate security measures

and standards must be developed. The technology must also be market-friendly, i.e. firms and customers must understand how to use it and what its benefits and limitations are. A lack of such understanding can lead to resistance among employees and customers. Your company must therefore know at which stage of maturity any technology of interest stands so that you can tailor your actions accordingly.

The second essential parameter of a prospective new technology that you must assess is its economic efficiency – the economic profitability of its application. The newest technology is not always the most cost-effective solution. Companies must meticulously analyse whether investments in new tools will yield the expected financial benefits. Often, a new technology is still too costly to be profitable, and companies must wait for a cost reduction or further development. Directly related to this is the payback period, a measure of the time it takes to recover the funds invested in adopting a technology. A shorter payback period means that the technology is more economically efficient. If you can quickly recover your expenses, you will be able to focus on further development and investments. Importantly, the economic efficiency of your chosen technology is also related to its ability to enable the cost-effective mass production of products or provision of services. For instance, modern production technologies can significantly reduce production costs and increase efficiency, thereby enhancing market competitiveness. Thus, the economic efficiency of the technology is immensely significant to your strategy. You must thoroughly analyse whether a particular technology can ensure a short payback period and facilitate the effective scaling of projects. Otherwise, you risk being ineffective and losing to the competition.

An illustrative example of poor timing of investment is a game development studio that decided to implement VR technology into its games in 2018. This decision was made in response to Facebook`s (still Facebook, not yet Meta in 2018) announcement to integrate VR technology into its strategic framework and to pursue its mass development. The game producer opted to leverage this technology for the existing market offerings, launching VR versions of their games compatible with Facebook`s VR devices. This strategic move resulted in a substantial increase in the organization`s operational costs. The development team expanded by nearly thirty per cent, and the costs associated

with the development and maintenance of the games surged by approximately fifty per cent. Simultaneously, to the dismay of the company`s owners and management, the sales of Facebook`s Oculus headsets did not take off as expected. The platform was not as popular as projected during that period, and the revenues from the VR game versions did not meet the anticipated levels. The inference from this scenario is that VR technology was not yet sufficiently mature or ready for this sector at that time. In essence, the company undertook the risk of adopting new technology early. This entire endeavour brought the company to the brink of bankruptcy.
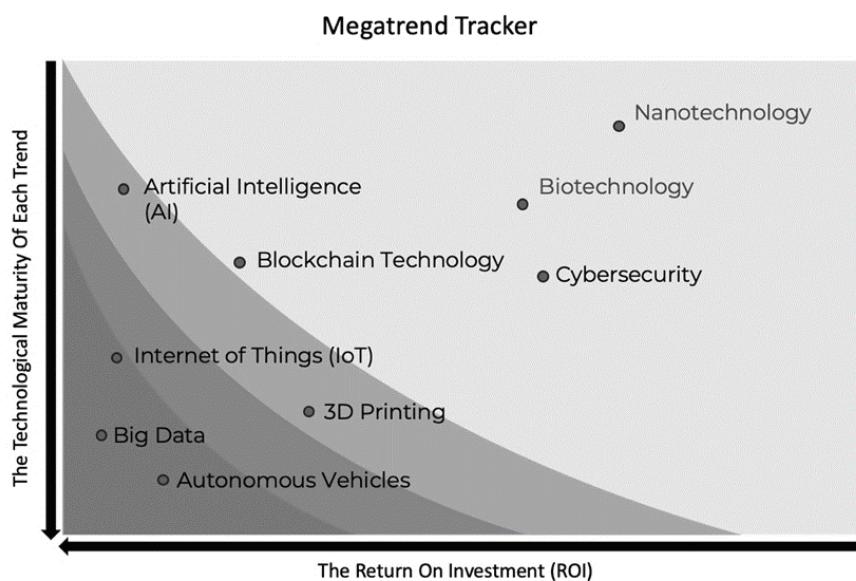
On the other side of the coin, it is worth mentioning the example of a garden equipment manufacturer. In 2018, the company faced a critical decision regarding investment in the development of its own omnichannel sales strategy. Despite the growing popularity of online shopping, the company decided to stick to traditional sales channels, such as brick-and-mortar stores, without investing in e-commerce or collaborating with online marketplaces. The decision not to implement new sales channels had significant consequences. While the garden equipment market was dynamically evolving and consumers were increasingly turning to online shopping, the company remained solely reliant on traditional sales channels. As a result, its market share gradually declined. It was not until 2022, when it became clear that purchasing habits had already shifted and consumers now preferred online shopping, that the company decided to develop its own e-commerce platform and collaborate with online marketplaces. Unfortunately, by that time, the competition in the online market was already strong. As a result, the garden equipment manufacturer lost nearly forty per cent of its sales over three years, badly weakening its market position. This example demonstrates how the failure to quickly adapt to changing market and technological conditions can lead to a loss of competitive advantage and a decline in revenues. In this instance, the company failed to catch the wave as the technology became mature and accessible.

Integrating new technologies into your strategy thus requires that a balance be found between technological maturity and economic efficiency. All megatrends of relevance to you must be examined to determine which solutions are ready to implement and what financial benefits they may offer.

However, corporate strategies must not solely focus on short-term goals. It is still essential to consider aspects related to sustainable, long-term success. What needs to change is how you track and exploit societal and technological megatrends.

You should, and indeed must, regularly assess the readiness of technological megatrends in particular, by creating a Megatrend Tracker. The special focus on technological megatrends is justified by two factors: first, the relative rapidity with which they can burst onto the scene as compared to the more generational turnover of societal megatrends; and second, the fact that they are far more likely to drive business megatrends than vice versa.

The readiness of technology is described by two parameters, which are reflected on the two axes of the tool. This tool presents emerging technologies on two coordinate axes. On one axis is technological maturity, where solutions closer to the origin are more ready for implementation in your industry. The farther from the origin on the coordinate system, the more time the technology requires for development. The second axis represents the Return-on-Investment period for implementing a particular technology. The closer to the origin, the shorter that period is.

Megatrend Tracker

Figure 8

The Megatrend Tracker makes it easy to evaluate various technological megatrends. Those closer to the origin can rapidly affect your company. These trends should be a primary focus of strategy updates, since their influence can be significant. With a sound evaluation of the current status, the strategy can be adjusted to the current technological and social landscape. As new technologies become more ready for deployment, the company can incorporate them into its business plans. This approach provides a balance between long-term strategy and responsiveness to current trends, but it is crucially reliant on regular monitoring of shifts in megatrends.

As we can see, the Megatrend Tracker is a tool that considers key aspects for analysing investments in new technology. The vertical axis is the technological maturity of a given technology, which is determined in relation to a specific industry, and often even within a narrow segment of that industry; it is common for a technology to be fully mature for one segment while still needing further development to be sufficiently mature for a closely related segment. A perfect example is the market for text translations. Large language model technology has made it possible to automate a vast majority of simple text translations between many languages, as the technology is now sufficient. However, when it comes to translating and editing very complex texts that require consideration of broader contextual meanings, language models are not yet fully mature. Nevertheless, for those with an interest in the translation of such complex texts, LLM technology now needs monitoring.

The horizontal axis of the tracker's matrix is equally important. The decision to use a technology must consider the economic benefits we expect to gain from its use. We compare the value of investment expenditures with expected positive cash revenues. For example, the technology of industrial robots has been developed for many years. Its technological maturity is essentially identical for all manufacturing companies worldwide. However, the profitability of implementing this technology can depend on the location of the enterprise that is considering implementing it. For example, implementing industrial robots in manufacturing plants in the USA may result in a return on investment within 12 months, whereas the same technological solution implemented in a manufacturing plant in Mexico may have a return period of 60 months. The difference in readiness between these two countries is due to

the disparity in savings that companies can expect from similar investments, largely due to differences in labour costs. Thus, though the technology may be undoubtedly 'mature', it does not usually become 'ready' for all markets at the same time. Clearly, then, both these factors need to be considered to determine whether the technology we are analysing is truly ready for implementation in our enterprise, meaning whether it is technologically advanced enough and whether its implementation will yield the required economic outcome. To effectively use the Megatrend Tracker, we can analyse the distance of various technologies from the origin and focus on the implications of those technologies that are closer to the zero mark. We can also divide our approach into areas and determine how we will proceed as different types of developing technology move between areas. Regardless of the method chosen, it is important that we not ignore technologies that are 'approaching' our market and our enterprise. These are precisely our proverbial black swans; our metaphorical tsunamis.

A graphical presentation of the readiness of various types of technology for use in a given industry or for a particular enterprise enables more informed decisions about the feasibility or even necessity of taking specific actions by the organization. However, there is no single universal guideline on how a company should proceed when a particular type of technology is positioned in a specific area of the graph. Decisions in this regard depend on the technology strategy adopted by the company. I have already detailed these approaches in Chapter 18, demonstrating that the attitude towards innovative solutions should align with the company's overall strategy.

So too, the role of organizational culture in the context of strategy cannot be overestimated. As the saying goes, 'organizational culture eats strategy for breakfast'. Today, this is truer than it has ever been. While strategies can be relatively easily changed through management decisions, altering organizational culture requires significantly more time and commitment. If your company is preparing to switch direction every six months rather than every five years, you will also need to revolutionize how you shape your organizational culture. Thus, flexibility in strategy goes hand in hand with flexibility in organizational culture. You must promote openness to change, support continuous learning and enable employees to respond to

new circumstances. Organizational leaders play a pivotal role in this. It is down to them whether the organizational culture will hinder or support rapid revolutions in strategy.

It is important to understand that organizational culture can function as either an accelerator or a brake for these shortened strategy lifecycles. If your company can build a culture that promotes adaptation and innovation, it can significantly speed up its responses to changes in the market and in technology. The Megatrend Tracker fully addresses the issues of managing organizational culture. Indeed, nothing affects an organization as profoundly as the clear sense that we need to learn and to better ourselves in order to step up to meet a new reality. Therefore, transparently publishing information such as the Megatrend Tracker both internally and externally supports organizations in building a culture of readiness to change.

Let us now condense the significant insights we have acquired from this chapter. There are no markets where technological, business or social megatrends will not affect a company`s strategy over a long period. We must therefore forget the luxury of developing and implementing a strategy that is set in stone. Instead, create a technology economic maturity matrix for your company or product. Place the various technological megatrends on it and assess the extent to which they demand that your company and its strategy respond to them. Then do this exercise regularly. Take pains to be as specific and brutally objective as possible – in the end, it is all about the success of your company. Lastly, but perhaps most importantly, it is time for us to openly communicate – to the market, suppliers, owners and the team – that the essence of our company strategy is the goal, not the method of achieving it. Methods change quickly and will change ever faster. Our role as leaders is to help others adjust positively and productively to constant novelty.

47. Tool 3: The Digital Roadmap: plan and do it right

Having used the Megatrend Tracker to examine the changes happening in the market, shifts in customer expectations, the evolution of production processes, and innovations in sales channels and in products themselves, it is now time to take action. We must now look at how to apply those learnings to your company so that you can identify appropriate strategic objectives and the routes towards achieving them.

Through my experience as a general manager in manufacturing companies and as the founder and CEO of a technology company, I have distilled key insights into creating a digital transformation strategy. From now on, we will be focusing on how to build, implement and, most importantly, execute a comprehensive digital transformation plan. Digital transformation is not just a set of trends you hear about at industry conferences: concrete steps forward are crucial. I will now guide you through the process of successfully creating, implementing and executing an effective and efficient plan that delivers tangible results.

The Digital Roadmap is a tool that integrates methodologies from both strategic consulting and operational reorganization project methodologies. This unique combination makes the tool both effective and flexible. Working with the Digital Roadmap involves three key steps: analysing the current state of the organization, developing a list of transformation initiatives, and building a coherent internal plan to implement these initiatives, including estimating their economic effects. Using the Digital Roadmap can guarantee the success of a transformation, but only if it is implemented and managed as a transformation process.

Let us start by addressing three fundamental principles on how to build a digital transformation plan such as the Digital Roadmap for an organization. First, the plan must encompass all aspects of digital transformation; as we have seen from numerous examples, a company can no longer focus solely on its product and assume that market dynamics will remain static. Therefore, the digital transformation plan must cover a wide range of changes both within and beyond the organization. Second, digital transformation is an ongoing

process; technological and business trends and increased global competition will ensure that digital transformation will now never truly end. Transformation is not a goal; rather, it is an approach that requires a complete shift in how we manage processes. Third, digital transformation involves the creation of various parallel pathways. Analysis of transformation trends across industries and companies has identified typical development pathways. Even having created a proper Digital Roadmap, you should be prepared that, within a few months, it may need modifying to account for technological changes that have emerged in the meantime.

To ensure that the transformation plan is coherent and covers all aspects of organizational transformation, it is divided into six major areas, which I have called 'the six axes of digital transformation'. They are, in brief: process digitalization, digital products, digital business models, data management, a culture of transformation, and cybersecurity. This division into six axes is an essential part of an effective digital transformation plan as it offers several benefits. It allows for better comprehension, management and implementation of the digital transformation process.

Why are these six digital axes so significant? Firstly, they provide an organized structure for all the main areas of transformation. It is crucial to take all aspects of your company`s operations into account if you are to precisely identify what work is needed and where. This avoids inadvertently omitting vital elements and enhances the effectiveness of the transformation. Secondly, the division into axes provides the ability to see coherent sequences of actions. This means that you can plan and implement initiatives and changes in a coordinated way, taking into account the dependencies between different areas. For instance, changes in products can affect production processes, which can have a knock-on effect on organizational structure, and this interconnectedness can quickly produce confusion. Chaos can only be avoided by adopting a structured paradigm, and that is what the six axes provide. Thirdly, each endeavour must be assessed in terms of the competencies it demands. Each of the digital axes requires specific skills and knowledge, so it is crucial to identify the competencies needed for developing and implementing initiatives in each area. This helps manage human resources more effectively and focuses efforts on developing the appropriate skills within the organization.

However, I cannot overemphasize the fact that all the digital axes are equally important to your organization. A common mistake made by leaders during transformation is to assume that certain areas are not relevant to their company. This assumption is dangerous. Every company, whatever its industry or size, must consider all these areas. Digital transformation affects the entire economy and all players. Companies that trivialize certain areas are left unprepared for unexpected and unfavourable market changes. There is reason to think that, for a car, the engine and steering wheel are more fundamental to our power to decide where we go than the brakes are. After all, we use the brakes when we have to, but the accelerator and steering wheel are the primary mechanisms by which we determine where we go, which is what a car is *for*. But we obviously won`t stay alive on the road if we ignore the brakes. Similarly, the axes of processes, digital products and digital business models are the ones through which we drive our company, but if we ignore the axis of, say, cybersecurity, we won`t survive long.

Digital Roadmap
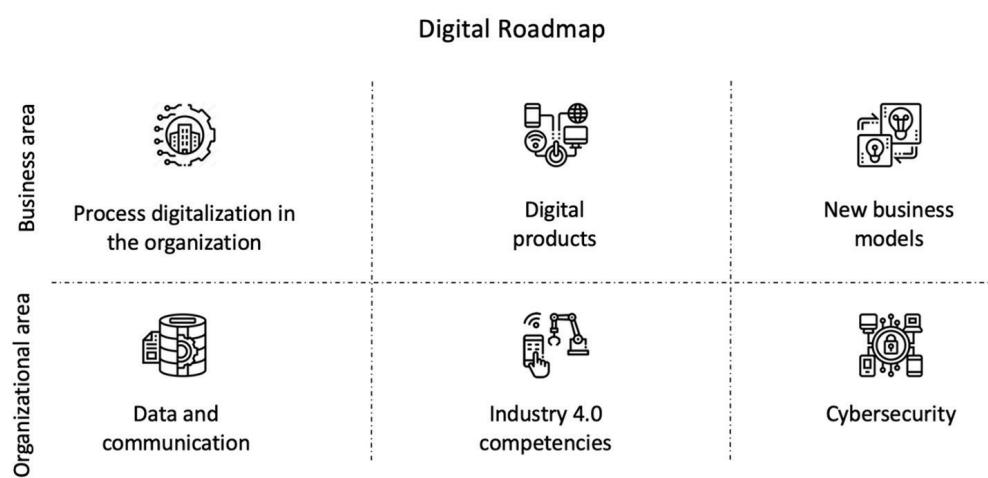
Figure 9

The six digital axes form the foundation of an effective digital transformation plan, but they also provide tools for managing action sequences, competencies and resources. In the continuation of this chapter, I will present each axis of digital transformation in turn. I recommend that readers refer to the appendix at the back of the book. It includes example rating scales for all axes and describes areas to assess. If you find that any areas or terminology are unclear, I invite you to return to parts A and B of this book, where all necessary concepts and methods have been described.

Axis 1. Processes. The first axis of digital transformation is focused on Digital Processes. Processes are the backbone of your organization, as they determine how strategies are executed and how customer needs are met. These include sequences of interrelated actions or operations planned and executed to achieve specific outcomes, such as sales, marketing, technology and R&D, procurement, logistics, production, quality management, financial management, and human resource management.

Digitalizing these processes means more than just incorporating new technologies; it requires a comprehensive strategy to fundamentally transform the company`s internal operations. This transformation is pivotal because it enhances organizational efficiency, improves agility, and strengthens competitiveness. For each process area, the digital transformation involves several levels of digital maturity, starting from basic data recording to full automation and AI support. For instance, the progression in sales processes is from simple electronic registration of agreements and orders to using AI to personalize customer interactions and predict sales trends. Similarly, in manufacturing, digital tools range from the basic capture of data on operations to the use of advanced Manufacturing Execution Systems (MES) to optimize production workflows.

The evaluation framework for this transformation is structured around a seven-level digital development scale. This scale helps organizations identify their current stage of digital maturity in various processes and guides them towards higher levels of precision, efficiency and data integration. The ultimate goal is to create a seamless flow of information and enhanced collaboration across all areas of the organization. By systematically upgrading each process,

organizations can not only improve their operational efficiencies but also ensure that they are adaptable to the future challenges posed by technological progress and market dynamics. This axis is not just about incremental improvements but about rethinking and redesigning processes to drive fundamental changes that will sustain your business in the digital age.

Axis 2. Digital products. Within this significant domain of the digital transformation of organizations, you will assess to what extent the company is already offering digital products. Business portfolios that already contain digital products can be further developed and refined. Attention can be focused on enhancing these products into more advanced market forms, increasing their appeal to customers, and opening new revenue streams.

Key areas of interest within this axis include the extent to which products can adopt an electronic form. Another important consideration is the ability to build products based on a community structure that fosters engaged, loyal customers. Equally significant is the extent to which the company is associated with the ICT industry, which can influence innovation and competitiveness. Product personalization is also gaining increasing importance, warranting reflection on how to tailor offerings to individual customer needs. Another critical aspect is product scalability – the capacity to meet growing demand through increased production or service provision.

Digital products change the way value is delivered to customers but also open up new avenues for satisfying needs, often involving both the creation and resolution of needs. Digital products frequently represent rapidly growing supplementary revenue sources for traditional companies.

Axis 3. Digital business models. Axis 3 explores the evolution of Digital Business Models, reshaping how companies generate value and interact within their markets. These models leverage digital capabilities to meet evolving economic demands and consumer preferences, marking a significant shift from traditional business strategies. It is essential to assess your company`s position concerning these traditional models if you are to understand and determine how to implement innovative alternatives. This assessment spans five key areas, each representing transformative strategies for adapting to the digital era.

The e-commerce sales model, for instance, has transformed retail by expanding market reach and reducing costs through digital means. Similarly, platform models create expansive ecosystems that facilitate collaboration and exchange among various providers and customers, enhancing service delivery and user engagement with potent network effects. The shift to As-a-Service models allows companies to offer continuous value through subscription-based services, fostering long-term customer relationships. Additionally, asset sharing enables organizations to pool resources, maximizing efficiency and cost-effectiveness. Lastly, the strategy of data monetization exploits the extensive data that companies collect, turning them into a substantial revenue source and actionable business insights.

These models collectively advocate for the more dynamic, interconnected and scalable business operations that are crucial for success in a digitally-driven marketplace. Despite their significant benefits, digital business models are often underappreciated. In my experience, companies are often reluctant to embrace these new models, with fewer than twenty per cent of projects successfully convincing organizations to innovate their market approach. Thus, attention to this axis is crucial if you are to integrate these new models into your overarching strategy and fully realize your potential.

Axis 4. Data management. The digital revolution is fundamentally data-centric, underscoring the importance of data as a critical component of any transformation strategy. In today`s environment, modern companies, regardless of industry or size, are accumulating vast amounts of data. However, merely collecting large volumes of data is not sufficient; the quality of data and their effective management are equally crucial.

For organizations, acknowledging the pivotal role of data is essential. Data can be a significant source of knowledge and competitive advantage when managed wisely. Advanced technologies now enable data to be collected, stored, analysed, and utilized in innovative ways that were not previously possible.

Data analysis forms an integral part of digital transformation, covering several key aspects that collectively enhance an organization`s capability to leverage data effectively. It starts with data collection, where information is

systematically gathered from both internal and external sources, ensuring a comprehensive dataset for analysis. This step is followed by secure and compliant data storage, crucial for maintaining the integrity and confidentiality of data while addressing security and regulatory compliance issues. Data communication also plays a critical role, involving the efficient transmission and sharing of data within the organization to enable accessible and collaborative analysis.

Moreover, analysing Big Data allows organizations to derive deeper insights from extensive datasets, significantly influencing strategic decision-making and operational efficiencies. The use of computational technologies is vital for efficient data management, enabling the rapid processing and analysis of large volumes of data, thereby supporting more informed and timely business decisions.

Together, these elements create a robust framework for harnessing the power of data, which constitutes a significant portion of digital transformation. The proper collection, processing and utilization of data enables organizations to achieve superior results, make more informed decisions, and respond more agilely to market changes. This axis supports but also drives organizational success in the digital age.

Axis 5. Culture of transformation. Organizational culture is the collection of values and beliefs that members of the organization hold and the daily behaviours prevalent within the organization. It influences how employees make decisions, collaborate with each other and respond to changes. Without the appropriate shift in organizational culture, even the best-planned strategy may not yield the desired effects.

Organizational culture is evaluated based on several critical areas that collectively influence the success of transformation initiatives within a company. Preferred leadership styles are pivotal in shaping the culture and behaviour of employees; leaders who encourage openness, flexibility and empowerment can significantly drive forward the cultural shifts needed for transformation. Additionally, an organization`s readiness for change is essential, as it enhances the likelihood that new processes will be adopted and integrated successfully, which will translate directly into the effectiveness

of the transformation process. Furthermore, fostering a habit of continuous improvement within the company culture can lead to greater flexibility and competitiveness, enabling the organization to respond swiftly and effectively to evolving market demands and technological advancements. A culture that vigorously supports and drives innovation is also crucial because it determines an organization`s ability to adopt and implement new solutions and ideas promptly.

Lastly, the availability of resources, including financial and human capital, critically shapes the organizational culture. Sufficient resources ensure that transformation plans are not only envisioned but also effectively executed, facilitating a smoother transition and better alignment with strategic objectives. Together, these factors create a robust framework for assessing and cultivating an organizational culture that supports energetic growth and sustained transformation.

Axis 6. Cybersecurity. In the era of rapid technological progress and increasing cyber threats, the security of data, IT systems and infrastructure is paramount for safeguarding company interests and maintaining customer trust. Cybersecurity is an integral part of a digital transformation strategy, aimed at ensuring secure, sustainable growth while constructing a positive image as a dependable business partner committed to protecting the data and information of its stakeholders. With cybercrimes such as hacking, data theft and ransomware attacks having severe repercussions for companies and their customers, the responsibility to shield against both financial and reputational damage has never been more crucial.

Axis 6 addresses the comprehensive measures and practices necessary to protect an organization`s digital infrastructure and sensitive information. It includes strategy and risk management, which involves assessing potential threats and devising effective mitigation strategies. The protection of networks and systems is critical, requiring robust security protocols to safeguard against unauthorized access and cyber-attacks. Data security is also essential, focusing on protecting data integrity and privacy from breaches and theft. Additionally, education and training are vital to equip employees with the skills needed to recognize and proactively respond to cybersecurity threats. Emergency

planning is another integral component, preparing the organization to swiftly handle and recover from security incidents.

This holistic approach to cybersecurity is essential for the integrity and resilience of any modern organization facing evolving cyber threats. In our fast-paced digital revolution, it is easy to overlook the need to adequately secure digital assets. Therefore, organizations must devise comprehensive risk management strategies that encompass network and system protection, data security and proactive employee education to ensure a well-prepared contingency plan for responding swiftly to any attack or security breach. This proactive and inclusive approach to cybersecurity ensures that organizations not only defend against immediate threats but also foster a culture of continuous vigilance and improvement.

As seen in the approach to digital transformation, the six axes describe all aspects of change relating to both the enterprise`s business performance and its organizational structure. This approach is designed to ensure that the transformation programme based on the Digital Roadmap is comprehensive and holistic. Additionally, it is important to remember that the effectiveness and efficiency with which this programme is implemented will depend on the coherence of the initiatives it contains.

In the first step, you will need to assess the current level of digitalization across all six axes and all the areas described within them. From experience, I know that self-assessing your own company usually results in much higher ratings than when the assessment is carried out by an external specialist; a company assessing itself will tend to paint an overly rosy picture that is not brutally honest enough to serve as a sound foundation on which to build a successful transformation. A warts-and-all picture is best taken by external specialists leading the management team through a structured conversation that systematically reviews the entire organization. The outcome of this first step is a set of assessment scores that cover all areas of all axes of digital transformation. This matrix of scores constitutes your assessment of your company`s level of maturity level before any changes are implemented.

The second step involves creating lists of transformation initiatives for all areas of all digital transformation axes. In practice, this action is relatively

simple, as the assessment matrices drawn up in step one have very obvious implications; your initiatives will be little more than proposals for achieving the next levels of digital maturity. For example, if in the first axis your company was rated at level three in the first area, which is sales processes, we can automatically assume that the next steps of development are levels four and five. Proceeding in this way with all areas of all digital transformation axes, we create from forty to even fifty transformation initiatives.

In the third step, we proceed to connect initiatives into sets of actions that should be carried out together and to arrange these sets in a timeline. It is extremely important here that the initiatives be coherent and logical and that their implementation be sequenced for success. For example, if we have initiatives related to influencing organizational culture and data collection systems, these initiatives should certainly precede initiatives related to the construction of advanced algorithmic solutions supporting digital processes or products. It is obvious that, before we start investing and working, it is necessary to build the appropriate knowledge plan and acquire the required resources. Once the schedule describing the implementation of actions over the next three to four years is ready, it is worthwhile estimating the economic effects of the developed plan. From experience, I know that no transformation, whether understood as a strategic or operational programme, can succeed if the stakeholders of the organization do not support it. And of course, in the case of long-term transformation plans, any attempt to create precise assumptions for financial models will be exceedingly inefficient and inaccurate at first. It is therefore all the more important to start early; early attempts will always be rough-and-ready, and it is necessary to allow for the time it takes for successive iterations to become steadily more precise.

Thus prepared, the Digital Roadmap allows us to take action. This plan can and should be verified and adjusted on the fly to changing external and internal circumstances. The plan is, in its essence, a multitude of initiatives that together contribute to the achievement of the goal. Therefore, if your next update to the Megatrend Tracker or any other event renders the assumptions of the transformation plan out of date, it is always possible to proceed by identifying only those transformation initiatives that need to be modified.

This capacity to adjust selectively to changes means that your transformation strategy sets the direction and establishes main activities while ensuring flexibility and readiness for change.

In following the three simple steps outlined above, there are several considerations to keep in mind, and we shall outline these here.

Firstly, remember that the Digital Roadmap is a tool that supports digital transformation as a process, not a one-time project. Therefore, it is intended for use in regularly reviewing the company`s digitalization level and the effectiveness of transformation initiatives. In practice, I perform an audit with my clients or suggest a self-assessment at three-month intervals, because the hyperreal world is so changeable that strategic assumptions are worth reviewing even four times a year.

Secondly, a transformation plan needs to maintain a balance between the present and the future. It is crucial to consider both current business-oriented actions and those directed towards long-term strategy. Overemphasizing either of these aspects can have negative consequences. Overly focusing on the future may result in a loss of competitiveness. Conversely, excessively concentrating on the present may cause you to neglect critical opportunities for change.

Thirdly, the digital transformation plan should not be limited to business-related activities. Changes must also encompass products, processes and business models, as well as organizational structure. If business transformation is not preceded by changes in organizational culture, employee education, data management and cybersecurity, the company can be exposed to risk and inefficiency. Thus, business and organizational aspects need to be worked on in sync to ensure harmonious development.

Next, digital transformation plans must maintain a healthy balance between planning and action. Many companies undertake hasty actions without adequate preparation and planning, which can eventually lead to issues. Transformational actions must be built on solid foundations, which include understanding the directions of transformation, proper data management and having a culture of digital transformation in place. Although actions can take

effect more quickly if this groundwork is skipped, the lack of attention can threaten the success of the entire transformation.

Further, the primary goal of digital transformation should include both financial and social aspects. When creating a transformation plan, we often focus on initiatives promising financial benefits and a positive return on investment. However, we must not forget the social aspects. Transformation affects not only a company`s financial performance but also its employees, customers and the wider community. Hence, it is equally important to consider social goals in the decision-making process for a sustainable and effective transformation that benefits the company and its environment alike.

A balance must also be maintained between technology and human factors. We are all excited about technological megatrends such as artificial intelligence, but business and social megatrends are equally important. When planning transformation based on the six digital axes, we must consider both technological initiatives and social changes.

Finally, we often concentrate on the use of the latest technologies, but we must not forget that people are key actors and beneficiaries in the transformation process. Thus, the transformation plan needs to encompass both technological investments and the development of employee skills and competencies. Any comprehensive picture of digital transformation will entail the combination of these two factors.

In summary, then, when reviewing an organization`s current state of digitalization, we first look in detail at where the organization stands in terms of each assessment area within each digital axis. These axes are elaborated on in detail in the appendix to this book. This furnishes us with a total of 34 partial assessments. Only by collecting and thoroughly analysing data on these can we make an overall assessment of where the organization currently lies along its digital transformation journey. To download the Digital Roadmap tool, please visit www.dbr77.com/pathfinder.

This will not only tell you where you stand on each axis now; it will also provide a clear view of what the next levels are in each area. Thus, the tool

also provides a clear foundation on which to draw up a comprehensive and coherent set of transformation initiatives. Their implementation will steer the company onto the right path of digital transformation in a way that is logical and aligned with your strategy.

48. The digital leader: the transformation within

For over twenty years, I have been working closely with manufacturing companies all over the world. This has involved hundreds of official and somewhat less formal conversations with leaders, managers and line workers, as well as consultants, advisors and scientists, about what it means to be a leader in these transformative times. These conversations have happened for the very prosaic and pragmatic reason that I have spent this time leading various companies, once mainly in manufacturing and now a technology startup, and working on the boards of various companies. It is therefore my professional duty to best serve the organizations and people I lead.

As you have read repeatedly throughout the preceding chapters, the era of digital transformation we are witnessing and participating in requires that we all put into effect radically new attitudes and competencies. We should all get used to the idea that things will no longer be as they were before. New territory awaits us and, as we forge onward, the obstacles it presents will only grow and the changes will only come more quickly. This chapter will first address what look set to remain the biggest challenges facing leaders at various levels of organizations in the coming years. In the second part, I will share my experiences as a change leader, talking about the duties that fall to every leader in the digital era.

It is difficult to definitively list the challenges that each of us faces. Nevertheless, many areas are common, and we all encounter them, some more consciously and others less so. It is worth identifying them because only by being conscious of them can we begin to look for solutions. Above all, this awareness is a prerequisite for our readiness for the change that must begin within ourselves. The mass digital transformation of the world is currently one of the biggest issues facing leaders at various levels. The transition to digital tools and processes is becoming increasingly important for organizational success. We live in times in which sticking to outdated methods and technologies can lead to a loss of competitiveness. Therefore, leaders must focus on managing this transformation and ensuring that the organization exploits new technologies to the full.

Technological progress is happening extremely quickly. New solutions and tools are appearing all the time, and leaders must keep up with these changes. You must understand the opportunities that each new technology offers and how it can be utilized within your industry. This requires that you be continuously learning and developing competencies related to the digital domain. Innovation is now a key part of success. Leaders must create an atmosphere that encourages the generation of new ideas and experimentation. It is no longer enough that you react to change; you must be ahead of the changes, creating innovations and taking initiative. The value of an organization is often shaped by its innovative approach to problem-solving and its creation of products or services that meet the needs of customers in a new, more efficient way. Leaders must lead this process and be ready to transform their organization into a place that fosters innovation.

The rapidly increasing variability of the external environment is another enormous source of uncertainty. The world in which organizations operate is changing more extensively and more quickly. Therefore, we must be able to effectively manage change in our organizations. Hyperreality means that technologies, market trends and customer expectations can change almost instantaneously. Leaders must be able to react quickly to these changes, adjusting their strategies and actions to the new realities. This requires not only flexibility but also the ability to make decisions quickly.

Effective management of the change process in an organization is a highly demanding undertaking. Leaders must be able to create a clear vision of transformation that is inspiring and understandable to the entire team. Thus, communication is crucial – leaders must be able to effectively convey the goal, direction and significance of the change. It is equally important to be able to mobilize teams to act in a dynamic environment. This requires that trust be built and that employees actively support the change process.

Another issue is the rapid growth in competition and complexity in the market. New companies are finding saleable applications of modern technologies and revolutionary business models. These models have increased the possibility for explosive growth and the chance that local players might suddenly go

global. Leaders must be able to monitor the competition, analyse its actions carefully and react quickly.

A key conundrum is how to create strategies that allow the organization to stay relevant in a market driven by explosive new technologies and customer expectations that can be changed almost overnight by new business models. This means that leaders must not only predict market trends but also react to them quickly and flexibly. Managing market complexity requires ongoing data analysis and informed business decisions to keep the organization competitive.

As organizations become global, leaders are dealing with cultural differences, international regulations and global competition. Managing diverse, often dispersed teams is thus a priority for maintaining competitiveness and organizational coherence on an international stage. Leaders must be flexible and ready to move with a shifting business environment and develop global strategies to maintain the organization`s competitiveness in the international market.

Another task for leaders in the era of digital transformation is talent management and the shortage of specialists. As digital technologies become more complex, it becomes increasingly difficult to find and hire qualified specialists in this field. Recruitment processes are becoming more competitive, and retaining the best employees in the organization is serious business. The competition for the best employees is becoming increasingly fierce. Leaders must invest in talent management, develop their teams and be able to attract top professionals. The value of an organization in the digital world largely depends on the competencies and commitment of its employees. Finding the right people is essential, but so too is taking care of their development, motivation and satisfaction if they are to stick around.

The next major challenge is the mass robotization and automation of processes. This is a process that requires leaders to take many actions. First, they must persuade employees to use new technologies that significantly improve work efficiency. This is not just a matter of introducing new tools but also changing the organizational culture so that employees see the benefits of these changes. They must convince employees that automation is not a threat

to their jobs but a way to improve quality and efficiency. The second aspect of this set of puzzles is the education of employees. As technologies develop, many professions and tasks are becoming obsolete, and employees must retrain. Leaders need to ensure proper training and support so that employees can meet the new requirements of the job market. This requires an investment in developing employees` competencies and creating an environment that values learning and development. Ultimately, leaders must find a balance between implementing new technologies to maintain competitiveness and avoiding excessive investment that could lead to inefficient use of resources. This requires careful planning while taking into consideration the organization`s long-term goals and its ability to respond to external changes.

Ethics and sustainable development also need to be addressed. Huge technological changes and increasing social and regulatory pressure inevitably present leaders with issues related to the social and environmental responsibility of the organization. They must create sustainable development strategies that address ecological, social and ethical problems. This means making decisions that benefit both present and future generations. The value of an organization in the digital era is not only about making profits but also about fulfilling its role in society and caring for the environment.

The next significant task for transformational leaders is to ensure flexibility and promote a new organizational culture. Leaders play a crucial role in developing preparedness by promoting a culture of flexibility and innovation within their organizations. They must act as role models and inspirations, encouraging experimentation, embracing new ideas and adopting new approaches to work. However, introducing a new organizational culture is not always easy, especially if the organization has a long history and tradition. Leaders must be capable of persuading employees to embrace new ways of working and thinking and to accept change. This requires effective communication, appropriate training and support for employees as they grow. Additionally, leaders should develop successors within the organization who will inspire others to actively participate in the cultural transformation process.

Our last but no less important challenge for transformational leaders is the need to implement AI in the organization. This requires the engagement of the

entire organization, not just the IT department. The leader must act as a catalyst, creating awareness among employees about the goals and benefits of AI and persuading them to embrace this new technology. In this context, education and training are crucial for employees to understand how AI can enhance their daily work. We must not forget the ethical and data security complications that this entails. Implementing AI involves collecting and analysing large amounts of data, which entails questions of privacy and information security. Adequate safeguards, processes and policies must be established to protect customer and employee data and comply with data protection regulations. At the same time, ethical use of AI must be ensured, avoiding situations where technology may be used in a discriminatory or unethical manner. Success in implementing AI depends on whether the leader can convince the organization to accept the technology, ensure its safety and compliance with regulations, and promote its ethical use. We can likely agree that the use of at least narrow artificial intelligence algorithms in daily operations will soon be a basic requirement for any company wanting to remain in existence.

In current times, we boldly declare that we need fewer managers and more leaders. To decipher this statement, we can turn to Peter Drucker`s famous quote: 'Management is doing things right; leadership is doing the right things.' Typical managerial tasks described over a century ago by Henri Fayol in his book *Administration Industrielle et Générale*, such as planning, motivating, organizing, coordinating and controlling, are increasingly being taken over by technology. As digital tools and systems evolve, they are reshaping traditional management roles by automating processes and facilitating more efficient decision-making. This shift is not only changing the nature of these tasks but also enhancing the strategic capabilities of managers, allowing them to focus on higher-level strategic goals and innovation.

The role of the leader is growing by the day. So, what should we, as leaders – regardless of the size of our organization or the difficulties it is currently facing – focus on? What are our responsibilities, and what are we accountable for? In search of answers to these questions, I have relied on the well-known and proven Five Practices of Exemplary Leadership, created by James Kouzes and Barry Posner, who began their research in 1983. The inspiration for this model came from stories of various individuals from around the world who

shared their most successful leadership experiences. Despite cultural, age, or gender differences, these stories revealed common patterns of behaviour. Kouzes and Posner identified and categorized these patterns into five key practices that they deemed fundamental for effective leadership.

These practices include leaders setting standards of behaviour that align with the group`s values, which allows them to serve as role models. These leaders are also able to envision the future and communicate their vision to others, motivating them to work together towards a common goal. They seek new opportunities for the organization, unafraid of experimenting and taking risks, and they build an atmosphere of trust and cooperation while enhancing the competencies of others and promoting teamwork.

All these tasks are, of course, important. However, considering the extensive list of challenges I described in the first part of this chapter, the list of key leadership practices needs to be re-examined. The contemporary digital world is introducing new rules in the field of management that leaders must take on board. Based on my professional experience and research, I have identified seven key areas that a leader in the digital world should pay special attention to. These areas are essential for effectively leading an organization through a Hyperreality subject to the complex interplay of technological, business and societal megatrends. The seven main tasks of a leader that I have described are:

1. Leading a Culture of Continuous Transformation

2. Crafting an Open Enterprise Blueprint

3. Driving a Data-Driven Organization

4. Shaping the Digital Vision and Strategy

5. 5. Guiding Digital Transformation

6. Accelerating Mass Automation

7. Building Digital Leadership Excellence

There is no need to describe each of the leader`s tasks in great detail, as I have already outlined their responsibilities throughout this book. At this point, I would like to consolidate these ideas into a logical whole so that each of us can see the seven tasks whose fulfilment is our duty. But before I do, one more important thought. The digital world undoubtedly allows more room for experimentation and mistakes. Accepting uncertainty is a natural consequence of the immense variability of the world around us. However, in this case, the world does not forgive easily. If a leader fails to accomplish even one of the seven tasks, it will most likely lead to the loss of the company`s competitive advantages and market position. So, dear leader, as we look at the seven tasks in detail, please consider them with the appropriate gravity; sadly, I have seen many fantastic projects bear little fruit because someone failed to attend to one or more of these tasks.
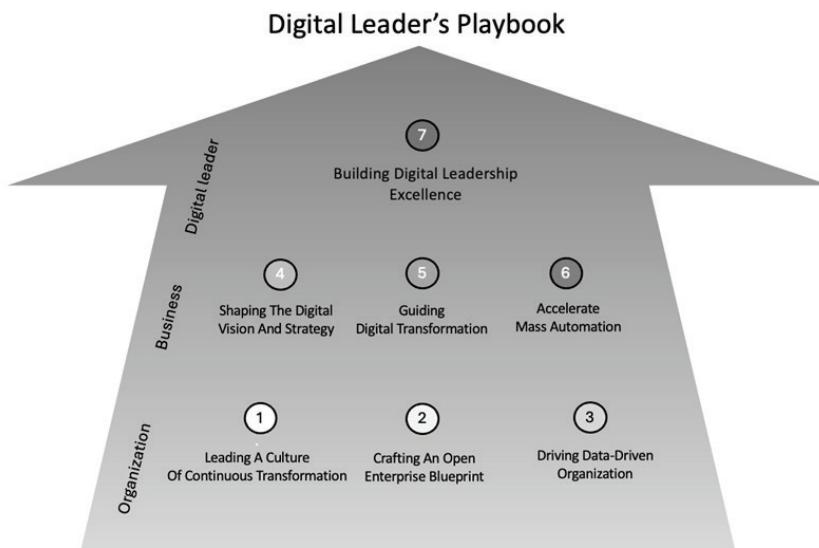
Figure 10

We start with 'Leading a Culture of Continuous Transformation'. This task is not the first on the list by pure chance. The first step in initiating transformational change is to get rid of our own implicit belief that everything is already perfect and complete. For change to begin, it must start in our minds and be reflected in our daily tasks. Of course, this change will not happen on its own and, unfortunately, there is little chance that it will start from the grassroots of the organization. The role of the leader therefore begins with the need to set 'the right directions'.

The leader must inspire employees to take risks and experiment, encouraging them to think beyond established patterns and to be open to change. Supporting openness to external contacts and impetus from beyond the organization is another major part of this task. The leader must promote collaboration with external partners, experts and the business environment. This means encouraging the acquisition of knowledge and inspiration from the outside, which can bring new ideas and solutions. Promoting experimentation and acceptance of mistakes means that employees should feel free to attempt and test new ideas, even if they turn out to be unsuccessful. Related to this is the fostering of a culture of learning and continuous development, where everyone has the opportunity to develop their competencies.

Shaping a culture of engagement and continuous learning and development is an essential task for a digital leader. Employees should be engaged in the organization`s goals and feel that their contribution matters. This is achieved by supporting processes of continuous learning and development to ensure that the organization is ready for changes and challenges. Furthermore, by fostering an environment where feedback is encouraged and valued, leaders can enhance employee commitment and adaptability, ensuring that the workforce remains not only competent but also motivated and aligned with the evolving demands of the industry.

Promoting a culture of multidimensional diversity both inside and outside the organization is an inherent part of this task. The leader must ensure that the organization is open to diverse perspectives, skills and experiences. It is about creating an atmosphere where everyone feels valued and accepted,

regardless of their differences. Emphasizing inclusivity not only enriches the workplace but also drives innovation by bringing together varied viewpoints and problem-solving approaches. This approach allows the organization to better anticipate and meet the needs of a diverse customer base, strengthening its position.

The second task of a leader is 'Crafting an Open Enterprise Blueprint'. This involves planning the organization`s development in such a way that it is primed to achieve its vision. This means identifying the necessary resources and competencies, which in turn means building an organizational structure that is flexible and ready to leap when the environment suddenly changes. Additionally, this blueprint should promote transparency and it should open communication channels across all levels of the organization, ensuring that information flows efficiently and that all team members are aligned with the overarching strategic objectives. This proactive approach helps foster resilience in the face of unexpected new demands.

Crafting an open enterprise blueprint not only involves planning the organization`s development to align with its vision but it also ensures that the organization is receptive to change and open to collaboration with other market participants. This requires an architectural approach in which the organizational structure is designed to be inherently flexible, accommodating shifts in market dynamics and technological advancements. It is about creating a foundation that not only supports internal adaptability but also fosters partnerships and networks externally, enhancing the organization`s capacity to innovate and respond to opportunities more effectively.

Moreover, critical to this task is the implementation of remote work and distributed teams. The leader must establish conditions that enable effective performance by teams that are geographically dispersed. This involves upgrading management and communication practices to support remote interactions and ensuring that all team members, regardless of location, are integrated into the organizational culture and processes. Effective remote work setups require robust digital tools and platforms to facilitate seamless collaboration and maintain productivity. By successfully managing these

changes, leaders can get the most out of their workforce, optimize resource allocation and tap into diverse talent pools, thereby strengthening the organization`s overall resilience and competitive edge.

Promoting task variability and multitasking within the organization is a crucial element in fostering an agile work environment. The leader must encourage flexibility in responsibilities and tasks, allowing employees to change direction quickly as new needs and priorities arise. This approach involves creating a culture of teamwork that transcends traditional organizational boundaries, encouraging collaboration across different departments and functions. By increasing the flexibility of organizational resources, employees are not only equipped to handle a variety of novel hardships but are also given opportunities to develop a broad range of skills and competencies. This strategy helps build a more resilient and versatile workforce that is better prepared to contribute effectively in a rapidly evolving business landscape.

Moving on to task three, 'Driving a Data-Driven Organization', as digital transformation progresses, every organization is on the path to becoming deeply integrated with information and communication technologies, making this task not just advantageous but essential. The initial step on this journey involves cultivating a culture that prioritizes data collection. By actively encouraging employees to gather and analyse data, organizations can unlock profound insights into operational processes and customer behaviours. To facilitate this, leaders must commit to significant investments in data collection and robust storage systems. This commitment ensures the organization is equipped with advanced technologies and infrastructure designed to manage, secure and leverage the massive volumes of data generated. This strategic emphasis on Big Data is crucial because it empowers organizations to utilize predictive analytics and informed decision-making, thus enhancing operational efficiencies and fostering innovation. As ICT becomes ubiquitous, mastering Big Data integration becomes a key driver for maintaining competitive advantage and future-proofing the organization in an increasingly digital marketplace.

Encouraging experimentation with data in processes and products alike is a crucial aspect of integrating Big Data into your organization. Leaders must

foster an environment where employees are prepared and encouraged to use data to create innovative solutions and enhance operational efficiencies. This shift towards an evidence-based approach emphasizes the importance of data analysis over intuition, promoting objectivity in decision-making. By prioritizing data over subjectivity, decisions can be more accurately targeted and effective. Leaders play a vital role in this transformation by advocating for decisions grounded in facts and rigorous data analysis, ensuring that actions are not only well-informed but also maximally beneficial. This approach not only improves the accuracy of business strategies but also drives a culture of continuous improvement and innovation within the organization.

To effectively implement data-driven strategies, robust cybersecurity and data privacy policies must be in place. The leader must ensure that adequate safeguards are established to protect data and systems, thereby securing customer and employee information against breaches and ensuring compliance with data protection regulations. This responsibility also extends to guaranteeing the ethical and legal use of data from customers and partners. By proactively addressing these security and privacy concerns, leaders not only fortify their organization`s defences but also build trust with stakeholders, which is crucial for maintaining a positive business reputation in a data-centric world. Establishing these protective measures forms a fundamental part of the digital transformation journey, ensuring that the organization can safely leverage data for innovation while respecting privacy and upholding ethical standards.

The next task for a digital leader is 'Shaping the Digital Vision and Strategy'. This begins with the leader behaving like a detective, fuelled by curiosity about the evolving world and sharply focused on all megatrends. A digital leader is engaged in continuous monitoring and investigation of the trends that are shaping both the industry and the organization.

Of course, all this is not to say that the vision and mission of an organization are crafted single-handedly by the leader. Absolutely not. This is where an organization that is ready for change and embedded in a culture of transformation plays a crucial role. However, experience shows that at the forefront of any team, there must be a leader who initiates change and

drives motivation towards transformation. This is where the significant difference between a manager and a leader emerges. A leader not only sets the direction but also inspires and mobilizes the organization to embrace and implement a vision and strategy that align with emerging digital threats and opportunities.

Building upon this understanding, the leader must then craft a clear vision and mission for the organization that aligns with these evolving trends and capitalizes on the opportunities that new technologies present. Creating this vision is akin to designing a map that guides the organization through the complexities of the digital landscape, outlining a clear path to where the organization aims to be. Simultaneously, the mission statement clarifies the organization`s purpose, detailing what it seeks to offer and what core values it upholds. This strategic vision and mission serve not only as a beacon for the organization but also as a rallying point from which employees and stakeholders can move towards achieving shared digital aspirations.

The next step involves establishing directions for strategic development based on the vision. This requires foresight, planning and flexibility. The digital leader must develop long-term plans that are adaptable enough to enable the realization of the vision. However, it is not enough merely to set these plans – it is crucial to inspire the team to bring the leader`s vision to life.

A digital leader needs to be both a visionary and a motivator. One of the primary aspects of this role involves inspiring the team to undertake bold actions that align with the vision. It is the leader`s responsibility to create an environment where people feel encouraged to take risks and work collaboratively towards achieving a shared goal. This dual role of steering the strategic direction while also energizing the team is essential for fostering an innovative and committed organizational culture.

Once the organization is prepared and the vision is set, it is time to set about the next task, which is 'Guiding Digital Transformation'. This begins by promoting the organization`s readiness for change and innovation. The leader must raise awareness within the organization that changes are inevitable if the company is to remain competitive in the hyperreal world.

Driving digital transformation in practice means continuously implementing initiatives aimed at transforming the organization into one that leverages data and technology to better meet customer needs and to enhance the efficiency of internal processes. However, this task cannot be accomplished by simply inventing and modifying random initiatives in selected areas of the organization. Strategic initiatives must form a coherent whole and encompass the entire organization, not just isolated parts.

This approach requires a holistic strategy that sees digital transformation as an integral part of all business operations, ensuring that every department is aligned with the digital vision. Leaders must ensure that these transformative efforts are integrated, sustainable and scalable, promoting a unified effort across the organization to embrace digital advancements and capitalize on new opportunities. This comprehensive and inclusive approach not only optimizes processes but also encourages a culture that is adaptive, innovative and fully committed to the digital agenda.

Driving digital transformation must fundamentally begin with education, as developing digital competencies within the organization is essential for promoting core transformational values. Leaders must prioritize significant investments in education and skills development to ensure that all team members are well-equipped to utilize new technologies and tools. This educational foundation is crucial because even the most promising change initiatives will falter without a workforce that is prepared and proficient in the digital realm. By emphasizing training and continuous learning, leaders not only prepare their organizations to face the novel challenges of the digital world but also ensure that the entire team is aligned and capable of implementing innovative solutions effectively. This approach solidifies the groundwork for a successful digital transformation, where continuous improvement and adaptation become integral to the organization`s culture.

Inspiring and managing the ongoing digital transformation process naturally extends from the foundational task of developing digital competencies. The leader must cultivate an environment that does not simply accept innovation and change but expects them as standard practice. This involves actively encouraging the creation and implementation of transformational initiatives

that align with the organization`s vision, fostering a culture that embraces continuous evolution and improvement.

Managing this process also requires the careful orchestration of resources to support transformation efforts. The digital leader must ensure that the organization has ready access to the necessary technologies, adequate funding and robust support systems to effectively carry out the transformation process. This involves strategic resource management, ensuring that these assets are not only available but also optimally allocated to meet the demands of various initiatives as they arise. By securing and managing these resources wisely, the leader enables the organization to respond swiftly and effectively to opportunities for innovation, ensuring the success and sustainability of the digital transformation strategy.

The next task for a digital leader is 'Accelerating Mass Automation'. This area is so significant and challenging that it merits being designated as a specific task for digital leaders. Above all, leaders must consistently initiate actions to automate processes, and crucially, this includes all processes occurring within the organization. This means staying current with new technologies and tools that enable automation.

Furthermore, it is vital to promote education on these new technologies and tools. The leader must encourage employees to learn and acquire knowledge in automation so that continual learning and skill development are natural priorities for all. Investing in developing the team`s competencies allows the organization to effectively leverage new technologies. By empowering employees with the knowledge and tools needed for automation, leaders can ensure that their organizations not only keep pace with technological advancements but also enhance efficiency and innovation across all facets of operations.

Leaders have the crucial responsibility to invest in automation and robotization when it is economically justified. They must evaluate which processes and areas of the organization can be economically automated to improve efficiency and competitiveness. Failing to automate where it makes economic sense can quickly lead to a loss of competitiveness.

The role of the leader involves maintaining a balance between investing too early in unproven technology, which can lead to excessive investment risk, and investing too late, which may result in losing a competitive position. It is the leader`s duty to say 'yes' to investment at the precise point that a new technology`s implementation aligns with the strategic development plan. In essence, the leader must astutely assess the readiness and potential ROI of new technologies, ensuring that investments are timed to maximize benefits without prematurely committing resources or missing critical opportunities for advancement. This strategic approach ensures that the organization remains technologically adaptive and competitively robust.

Experimenting with new technologies plays a crucial role in the task of process automation, as leaders must encourage a culture of innovation and experimentation. Employees need to have opportunities to test and experiment with automation technologies within their specific areas of work. This not only provides valuable firsthand experience but also aids in identifying the most effective solutions tailored to the unique needs and tasks of different departments. When trial and error are embraced, organizations can better understand which technologies yield the best results and drive meaningful improvements in efficiency and productivity.

Automation has emotional and psychological repercussions for employees, and these demand serious attention. Leaders must address any concerns and resistance to automation with empathy and open communication. Job insecurity can greatly hinder automation initiatives. Leaders must therefore engage with their teams transparently, discussing the benefits of automation not just for the organization but also for the employees` own roles. Providing reassurance, retraining opportunities and illustrations of how automation can alleviate mundane tasks and enhance job satisfaction are key strategies. Through these efforts, leaders can help employees navigate the transition more comfortably, reducing fears and building a more resilient and adaptable workforce.

The final task on the list, but equally important, is 'Building Digital Leadership Excellence'. Recognizing the gaps in one`s knowledge and competencies is the crucial first step in this ongoing process. Leaders need to

be acutely aware of their weaknesses and actively work on improving them. Self-development involves the creation of detailed individual professional development plans.

To effectively engage in self-improvement, leaders should systematically identify the specific areas they wish to develop. This could involve enhancing technical skills to stay abreast of the latest digital innovations, improving people skills to better lead and inspire teams, or learning new strategies for managing change in a digital environment. Once these areas are identified, leaders should formulate clear, actionable strategies to achieve these goals. This might include pursuing further education, seeking mentorship, attending workshops or seminars, or even engaging in self-directed learning.

By committing to a structured approach to personal development, leaders not only enhance their capabilities but also set a powerful example for their teams. This commitment to continuous learning and change is vital in remaining equipped to competently guide others through a rapidly evolving digital landscape.

In addition to internal efforts, promoting openness to ideas and feedback from outside the organization is a crucial aspect of self-development. Leaders should be open to suggestions and opinions from others, both from within their teams and from external sources, to continually refine and enhance their leadership skills. Utilizing external support for continuous personal re-education is another crucial element. This may include participating in external training sessions and courses or engaging in coaching and mentoring relationships.

Moreover, the courage to take on novel challenges is an essential trait for a leader. Self-development often involves stepping out of one`s comfort zone and embracing new experiences. Leaders must be ready to take on risks and new challenges that can bring substantial value to the organization and foster personal growth.

Yes, I know, the list of tasks for a leader is long, diverse and extremely demanding. Right at the beginning, I emphasized that a leader should ideally master all these areas. But then, no one ever promised that digital

transformation would make our professional lives easier! On the contrary, on every page of this book, I have tried to convey that the digital world is hugely competitive and demanding.

The responsibilities of leadership in the digital era are burdensome to be sure, but taking the path of self-development also makes them endlessly elevating and fortifying. For leaders ready to embrace these tasks, digital transformation offers a chance to revolutionize their organizations, transform industries and shape the future. Therefore, it is crucial for leaders not only to strive for mastery of their domains but also to continuously develop their skills, adapt to changing circumstances and inspire their teams to collectively pursue goals. Although the list of tasks may seem long and daunting, digital leaders should not be overly intimidated. Many of these responsibilities align with skills and habits that are already part of a leader`s repertoire. It is important to recognize that no one leader will ever master all of these areas perfectly. The key lies in taking a conscious and deliberate approach to developing the widest possible set of leadership competencies, ensuring that all seven areas receive the attention they deserve. Together, these efforts help mould leaders who are not just capable of managing the present but are also visionary architects of the future.

We are incredibly fortunate to be living through this era of digital transformation. The exact outcomes may be unknown, but we can be confident that they will be both new and exciting, ultimately benefiting everyone. In the meantime, it is important to remember that digital transformation, like any change, begins in our minds. Taking the first step is essential. This proactive mindset is crucial as we navigate and contribute to the evolving digital landscape, ensuring that we not only react to but also shape the future developments that await us.

Piotr Wisniewski, PhD

Afterword

It is my sincere hope that you have been persuaded that digital transformation is shaking the foundations of the world around us and that you have come to see how it has reshaped many of the businesses we are familiar with. This radical new reality demands that we revisit, rewrite or replace many established paradigms in management and economics, and that is what I have begun to do with this book. The world has been made more complex by factors such as globalization, intergenerational changes, mass robotization, unlimited computing power, the Internet revolution and artificial intelligence. This new complexity means that we all have to thoroughly redefine not only our business strategies but, above all, the very way in which we go about strategizing.

The digital revolution is driving innovation in completely new ways. An extensive analysis of the transformational changes taking place in many markets has led us to the clear conclusion that the only way to defend against upcoming or present changes is to act. In the world of digital consumers, for whom customer experience is a key factor in making a transaction, the only way to maintain a lasting competitive advantage is to constantly question your status quo.

Digital transformation does not simply involve robotizing production or implementing a complicated company control programme. It requires that we digitalize our internal processes and develop and implement new products or business models. Equally important, it is a process that never ends or slows down.

Today, we all need to be gathering and using data about our organization, its products and its customers on a massive scale; so, we all are – or will soon be – ICT companies. Those of us who have not yet invested in the extensive observation and analysis of the world around us will certainly be left behind

as others standardize and automate their activities. Automation applies not only to the physical work of industrial robots in production halls but above all to every systematically repeated activity currently performed by humans. Those who do not automate their activities today based on carefully collected data will quickly lose their ability to compete.

Digital products have already taken a prominent place in our everyday lives. While we may still read physical books or play chess across the physical board from an adversary, we are now spending much more of our free time engaging in activities through the medium of our familiar phones, tablets, consoles and laptops. These devices have facilitated the development and delivery of attractive, personalized, easy-to-use digital products that have overtaken their analogue predecessors.

However, the real revolution is being led by new digital business models. These disruptors are capable of changing a market so entirely and so quickly that companies that have dominated, even for decades, can be toppled and replaced within a few months or years. Business models that employ customer data and, above all, exploit quick access to geolocation and mobile payment options are truly revolutionizing nearly all traditional business models. Few business areas have not been digitalized, whether by sharing economy models, the As-a-Service formula or platforms. For established players, a player entering the field with a new digital business model usually brings a sharp loss of market share or a significant decline in financial performance.

It is also worth paying attention to how the mass implementation of narrow artificial intelligence algorithms is affecting the changes that we have been seeing. These algorithms are accelerating change, and the vast knowledge that humanity has accumulated over the centuries is now accessible to everyone almost equally. The future has already happened; it just hasn`t been evenly distributed yet. Artificial intelligence algorithms, especially large language models, have given everyone in the world almost instant access to unlimited knowledge.

Today, it is up to us, the people, to decide the fates of our enterprises, both those we own and those we work for. In the era of Hyperreality, we have no choice but to find our path to meaningful transformation – to guide our

companies and communities through the digital transformation process as smoothly as possible. Fortunately, this is not a difficult task, and using both the experience of other entities and the tools I propose, we can confidently define both strategic directions of change and a tactical programme.

Unfortunately, however, digital transformation is different from the changes we implemented in the pre-digital world. In the past, the company`s management could decide to change strategy, launch a change management programme and, after it had been implemented, enjoy the benefits. One could even determine that a strategy had been a great success. Unfortunately, such a model is not possible in the digital world, because the changes around us never end, and the digital transformation process is not only continual but also requires constant control over both the directions and the tools used in this process. In other words, digital transformation is not a destination, but a path that we all must follow.

I am sometimes asked where technology or business is heading, and many futurists try to make long-term predictions, but I see little use in speculating, beyond keeping a practical eye on the near horizon of megatrends. Will future generations judge that all these changes constituted a net benefit for us inhabitants of the Earth? I do not know. Nevertheless, when pessimism prevails, it is worth remembering that the past never offered such a high average quality of life as what we enjoy today. Even though our subjective experience sometimes suggests otherwise and our sympathy for those less fortunate than ourselves may warn us against complacency, every indicator of well-being shows that humanity has never had it better than it does now. And it is worth looking to the lessons of history. The first Industrial Revolution reshaped almost all aspects of life; technology-driven, it saw many forms of manual labour mechanized, and that caused turmoil, to be sure, especially for those whose established way of life was disrupted from one day to the next. But in the longer term, people adapt. Released from the backbreaking

millstone, the plough and the loom, societies have always found newer, more creative, less arduous, more productive ways of generating wealth. We should not expect all changes to be positive, especially in the period of adaptation. It is therefore my hope that, as a community, we will be wise and mature

enough to use digital transformation primarily to improve the quality of life and increase security while minimizing its negative effects.

I sincerely hope that reading this book has also opened your eyes, dear reader, to the scope, depth and breadth of the changes that can be set off by collecting ever more data and processing them ever more quickly and astutely. The digital transformation that is undoubtedly already happening – the Hyperreality that is engulfing us – requires that we all continually learn more, both about technology and about how we can use it in our businesses and our personal lives. No matter what educational path has brought us to where we now stand, we cannot consider that we have reached our destination and that we no longer need further education. That is why, as I type these last words of this book, and even though I am now over 45 years old, there are already books on my desk about programming in Python and creating algorithms in the TensorFlow environment. It is time to get learning. Time for a new adventure.

Appendix: The Digital Roadmap

This appendix presents in detail the methodology I have been using for several years to define digital transformation paths. It is through this methodology that any company can determine where it currently stands and the path that will lead it through the changing landscape – a topic I have extensively discussed in this book.

The assessment matrix is based on the philosophy of control embodied in the automotive standard VDA 6.3 for assessing process excellence in companies. This method is especially useful in manufacturing and service industries, and it was designed to ensure safety and efficiency in supply chains. It allows a precise evaluation of the digital technologies currently implemented in different organizational areas, which aids in identifying areas requiring improvements or development and in making more informed decisions on investment in digital technologies. Ultimately, its use can help a company achieve greater efficiency, competitiveness and adaptation to market changes.

Each axis of the Digital Roadmap has a distinct role and describes a different objective; please keep in mind that all of them are equally important for a company. The areas of assessment and specific evaluation levels I propose are based solely on my experiences as a manager, consultant and lecturer. Companies are free to modify the assessment matrices I suggest. However, I caution against oversimplifying them. Contrary to what it might seem, a lower initial evaluation score is better, as it presents an opportunity for the company to further develop and enhance its competitiveness.

In this appendix, I will separately describe each axis of digital transformation that constitutes the roadmap. Starting with a brief introduction explaining the significance of each axis and the method used to determine the development levels within it, I will then outline the assessment rules set for each axis. Once these principles are established, I will detail the characteristics of each

evaluation level for the specific area. Please remember that in constructing such a complex assessment system, aimed at describing all types of enterprises, I had to employ certain simplifications and shortcuts. As a result, there may not be clear boundaries between individual levels. If this is the case for you, I suggest you rate your company as being on the lower level until you have met all the criteria of the higher level. This will give you greater motivation to act and make changes. As regards any lack of clarity between levels, as you return to use the tool later to assess what progress your initiatives have brought, you will assess and utilize it with greater ease and understanding.

If you find the assessment methodology and the creation of transformation initiatives outlined in this appendix unclear, I strongly advise you to return to the chapter 'Tool 3: The Digital Roadmap', where I comprehensively discuss the objectives, significance and usage of this essential tool.

Axis 1: Digital processes

We begin with assessing digital processes. For a business, a process is defined as any set of interrelated and sequential actions or operations planned and executed to achieve a specific outcome. Processes are crucial to the organization because they define how its core activities and operations are performed. The great majority of a company`s processes are encompassed within the nine areas we deal with here, namely, the seven core areas of sales, marketing, process technology and R&D, purchasing, logistics, production, and quality, and the two support domains of finance and HR.

Processes need to be well-defined, documented and optimized, as they determine the quality and efficiency of an organization. Process optimization can save time, resources and costs critical to competitiveness and success. Therefore, process management is a pivotal component of business strategy that enhances organizations` operations and adaptability.

Matrix for Evaluating Process Digitalization

	Sales	Marketing	Technology	Supplies	Logistics	Production	Quality	Finance, controlling, administration	HRM
7. Support Algorithms	Algorithmic offer personalization, bots, GPT	Chatbot, content generation, GPT	Algorithmic support in development work	Predictive pricing algorithms	AI optimization of inventory levels and deployment	AI algorithms for MPS, scheduling, balancing	Algorithms for quality control scope determination	Bi	AI recruitment and talent management
6. ERP	Integrated ERP	Integrated ERP	Integrated ERP	Integrated ERP	Integrated ERP	Integrated ERP	Integrated ERP	Integrated ERP	Integrated ERP
5. MES	Supply chain reporting system	Conversion tracking in the sales tunnel, lead scoring	Project management	Purchase KPIs	WMS +3D Milkrun	MES, plant-wide work control	QMS	Workflow management system	HRM software
4. Automation	Online store, marketplace, DIY online	Automated e-marketing tools	3D printer, virtual reality, augmented reality	B2B purchasing and bidding platforms	AGV, robotic operations, EDI/web	Robotization and automation	Robotic optical analysis	RPA	E-kiosk HR, web kiosk HR
3. Process Control	Automatic sales budgeting	SEO and google analytics	Failure mode and effects analysis (FMEA)	Automated process workflow	WMS, EDI web	Cmms OEE analysis , VSM	Central response system for quality defects	Decision approval system	RCP
2. Workstation Control	Sales reporting system	CRM + KPI analytics	Digital simulation tools	Material coverage plan	System locations, mobile terminals	PLC, sensors, data visualization	Built-in quality control in the machine	FK	HR and payroll system
1. Basic Data Registration	Registration of contracts and orders	CRM	Design tools	Transaction records	Barcode scanners, RFID	Data from machines and equipment	Electronic compliance cards	OCR/electronic document circulation	Electronic work cards

Figure 11

Organizations differ in their internal processes. Nevertheless, certain processes are fundamental to most companies, regardless of industry or size. The set of processes we will be discussing primarily derives from manufacturing companies that engage in the production of physical goods, but variations on these processes can be customized to each company`s specific activities. For non-manufacturing organizations, this list will be slightly different and tailored to their needs. However, the concept of evaluation and the use of this matrix remains the same.

The digital transformation of processes within an organization unfolds through a structured seven-level development matrix, each stage enhancing efficiency and responsiveness to both external customer needs and internal organizational requirements. As processes are more comprehensively digitalized, they not only become more cost-effective but also more precisely aligned with user demands. The seven levels of digital processes are as follows:

Basic Data Registration: At this initial stage, systems are implemented to collect and store basic data relevant to specific processes. Data entry may be manual, or it can be automated through dedicated applications, with datasets integrated and annotated for easy accessibility.

Workstation Control: Digital tools, both software and hardware, are installed at various workstations to enhance operational efficiency. This equipment enforces adherence to job descriptions and reduces process errors by streamlining tasks at each station.

Process Control: All workstations involved in a particular process are linked through a unified management and control system, allowing for detailed process planning, target setting and performance evaluation.

Automation: Automation tools are introduced based on data from individual workstations and the entire process. These tools automate tasks that are repetitive and critical for customer satisfaction or organizational stability, including physical movements and modifications of material properties.

Industrial robots, collaborative robots (cobots) and automated guided vehicles (AGVs) are examples of such automation.

Manufacturing Execution Systems (MES): MES solutions collect, analyse, and display information across large organizational areas, providing decision-making support. These systems visualize process outcomes and report real-time key performance indicators (KPIs).

Enterprise Resource Planning (ERP): At this level, most processes occur independently of operator decisions and are embedded within an integrated information system. Organizational roles are defined, with most processes relying on a unified system.

AI Support Algorithms: Algorithms that improve workflow by utilizing internal or external datasets are deployed, enhancing the precision and efficiency of processes as they evolve with new data. These algorithms provide ongoing developmental support to the processes, continually adapting and learning from operational data.

Area 1A. Sales processes

The sales process in an organization is fundamentally about converting potential leads into actual customers, thereby driving revenue growth. It involves activities such as identifying prospects, nurturing relationships through strategic communication, and closing deals by meeting the needs and expectations of clients.

Level 1. Recording of basic data. Sales employees use dedicated systems to electronically register agreements and orders. This level ensures the precise documentation and efficient storage of crucial data.

Level 2. Workstation control. There is a reporting system that allows the monitoring and analysis of sales-related data. The reporting tool automatically generates reports containing key sales indicators and statistics, facilitating decision-making.

Level 3. Process control. Budget control is implemented within the sales process through automation. An appropriate system enables the planning and control of the sales budget. The system generates the budget based on predefined parameters and sales indicators, streamlining financial management.

Level 4. Automation. We use various tools to automate sales such as online shops, marketplaces or a DIY platform that allow customers to buy online without having to interact with our employees.

Level 5. MES. Manufacturing Execution Systems are used for reporting in the sales process. These systems enable the monitoring and analysis of data related to deliveries and logistics. They generate reports on deliveries, track delivery statuses and provide information on shipments and delivery deadlines.

Level 6. ERP. Integrated ERP (Enterprise Resource Planning) solutions are used within the sales process. This comprehensive system encompasses the management of key business processes, including sales. It synchronizes sales processes with other areas of the organization, such as procurement, production and finance.

Level 7. AI support. We harness advanced algorithms within the sales process to personalize offerings and provide other advanced features. Of note here are offer-personalization algorithms to analyse customer preferences and generate personalized purchase suggestions. We also employ natural language processing technology for customer service and tools for the automated operation of sales bots.

Area 1B. Marketing processes

The marketing process is central to understanding and engaging an organization`s target audience, employing strategies that communicate the value of products or services effectively. It encompasses market research, campaign execution, and the analysis of marketing outcomes to refine future strategies and ensure alignment with the evolving preferences of consumers.

Level 1. Recording of basic data. The key feature of digitalization here is a CRM (Customer Relationship Management) system to register and manage basic customer data. It gathers contact details, precise interaction histories and marketing preferences, which are the basis for further marketing operations.

Level 2. Workstation control. The marketing domain leverages CRM tools in conjunction with key analytical indicators to assess the effectiveness of marketing operations. Integrating CRM systems with analytical tools enables precise analysis and monitoring of key marketing indicators for well-informed decision-making.

Level 3. Process control. Tools related to search engine optimization (SEO) and data analysis from Google Analytics are employed. This provides oversight of marketing processes and the ability to assess the effectiveness of online activities. SEO strategies raise the visibility of websites in search results, while data from Google Analytics enable the monitoring of website traffic and user behaviours.

Level 4. Automation. We use e-marketing tools to automate, for example, the sending of newsletters, email campaigns and offer personalization. E-marketing platforms automate campaigns based on predefined scenarios and customer segmentation, significantly enhancing the efficiency of marketing efforts.

Level 5. MES. Manufacturing Execution Systems are used to measure conversion in the sales process and evaluate the quality of marketing activities. In the marketing context, MES tools track conversions at various stages of the sales funnel and assign scores to potential customers (leads) based on their activities and behaviours.

Level 6. ERP. Marketing harnesses integrated Enterprise Resource Planning solutions to manage key processes. An ERP system integrates marketing processes with other areas of the organization, allowing for efficient campaign management, customer data management and performance analysis.

Level 7. AI support. We assess the extent to which advanced algorithms are used in marketing. Technologies such as chatbots and content generation based on natural language processing (NLP) support customer interaction and the creation of personalized content. Chatbots provide rapid responses to customer inquiries, while NLP algorithms deliver personalized information, significantly improving customer service quality and raising audience engagement.

Area 1C. Process technology and R&D processes

The process technology and research and development processes within an organization focus on innovation and the enhancement of products or services. These processes involve the systematic investigation and application of knowledge to create new technologies, improve existing products, and ultimately deliver significant competitive advantages.

Level 1. Recording of basic data. Design tools such as CAD record precise basic data on technological solutions that have been designed.

Level 2. Workstation control. In the technology field, digital simulation tools enable control over workstations and technological processes. Through process simulation software or equipment operation simulations, the efficiency of technological workstations can be analysed and controlled.

Level 3. Process control. Failure Mode and Effects Analysis (FMEA) is applied, which allows the control of technological processes and the identification of potential errors and their consequences, and thus the development of preventive action plans.

Level 4. Automation. Various automation technologies such as 3D printing, virtual reality (VR) or augmented reality (AR) are in use. These allow prototypes to be created and tested and technological processes to be improved. 3D printing enables rapid prototyping and design verification, while VR/AR technologies support process simulation and employee training.

Level 5. MES. Manufacturing Execution Systems are used to manage technological projects and monitor their implementation. MESs aid in planning, monitoring and managing technological projects, including task scheduling, resource allocation, progress control and reporting. In the development of manufacturing technologies, a Digital Twin is an MES-class tool.

Level 6. ERP. Integrated Enterprise Resource Planning solutions manage key business processes, including technological processes. An integrated ERP system enables the management of technological processes, task

scheduling, progress monitoring and integration with other areas of operation. Integrating the technological process with the ERP system also allows the exchange of data on technological cycle times, which is particularly useful during the design, price quoting and execution of new projects.

Level 7. AI support. Technologies such as AI algorithms support developmental work and the optimization of technological processes. These algorithms analyse data, optimize technological processes, generate proposals for improvements and automate actions, leading to efficiency and innovation in technological operations. AI can assist in identifying promising research areas, further expediting the innovation process and the development of new technologies. This makes AI an invaluable partner in R&D, contributing to new and unexpected results in various fields of science and technology.

Area 1D. Purchasing processes

The purchasing process in an organization entails the strategic acquisition of goods and services needed to sustain business operations. It involves selecting suppliers, negotiating contracts and managing procurement activities to ensure cost-effectiveness and compliance with quality standards.

Level 1. Recording of basic data. Basic transaction data are digitally recorded and stored, such as data about suppliers, products, quantities and prices. This level is fundamental because it ensures consistent and precise transaction information.

Level 2. Workstation control. Inventory planning tools, such as Material Requirements Planning (MRP), control material availability. These tools are used in establishing optimal ordering plans to ensure that there is always adequate availability of materials.

Level 3. Process control. An automated workflow system manages and controls the entire purchasing process, from the moment an order is placed, through its internal approval within the organization, to its execution and settlement. This makes procurement processes more efficient by automating their monitoring and management.

Level 4. Automation. We utilize B2B procurement and auction platforms that enable electronic order placement, price negotiations, supplier offer comparisons and the efficient management of procurement relationships. This level provides more efficient procurement processes that are better integrated with suppliers.

Level 5. MES. MES-class systems enable the monitoring of purchasing-related KPIs. Metrics such as procurement costs, delivery times, delivery quality and the effectiveness of price negotiations are closely monitored. This level makes procurement processes more transparent and controlled.

Level 6. ERP. Integrated Enterprise Resource Planning systems encompass the management of key business processes, including procurement processes. This allows us to schedule orders, monitor deliveries, process payments and integrate procurement processes with other areas of company operations.

Level 7. AI support. Advanced predictive algorithms are applied to support pricing and price negotiation processes. These algorithms analyse the market, forecast commodity and component prices, and support negotiations with suppliers. This level makes procurement processes more intelligent and adaptable to changes in the commercial landscape.

Area 1E. Logistics processes

Logistics processes within an organization manage the flow of goods from suppliers to customers, ensuring that products are delivered efficiently and meet service standards. This involves coordinating transportation, managing inventory, warehousing, and handling distribution channels to optimize the supply chain and reduce operational costs.

Level 1. Recording of basic data. We employ RFID or barcode scanners that allow the registration of data related to material location and identification. These scanners quickly read the labels on goods in the warehouse to precisely identify them and record their locations.

Level 2. Workstation control. We use real-time location in the system and mobile terminals to control and monitor logistics stations. Employees can thus track and update the location and condition of goods in the warehouse.

Level 3. Process control. A Warehouse Management System (WMS) and Electronic Data Interchange (EDI) are used over the Internet. This facilitates control and management of the logistics process at a higher level. The WMS system supervises the flow of materials in the warehouse, while EDI streamlines electronic data exchange with business partners to enhance logistics processes.

Level 4. Automation. We use Automated Guided Vehicles (AGVs) that can independently move goods within the warehouse. Meanwhile, robotized order-picking and other robotic operations automate or assist in many logistics operations, such as loading and unloading.

Level 5. MES. MES-class systems and an advanced Warehouse Management System (WMS) integrated with Milkrun or Kanban systems monitor and optimize logistics processes. The MES system integrates production and warehouse management, while the WMS system, combined with Milkrun and Kanban, helps optimize inventory management and internal transport services.

Level 6. ERP. Integrated ERP systems encompass the management of key business processes, including logistics processes. This allows us to manage

logistics processes such as tracking goods, warehouse management, order management and integration with other areas of company operations.

Level 7. AI support. AI algorithms support the optimization of inventory levels and the allocation of goods within the warehouse. These advanced algorithms analyse demand, forecast needs, optimize inventory levels and assist in optimizing the placement of goods in the warehouse, thereby increasing operational efficiency and accelerating responses to changing external and internal circumstances.

Area 1F. Production processes

The production process in an organization involves converting raw materials into finished products through a series of operational steps, utilizing both human labour and machinery. This process is critical for maintaining product quality and meeting production targets, while also focusing on efficiency and minimizing waste to optimize cost-effectiveness.

Level 1. Recording of basic data. A precise monitoring and recording system gathers basic data from production machines and equipment. Those data include machine runtimes, technical parameters, performance and product quality.

Level 2. Workstation control. Programmable Logic Controllers (PLCs), sensors and detectors are employed to control and monitor production stations. PLCs, sensors and detectors monitor process parameters such as temperature, pressure and speed, and they control the operation of machines and equipment.

Level 3. Process control. Advanced systems are applied, including Computerized Maintenance Management Systems (CMMS), Overall Equipment Effectiveness (OEE) analysis, and Value Stream Mapping (VSM). These help control and optimize the production process. The CMMS system aids in planning and monitoring machine maintenance; OEE analysis evaluates equipment efficiency; and VSM allows production process parameters to be visually represented.

Level 4. Automation. Automation and robotization of production operations increase productivity and precision. Automation encompasses the use of industrial robots and automation systems for repetitive tasks, eliminating human errors and enhancing efficiency.

Level 5. MES. Manufacturing Execution Systems are employed on production lines. MES systems include real-time management and control of production processes. This includes production planning, order management, material tracking, quality control and reporting on production lines.

Level 6. ERP. The key business processes that integrated ERP solutions manage include production. ERP systems integrate production management,

resource planning, purchasing, sales and other processes to optimize the production process through efficient resource management.

Level 7. AI support. AI algorithms optimize production plans, precisely schedule tasks at individual workstations, and facilitate the even distribution of loads on production lines (including based on data acquired from digital twin simulations), thereby increasing efficiency and production flexibility.

Area 1G. Quality processes

Quality processes ensure that products and services meet predefined standards and customer expectations. These processes involve rigorous testing, monitoring and evaluation at various stages of production to detect and correct defects, thereby guaranteeing the reliability and safety of the final output.

Level 1. Recording of basic data. Electronic compliance sheets are used to record basic data related to product quality. These electronic sheets contain information about quality parameters, measurement results, tests and other quality-related data.

Level 2. Workstation control. Quality control systems embedded in machines and equipment are used in the production process. These systems allow for real-time monitoring of quality parameters such as dimensions, surface features, or other critical characteristics. Cameras, sensors and analysers are used for automatic quality control.

Level 3. Process control. A central system responds to quality defects. It quickly identifies, responds to and eliminates quality defects in the production process by automatically detecting defects, generating alerts, informing relevant personnel and initiating corrective actions for improved product quality.

Level 4. Automation. Robots and advanced vision systems are employed for precise automatic examination of product quality. These systems can analyse defects, dimensions and surface characteristics and can eliminate human errors to ensure consistent quality.

Level 5. MES. A Quality Management System (QMS) controls and monitors product quality at various stages of production. This includes document management, quality planning and control, and tracking of tests and inspections, as well as reporting on product quality and process stability.

Level 6. ERP. Integrated ERP solutions are applied that encompass quality management in the production process and that integrate this information with other areas of business operations. ERP systems integrate quality

management, documentation, process control, customer complaint handling and other quality-related functions.

Level 7. AI support. AI algorithms determine the scope of quality control in the production process for efficient and precise management of the quality control process. These algorithms use data analysis and product quality histories to automatically determine which production batches require detailed quality control.

Area 1H. Financial management processes

So far, we have focused on so-called 'core processes'. In addition to these, every organization has at least two support processes. The first of these is financial management. Financial management processes are crucial for maintaining the financial health and stability of the business. These processes encompass budgeting, financial forecasting, managing cash flows, and ensuring compliance with financial regulations. They enable strategic financial decision-making to support company growth and profitability.

Level 1. Recording of basic data. Technologies such as OCR and electronic document management are used to record basic data such as invoices, contracts and other financial documents. OCR technology automatically extracts data from invoices and electronic document management to accelerate and streamline the recording of financial data.

Level 2. Workstation control. Financial control (FC) tools and systems such as financial management systems monitor and control financial indicators and financial reporting. FC systems analyse and control budgets, costs, profitability and other financial indicators.

Level 3. Process control. Decision acceptance systems coordinate and control financial decision-making processes. This improves information flow, risk assessment and the approval and monitoring of financial decisions at various levels of the organizational hierarchy.

Level 4. Automation. Robotic Process Automation (RPA) automates processes for automatic and efficient execution of repetitive tasks. RPA technology is used for tasks such as automatic invoice processing, report generation and financial analysis.

Level 5. MES. Workflow Management Systems optimize financial processes and control and track the progress of tasks. They automate and enhance financial processes such as payment approval, order management and cost reconciliation.

Level 6. ERP. Integrated ERP solutions provide financial control within the organization, process integration and real-time access to financial data.

Level 7. AI support. AI algorithms and Business Intelligence (BI) tools are utilized for financial data analysis, report generation, forecasting and making advanced financial decisions.

Area 1I. HR processes

Human Resources processes in an organization focus on managing the employee lifecycle from recruitment to retirement. This includes talent acquisition, training and development, performance management, and employee engagement. Effective HR processes are essential for building a motivated and skilled workforce that aligns with the organization`s goals and culture.

Level 1. Recording of basic data. Electronic work cards are used to register basic HR data such as work hours, employee presence and other time-management-related information.

Level 2. Workstation control. Systems engage in payroll management, overseeing salary data, payroll lists, tax declarations and other aspects of human resource management.

Level 3. Process control. Systems are used that register work time and attendance so that employees can automatically record their work hours using various technologies such as proximity cards, biometric readers or mobile applications.

Level 4. Automation. HR processes are automated using e-kiosks and web applications that allow employees to independently manage their data, request leave, access documents and perform HR-related tasks.

Level 5. MES. Comprehensive Human Resource Management (HRM) software records personal data and employee assessments, and it is used in planning training, monitoring salaries and benefits, and career management.

Level 6. ERP. An integrated ERP system with HR modules is used to centralize human resource management data.

Level 7. AI support. AI algorithms support recruitment processes, talent management, HR data analysis and employee development planning.

Axis 2: Digital products

Digital products represent a pivotal category in the digital transformation landscape, encapsulating goods and services that are stored, delivered and used in an electronic format. These products, ranging from software and apps to digital media, offer businesses a significant competitive edge due to their scalability and potential for rapid global distribution. As digital products bypass traditional physical limitations, they open avenues for companies to access wider markets more efficiently and at a lower cost. This inherent scalability and reach make digital products not just a transformative force but a critical element in redefining market boundaries and establishing new revenue streams in the hyper-competitive digital economy.

Even within digital products, we can discern various levels of maturity and sophistication. Basic products like e-books, audiobooks, or movies can be effortlessly downloaded or streamed from online platforms such as Amazon and Audible. For instance, a customer might purchase an e-book on a website and download it to their e-reader device. Moving towards more complex solutions, intermediate products that amalgamate multiple formats – such as multimedia, e-books and audio or video files – are accessible on a variety of devices or platforms, including streaming platforms like Netflix. A website might offer a multimedia package that includes e-books and audio or video files that can be utilized across different devices. Advanced electronic products enhance user experience with additional features such as personalization, user interaction, or artificial intelligence. For example, a mobile app may allow users to customize settings and interact with other users, adding a layer of engagement and functionality.

Products can offer interactivity, such as many video games, virtual reality, educational apps or design tools that enable users to actively collaborate on or modify the product. Many video games allow users to interact with a virtual environment and make decisions that affect the game`s progress. Expert products leverage innovative technologies like artificial intelligence, machine learning and blockchain to deliver more advanced products, such as intelligent data analysis systems, enterprise software or virtual reality platforms. Online services like e-learning platforms or cloud services also fit into this level. An

Digital Pathfinder

AI-based data analysis system uses machine learning algorithms to process and analyse large datasets.

Digital Products

Level 5: Expert Level	Ai-based application	Level of co-ownership and influence	Level of innovation and product improvement	Make-to-order	Product with global potential
Level 4: Interactive Level	Interactive application	Level of creativity and co-creation	Level of automation and process personalization	Personalized offer	Product with international presence
Level 3: Advanced Level	Executable application format	Level of experts and mentors	Level of communication and interaction	Dynamic pricing	Product on global platforms
Level 2: Intermediate Level	Multimedia format	Level of collaboration and interaction	Level of personalization and customization	Market segmentation	Regional product
Level 1: Basic Level	Electronic file format	Level of resource sharing	Level of data collection and analysis	Omnichannel	Local product
	1. Electronic Products	**2. Community-based Products**	**3. ICT-based Products**	**4. Product Customization to Customer Expectations**	**5. Product Scalability**

Figure 12

In this area, we analyse the capability of products to transition to, or be developed in, digital formats, which notably enhances their accessibility and distribution efficiency. Community engagement in product development is evaluated to determine how well products foster the user loyalty and engagement that are crucial for long-term success. The connection to the ICT industry is also scrutinized to understand its impact on a company`s innovative capacity and competitive edge. Personalization of products is explored to ascertain how effectively products can be tailored to meet the unique demands of individual customers, an increasingly important factor in customer satisfaction and retention. Finally, the scalability of products is examined, focusing on the ability to expand production or services to meet escalating demand without sacrificing quality or performance. This comprehensive approach ensures a thorough understanding of a product`s digital maturity and market adaptability. For digital products, a five-tier model has been proposed to assess digital maturity. Due to the wide variety of assessment areas, it was not feasible to assign universally descriptive names to the various stages of digital development. Thus, the progression in digital product development is described simply in terms of advancement from a basic level to an expert level. This progression encapsulates a gradual enhancement in the sophistication and capabilities of the products, reflecting their increasing integration and utilization of digital technologies.

Area 2A. Digital products

Digital products encompass a range of goods or services available in electronic formats that can be downloaded or accessed online. These include, but are not limited to, software applications, music, films, e-books, video games and online educational courses. Such products can be evaluated based on their technological sophistication and the complexity of their features, enabling them to be graded from basic to highly advanced offerings. This categorization helps in assessing the digital maturity of products as they evolve to incorporate more intricate and technologically advanced functionalities.

Level 1. Basic. Products such as e-books, audiobooks or movies can be easily downloaded or streamed from online platforms like Amazon and Audible. For example, a customer purchases an e-book from a website and downloads it to their e-reader device.

Level 2. Intermediate. Products that combine multiple formats such as multimedia, e-books, audio and video are available on various devices or platforms, such as streaming platforms like Netflix. A website offers a multimedia package containing e-books, audio and video that can be played on different devices.

Level 3. Advanced. Electronic products with additional features, such as mobile apps, games or software offer added functionality like personalization, user interaction or artificial intelligence. A mobile app allows users to customize settings and engage with other users.

Level 4. Interactive. Products that offer interactivity, such as many video games, virtual reality, educational apps or design tools that enable users to actively collaborate or modify the product. Many video games allow users to interact with a virtual environment and make decisions that affect the game`s progress.

Level 5. Expert. Products leverage cutting-edge technologies like artificial intelligence, machine learning and blockchain to deliver more advanced products, such as intelligent data analysis systems, enterprise software or virtual reality platforms. Online services like e-learning platforms or cloud

services also fit into this level. An AI-based data analysis system uses machine learning algorithms to process and analyse large datasets.

Area 2B. Community-based products

Community-based products are created and developed with the engagement of a community of users. This approach is built on principles of participation and collaboration by which users not only use the product but also contribute to its improvement. Organizations can thereby enhance product quality and increase user engagement for greater customer satisfaction and company profits. Community-based products are gaining popularity in the digital age and are used across various industries, from computer games to business software.

Level 1. Basic. An online community shares resources such as files, tools or information. Users can collectively utilize these resources and support each other by sharing knowledge and experiences. A community of photographers, for example, share their photos on an online platform, allowing other users to download and use them.

Level 2. Intermediate. An online community actively collaborates and interacts while working on projects, discussions and problem-solving. Users engage in group activities and share ideas, opinions and comments. A platform for developers, for example, enables collaborative work on projects, sharing code, commenting and mutual assistance.

Level 3. Advanced. This level focuses on experts sharing knowledge and expertise and mentoring other community members. Users can receive advice and support from more experienced individuals in their field. A community of programmers, for example, offers mentoring and provides educational materials for beginners in programming.

Level 4. Interactive. The online community actively contributes to creating content such as designs, articles, videos or graphics. Users can collaborate in creating something new, shared and creative. A community of artists, for example, collaborates on an artistic project, combining their skills in various art forms.

Level 5. Expert. This highest level is based on community members` involvement in co-owning and influencing the community`s development

and the products or services it includes. Users can participate in decision-making, express opinions and influence the community`s direction. The user community of a social media platform, for example, influences the platform`s features, design and improvements by actively suggesting ideas and voting on them.

Area 2C. ICT-based products

ICT-based products operate using information technology and communication tools. These may include management systems, remote-working tools, mobile applications, content creation and publishing software, cloud services, data monitoring and analysis systems, e-learning platforms, and e-commerce solutions. All of these products are built on information technology and allow interaction with users through various web-enabled mobile devices and computers. ICT-based products enhance work efficiency, improve business effectiveness and facilitate access to information and tools.

Level 1. Basic. ICT is used for collecting, processing and analysing customer data. These data may include preferences, behaviours, purchase histories and other information that helps better understand customers. An analytical platform tracks user interactions on an online store`s website.

Level 2. Intermediate. ICT enables the personalization of offers to customers based on collected data. Advanced algorithms and analytical tools create personalized recommendations, offers and user experiences. An example of ICT use for personalization is a product recommendation system in an online store.

Level 3. Advanced. ICT is employed to facilitate communication and interaction with customers. Tools such as communication platforms, customer support systems and chatbots allow rapid and efficient information exchange. An example of effective ICT use for communication with customers is an integrated customer support platform that combines various communication channels in one place.

Level 4. Interactive. ICT is used to automate and personalize customer service processes. Advanced Customer Relationship Management (CRM) systems and marketing automation tools deliver messages, offers and responses all personalized to customer needs. An example of using ICT for automating and personalizing customer service processes is an advanced CRM system integrated with marketing automation tools.

Level 5. Expert. At the highest level, ICT serves as a tool for innovation and product improvement. Technologies such as big data, artificial intelligence, machine learning and predictive analysis are used to generate new ideas, discover trends and create innovative products that better meet customer expectations. For example, a company in the medical equipment manufacturing sector uses artificial intelligence and big data to create more precise and efficient diagnostic devices.

Area 2D. Product alignment to customer expectations

Product alignment to customer expectations is a critical area in the assessment of digital products, focusing on how well a product meets the specific needs and preferences of its target audience. This alignment is essential for ensuring customer satisfaction and loyalty, as it directly influences how consumers perceive and interact with the product. Effective alignment involves tailoring product features, functionality and user experience to cater to the evolving expectations of customers, often using data-driven insights to personalize offerings. As digital markets continue to grow and consumer behaviours shift, maintaining a strong alignment with customer expectations becomes a key driver of competitive advantage and market success.

Level 1. Basic. The product is available through various sales and communication channels, providing customers with consistent experiences, regardless of where and how they engage with it. For example, an e-commerce company collects data on customers` purchasing preferences and analyses them to customize product offerings and recommendations.

Level 2. Intermediate. The product is tailored to different market segments, considering the unique needs and preferences of each customer group to deliver personalized and appealing solutions. In a typical example, a streaming platform adjusts movie and show recommendations based on the viewer`s preferences.

Level 3. Advanced. The product uses flexible pricing models that adjust to changing market conditions, customer preferences and competition, ensuring optimal value for different audience groups. The company employs a communication platform that allows customers to contact customer support through live chat.

Level 4. Interactive. The product customizes experiences to individual customer needs, preferences and history by personalizing content, features and recommendations. The company sends automated emails with product offers and recommendations tailored to the customer`s preferences.

Level 5. Expert. The product is customized and manufactured to the customer`s order, allowing the customer to tailor it to individual requirements and preferences, leading to greater satisfaction and alignment. The company uses predictive analysis and machine learning to create innovative products that respond as customer needs evolve.

Area 2E. Product scalability

Product scalability is an integral aspect of evaluating digital products, focusing on the ability of a product to expand and adapt to a larger scale of operations or a broader audience without compromising performance or quality. Scalability is crucial for digital products, as it determines their potential to grow and succeed in diverse markets. It involves considerations of architecture flexibility, resource efficiency, and the capability to handle increased loads or expand into new markets with minimal adjustments. Effective scalability ensures that a product can meet growing demand, take on board new customer needs, and maintain efficiency, making it a vital component for achieving long-term viability and success in the competitive digital landscape.

Level 1. Basic. The product is developed and offered locally, focusing on a narrow audience or regional market. There are no opportunities for expansion into other markets. For example, a food ordering mobile app that operates in only one city.

Level 2. Intermediate. The product gains popularity in a specific region and starts expanding into adjacent markets. This may involve expansion into countries with similar preferences and needs. An example is a streaming service available in several countries in the Central and Eastern European region.

Level 3. Advanced. The product leverages global platforms and services such as e-commerce platforms, social networks or cloud services to reach customers in different markets. The product is accessible to customers from various countries but may require some adaptation to local preferences. For instance, there is a range of mobile online shopping apps available on the App Store and Google Play that are targeted to various markets.

Level 4. Interactive. The product has a presence in multiple international markets and is adapted to various regions. This may include content translation, user interface customization and compliance with local regulations and standards. An example is an e-commerce website available in different languages and supporting various currencies and payment methods.

Level 5. Expert. The product is globally accessible with no geographical constraints. It is widely recognized and used in various markets worldwide. It is customizable to different cultures and languages and complies with local regulations and requirements. This is perhaps best exemplified by a social networking platform that is available worldwide and supports multiple languages and cultural variations in user behaviours.

Axis 3: Digital business models

The axis of digital business models represents a critical component in the framework of digital transformation, as it underpins how companies generate value and interact with the modern digital economy. This axis explores the evolution from traditional business models to innovative digital formats that leverage technology to create, deliver and capture value in unique and dynamic ways. Digital business models enable organizations to respond more effectively to consumer demands and market changes, often leading to increased efficiency and opening up new revenue streams. As we examine this axis, we will be looking at the shift towards models that prioritize agility, customer engagement and continual adaptation to technological advancements. This transformation is not just about adopting new technologies but also about rethinking the organization`s approach to business, and making strategic use of digital tools to enhance competitiveness and sustainable advantages in the digital era.

Digital Business Models

	1. E-commerce Model	2. Platform Models	3. As a services	4. Asset Sharing	5. Data Monetization
Level 5: Expert Level	Data-driven product store	SAM platform organizer plus community	Full accountability for process outcome	Shared comprehensive business solutions	Data-driven innovations
Level 4: Personalized Level	Customized offer store	SAM platform organizer	Pay-per-task model	Shared financial resources	Data sales
Level 3: Advanced Level	Online store with offer customization	Ecosystem platform organizer	Pay-per-asset time model	Shared physical assets	Offer personalization
Level 2: Intermediate Level	Integrated store with marketplace	Trade platform organizer	Long-term lease	Shared virtual assets.	Data analysis
Level 1: Basic Level	Online store	Platform participant	Short-term rental	Shared knowledge and skills	Data acquisition

Figure 13

The assessment covers five key areas: the use of e-commerce models, platform solutions, As-a-Service models, asset sharing and data monetization. Each category is crucial for understanding how businesses adapt to and thrive in the digital economy, focusing on scalability, customer engagement and the strategic use of digital tools to develop a competitive edge.

Each area is rated on a scale that reflects the maturity and sophistication of the business model, from basic implementations to expert-level innovations that incorporate the latest technologies and market approaches. This structured assessment helps organizations identify their current capabilities and areas for growth in the digital landscape.

Area 3A. Use of e-commerce models

In the hyperreal world, numerous levels of e-commerce business models are shaping the landscape of trade. Online stores and e-commerce platforms are central to delivering products and services worldwide. These business models evolve gradually, from a basic level to advanced strategies based on personalization and the latest technologies.

Level 1. Basic. Online stores offer products or services through their own websites or popular e-commerce platforms like Amazon or eBay. Customers can choose from a variety of products, such as clothing, electronics or cosmetics, and make online purchases. This process involves adding products to a cart and making payments. Companies utilize basic sales applications to manage orders and track sales.

Level 2. Intermediate. An essential step is integration with various e-commerce platforms to enhance the visibility of products on various platforms. Additionally, sales applications offer more advanced tools such as inventory management and sales data analysis. The importance of offer personalization is greater at this level, and products can be tailored to individual needs.

Level 3. Advanced. E-commerce stores continue to enhance their capabilities through further integration with various platforms, including marketplaces. More advanced visualization tools allow customers to, for example, view products in different colours or configurations. The personalizing of offers is more advanced at this stage, relying on customer purchase data and enabling customization, such as a choice of colours or engraving options. Advanced-level stores may also use product recommendations based on customer purchasing behaviour to give them a competitive advantage.

Level 4. Advanced personalization. Internet stores reach for even more advanced visualization tools and sales applications that allow for full customization of offers. Integrated e-commerce platforms are more comprehensive, enabling the sale of products on multiple platforms simultaneously. At this level, personalization becomes a key element of the business strategy, facilitating the adaptation of offers to each customer`s individual preferences.

Level 5. Expert. E-commerce harnesses the latest technologies such as artificial intelligence, blockchain and the Internet of Things. Product visualization can include advanced virtual reality technologies, providing customers with incredibly realistic online shopping experiences. Integrations with marketplaces are highly comprehensive, allowing for product sales on various platforms simultaneously. Companies such as IKEA, with its online furniture store, and the IBM Commerce sales platform are setting the standard in e-commerce, using state-of-the-art technologies and innovative approaches to customer service.

Area 3B. Platform solutions

The second assessment area focuses on the use of platform solutions in business models. These models, while offering significant competitive advantages and financial returns, are among the most complex to implement. They involve the creation of digital platforms that act as intermediaries, connecting service or product providers with customers and facilitating transactions within a digital ecosystem. Revenue is often generated through fees charged to either sellers or buyers. Successful platform models establish ecosystems where suppliers and customers collaborate and share knowledge, but they also require adaptation to market needs and robust support for ecosystem participants. Their complexity and need to be continuously adapted are what make these business models challenging to implement but also powerful means by which to secure lasting competitive advantages.

Level 1. Basic. An individual or company uses a platform to conduct simple transactions, such as purchasing or selling products or services. For example, a company might use a B2B platform to optimize raw material purchases or to forecast prices.

Level 2. Intermediate. A company or institution provides a platform where sellers can offer products or services to customers. The platform may offer analytical tools to sellers and personalized recommendations to customers. An online gaming platform, for example, might provide access to games through a subscription or one-time payment.

Level 3. Advanced. A company or institution creates and manages an ecosystem, connecting suppliers, partners and customers to create added value and synergy. They offer market analysis tools, joint promotions and loyalty programmes. An example might be an e-commerce platform integrating suppliers, partners and customers while also offering market analysis.

Level 4. Advanced SEM. In addition to facilitating transactional relationships, the owner provides Software-as-a-Service solutions on its platform, enabling access to various online applications and tools. This type of platform organization is referred to as a Software-as-a-Service Enabled Marketplace (SEM). SEM platforms offer diverse applications, from project

management to data analysis, with the option for customization and integration. An example might be a project management platform that provides access to various tools tailored to customer needs.

Level 5. Expert. The highest-level platforms combine the functionalities of SEM platforms with an active user community. This enables participants to interact, collaborate and share knowledge. Companies combine SEM platforms with forums and chats where users can share knowledge and resolve issues. For example, an IT platform might allow IT resource management while also providing a space for collaboration and technical support for users.

Area 3C. As-a-Service

The third area of analysis is the As-a-Service business model, in which companies offer their solutions on a subscription or pay-per-use basis. In this model, the customer has access to the provider`s infrastructure, applications, tools and resources, allowing them to leverage advanced technologies and services and to pay only for what they actually consume. This model enables companies to save significant time and costs associated with maintaining infrastructure and employee teams. It also allows for flexible scalability and faster market innovation.

Level 1. Basic. The company and its service provider enter into long-term service agreements that resemble traditional partnerships. The provider offers a basic service with an emphasis on availability and simplicity. The customer values the convenience and flexibility of using the service, even though the service does not solve complex business problems. For example, an electronics manufacturer collaborates with an external company to run a basic online store and manage online product delivery. Customers can purchase products through the website, and the provider facilitates basic e-commerce services.

Level 2. Intermediate. The company and the service provider establish long-term subscription or tariff-based agreements for service usage. The provider offers more advanced features and technical support. The customer expects consistent service quality throughout the contract period. Here, an example might be an electronics manufacturer collaborating with an external company that handles warehousing, packaging and product shipping on demand. The external operator is responsible for the product from the completion of production to delivery to the customer.

Level 3. Advanced. The customer pays the service provider for the time they use available assets or resources. The service provider focuses on managing and maintaining assets for the customer`s needs, providing greater flexibility. Consider an electronics manufacturer that establishes a long-term partnership with an outsourcing company that manages various sales channels, including online stores, physical retail shops and online marketplaces. The outsourcing company also offers advanced analytical tools for sales monitoring.

Level 4. Advanced personalization. The customer pays a service provider to complete specific tasks or achieve precisely defined results. The provider adapts heavily to the customer`s individual needs and delivers personalized solutions. The customer expects a specialized and tailored approach from the provider. An electronics manufacturer might use an omnichannel platform that connects various sales channels, allowing personalized customer service at every stage. The platform integrates online stores, physical stores, mobile apps and real-time delivery.

Level 5. Expert. Service providers act as the primary executor, managing the entire customer business process. The customer leverages comprehensive business solutions offered by the provider. This is the highest level of provider involvement in the customer`s business processes and might, for example, entail an electronics manufacturer outsourcing solutions to experts in omnichannel. The collaboration includes comprehensive sales management, delivery, customer service and high-level personalization. Services are fully tailored to the customer`s needs and utilize advanced technologies. In this business model, the level of digital maturity depends on the amount of complexity and risk that is delegated to the service provider. The technological aspect of this assessment indirectly concerns the extent to which the service provider can monitor and manage the risks they undertake.

Area 3D. Asset sharing models

Asset sharing is gaining popularity as a business model in the era of digital transformation. It involves creating platforms that enable users to share various types of assets, whether virtual or physical, as well as knowledge and financial resources. This can not only efficiently utilize available resources but also create ecosystems where users can collaborate, exchange services and achieve their business goals.

Level 1. Basic. The platform allows users to share virtual assets such as files, digital content, applications or online services. Users can use these assets based on subscriptions, pay-per-use or platform access. For example, a platform might allow graphic designers to share tools and collaborate effectively on projects, paying for access based on the number of projects they create.

Level 2. Intermediate. The platform enables users to share physical assets such as cars, properties, tools or equipment. Users can rent these assets from others for a specified duration, allowing them to save on purchasing or renting a full set of items. For instance, a bike-sharing platform allows users to rent bikes from other users on a subscription basis, providing them access to various types of bikes based on their needs.

Level 3. Advanced. The platform allows users to share knowledge, skills, experience or the product of intellectual work. Users can offer their services, conduct training or share educational materials with other platform users. One example might be a platform for marketing professionals on which experts offer their skills in data analysis and marketing strategy to other platform users for an hourly fee.

Level 4. Advanced personalization. The customer pays the service provider for the time they use available assets or resources. The service provider focuses on managing and maintaining assets for the customer`s needs in order to increase the customer`s flexibility. Thus, an electronics manufacturer might enter into a long-term partnership with an outsourcing company that manages various sales channels, including online stores, physical retail shops and online marketplaces. The outsourcing company also offers advanced analytical tools for sales monitoring.

Level 5. Expert. The platform enables users to share complex business solutions such as IT infrastructure, analytical tools, logistics services or project management. Users can use these solutions on a subscription or pay-per-use basis, allowing them to reduce the costs of their investments. An example might be a platform that integrates various services and technologies to provide comprehensive business solutions for project management, data analysis and logistics. Companies can use these solutions on a subscription basis, allowing them to devote the time and resources they save to developing their proprietary solutions.

Area 3E. Data monetization models

The fifth area in which business models are assessed for digital maturity is data monetization models. These models centre on a company`s ability to generate financial revenue by collecting, analysing and utilizing data about customers or processes. These data constitute a crucial resource for understanding and serving customers and generating added value.

Level 1. Basic. The company collects data from its customers, such as preferences, shopping behaviour and demographic information. It uses the data to comprehend customers and enhance its offerings. For example, auction platforms analyse purchase histories to recommend to users products that may interest them.

Level 2. Intermediate. The company conducts more advanced analysis of the accumulated data to identify patterns, trends and opportunities. Data analysis helps it understand customers and make more informed business decisions. An example is Netflix, which analyses viewership data to identify trends and create more personalized recommendations for users.

Level 3. Advanced. The company employs the gathered data to personalize offerings to individual customers. This allows it to deliver customized products, services and content that align more closely with individual customer needs and preferences. Spotify, for instance, analyses musical preferences to provide users with personalized playlists and song recommendations.

Level 4. Advanced personalization. The company uses the accumulated data as a valuable resource that can be sold, shared or used to generate additional revenue. This may involve sharing data with business partners, offering paid analytical services, or using data for advertising purposes. Facebook, for instance, sells data to advertisers, enabling them to target specific user groups.

Level 5. Expert. The company uses its gathered data to create new products, services and innovative solutions. Data serve as the foundation for developing new business models, crafting intelligent algorithms and harnessing artificial intelligence to deliver more advanced solutions to

customers. Google, for example, utilizes user data to develop advanced AI algorithms, such as search algorithms, leading to the creation of new services and products.

Axis 4: Data management: Big Data everywhere

In the digital era, data management and the effective use of Big Data have become critical components of organizational success. The fourth axis of digital transformation focuses on how well an organization captures, stores, processes and utilizes vast amounts of data to enhance decision-making, improve operational efficiencies and drive innovation. This axis examines the infrastructure, strategies and competencies that organizations deploy to handle the complexities of Big Data.

Data Management

	1. Data Collection	2. Data Storage	3. Data Communication	4. Big Data analytics	5. Computing
Level 7	Business process management (BPM) system	Hybrid cloud	5G-based	ML (machine learning) algorithm for unusual data identification	Computer clusters
Level 6	CRM behavior analysis	Public cloud	Cloud-based	Simulation	HPC (high performance computing)
Level 5	Automated survey tools	Private cloud	Network-based	Data quality management tools	Cloud computing
Level 4	Customer service monitoring system	On-premise cloud data storage	Industrial-based	Big data analytics tools	GPU technology
Level 3	Social media analysis	Local computer file storage	Ethernet-based	Database visualization tools	Virtualization of computing machines
Level 2	Tools for automated online behavior analysis	Data collected and accessible only on the workstation - on machines	Fix text-based reports	ETL - systems for extracting data from various sources	Edge computing
Level 1	Web data analysis	Exclusive paper-based records	Paper-based reports	DBMS - database management systems	Computing on PC workstations

Figure 14

As we explore this axis, we investigate the various facets of data management that are essential for building a strong digital ecosystem. From collecting data and ensuring their secure storage to conducting advanced analytics and deriving actionable insights, each component is crucial in turning raw data into strategic assets. This axis encompasses not only the technical skills required to handle Big Data but also the cultural transformations needed to cultivate a data-centric approach throughout the organization. A seven-tier maturity model has been proposed to assess each area, reflecting the broad range of technical capabilities present in these fields.

Area 4A. Data collection

This is a complex process involving various stages such as identifying the sources of data and collecting, validating and evaluating those data. This requires the right tools and technologies to ensure not only the high quality and reliability of the process but also the security and confidentiality of the gathered data. Another important component of the data collection system is its assessment and control of data quality, including of accuracy, completeness and consistency. It is also valuable to provide suitable procedures and tools for monitoring and analysing the data to understand organizational processes better and make decisions more effectively.

Level 1. Manual data collection. This involves employees manually completing forms with information about their work or other activities related to the organization. These forms typically include information about tasks performed, working hours, equipment used, materials and tools employed by the employee, and work-related problems or incidents. The downside of manual declarations is that they are time-consuming and costly, requiring manual filling of documents by employees. They are also often prone to human error, which can degrade data quality and complicate analysis. An example of this level is a construction company using paper cards to track working hours and equipment usage. While a simple task, errors in records could lead to inaccuracies in project management.

Level 2. The use of graphic symbols. Such techniques as the use of barcodes or QR codes are popularly employed in warehouses, stores or production to identify goods, products or devices using a scanner. Each product or device is graphically labelled, and its data are stored in an IT system. Using a scanner, an employee can quickly and precisely gather information about products or devices to ensure their smooth operation or to assist customers. In a large supermarket network, each product on the shelf has a barcode. Employees use scanners for quick inventory counting and receiving deliveries, thereby increasing efficiency and reducing errors.

Level 3. Advanced technological solutions. Technologies such as Radio Frequency Identification (RFID) streamline operations and processes.

RFID enables the automatic identification and tracking of objects using radio waves. In manufacturing, this technology serves as a data collection system, significantly improving warehouse management, logistics and the monitoring of production processes. For example, in an automotive parts factory, the use of RFID tags is invaluable. The tags are used to track boxes containing car components. With this system, the organization can precisely monitor inventory availability, allowing for more efficient management. RFID technology not only improves efficiency but also enhances monitoring accuracy, eliminating human errors and providing better control over the organization`s resources.

Level 4. Data from manufacturing machines and devices. A key source of information is machines and devices equipped with various sensors that measure a range of process parameters, such as temperature, humidity, pressure, speed, rotations, vibrations and more. These data are collected in real-time and processed in IT systems, enabling continuous monitoring and analysis of production processes. For example, beverage factories may use sensors to monitor temperature and pressure in the pasteurization process. This data is analysed in real-time by the system, which can adjust pasteurization parameters on the fly. This ensures consistent product quality and minimizes the risk of failures.

Level 5. Mobile data collection devices integrated into the production management and optimization process. Crucial information can be gathered regarding employees` interactions with mobile applications and devices used to monitor their work. These data may include information about employees` location, behaviours and preferences, and other relevant factors. An example is the use of smartphones or specially adapted devices that allow employees to be located within the production plant and data related to their work to be collected. For instance, these tools can monitor time spent at specific machines, work efficiency and breaks taken. With these tools, manufacturing companies can refine their operations and effectively respond to changing production conditions.

Level 6. Production data collected from physical objects. Modern sensors are increasingly recording various environmental parameters such as

temperature, humidity, pressure, light intensity or motion. The data that are collected are extremely valuable, as they can be used for various purposes such as monitoring working conditions, performing machine diagnostics and optimizing production processes. An excellent example is that of a food production factory using temperature and humidity sensors in its warehouse. These sensors constantly monitor product storage conditions, and the data they collect are transmitted to the appropriate software. This allows the company to meticulously track the quality of stored products. In case of any irregularities, such as inappropriate storage conditions, the software enables swift intervention, minimizing losses and ensuring high product quality.

Level 7. Optical control. This advanced approach to collecting data from physical objects uses cameras and other optical devices to monitor and assess the state of physical objects. Optical devices capture images of objects, which are then meticulously analysed for potential damages or other irregularities. Thus, cameras might be installed on the ceiling of a production or warehouse hall for real-time monitoring and identification of the activities that equipment is performing. These advanced cameras, equipped with sensors and image-processing algorithms, track objects on the production line, identifying their position and actions. This intelligent solution integrates visualization, data analysis and monitoring to create a more efficient and secure production environment.

Area 4B. Data storage methodology

This assessment area focuses on how an organization manages its data, encompassing its collection, storage, organization and sharing processes. It involves understanding the types of data collected, their update frequency, and security needs. The selection of appropriate technologies such as databases, cloud solutions and storage networks is crucial, along with strategies for backup and archiving. The performance, availability and scalability of these systems must be defined to ensure that data are accessible and processed efficiently. Additionally, data reliability and security must be ensured to prevent loss and protect privacy. These considerations are critical in designing and implementing a robust data management system that delivers maximum organizational benefit.

Level 1. Traditional data storage methods. These rely on physically recording information on paper. Data are printed and archived as hard copies in offices or specialized archives. This approach is typical for smaller firms lacking extensive IT systems and databases. A typical example is a notary`s office, which stores the legal documents of its clients as hard copies in binders and cabinets. When clients need access to their records, office staff must manually search through the paper archives, which can be time-consuming. In this case, paper-based storage is dictated by legal requirements.

Level 2. Single local digital storage. Information is held on a single device or workstation, which limits data access to that device only, meaning the information is not available to other users or systems. This approach is often employed in machine control systems, where data generated by the machine are stored on a local control device. An example would be a manufacturing plant where a machine control system for metal-cutting stores all its data on a local computer only. Engineers working in different parts of the factory cannot easily access these data, hindering the analysis and optimization of the production process. When there is a need to share this information with other employees or systems, data must be painstakingly copied manually.

Level 3. Dispersed local digital storage. Various computers or devices are commonly used for data storage in small businesses or by individual users.

Data are saved on the hard drives of individual computers, resulting in a lack of centralization in data storage. This approach carries some risk related to data protection, as the failure or loss of one computer can lead to the loss of important information. Additionally, it complicates collaboration and data sharing among employees and can be an obstacle to the analysis and utilization of data for business purposes. An example is a small accounting firm where each employee stores client data on their personal computer. If one of these computers fails or is stolen, there is a risk of valuable data being lost. Furthermore, the lack of a central database hinders effective collaboration among employees, as they do not have easy access to shared information.

Level 4. Local cloud storage. A company maintains and manages cloud infrastructure in its own data centre. This allows the organization to retain full control over its data and ensure a high level of security, as access to data is limited to authorized personnel. However, this method requires significant investments in infrastructure and human resources for managing and maintaining the local cloud. The example here is a manufacturing company that uses its server space to store and manage data related to quality control and safety. Although the company has full control over its data and protects it from unauthorized access, it bears the substantial costs of purchasing, maintaining and updating the infrastructure.

Level 5. Public cloud storage. This involves using the data-processing services of external cloud service providers. These providers maintain cloud infrastructure, which their clients access via the Internet. Public clouds offer a wide range of services, including data processing, data storage, virtual machines and tools for data analysis. A company that uses the services of providers such as Google Cloud, Dropbox or AWS is operating at this level. Employing a public cloud reduces costs, allows resources to be scaled, and provides flexibility in managing data and applications.

Level 6. Private cloud storage. Cloud infrastructure is dedicated to a single organization. This means that cloud resources such as servers, storage and network are available only to the employees of that specific organization, and not to external users. An example is a financial corporation such as a bank

using a private cloud to securely store customer data. This ensures full control over data security, a critical aspect in the financial sector.

Level 7. Hybrid approaches. Companies strategically manage their data storage by utilizing a mix of solutions tailored to the specific needs of different types of data. For instance, operational data critical for production processes are stored on edge devices for immediate access, while sensitive information like technical drawings is kept in private clouds to enhance security. Other data, such as financial and material reports, benefit from the scalability and accessibility of public clouds, allowing for resource adjustments in response to fluctuating demands. This approach not only optimizes performance and cost-efficiency but also ensures robust security and control, exemplified by an automotive component manufacturer who effectively segregates data storage based on function and sensitivity.

Area 4C. Data communication

A data communication system comprises methods and tools for transmitting information between different devices, applications and individuals. Fundamental components of the data communication system include communication protocols, computer networks, network devices, network management software and tools for monitoring and analysing network traffic.

Level 1. Hard-copy reporting. Traditional paper reports are the primary means of communication and data transmission. This classic method involves printing data out and passing them between employees or sending them outside the company. An example might be a financial industry company still using traditional paper reports for internal and external communication. This is a costly and time-consuming approach with negative environmental impacts.

Level 2. Reporting via email. This is a fast and convenient method of information transfer, facilitating easy document sharing among employees and ensuring easy access. However, it comes with data security risks, such as the possibility of data interception by unauthorized individuals or email system failures. It is thus essential to ensure adequate security measures, such as data encryption, confidentiality regulations and backup procedures. Let us take the example of a consulting company that relies on email to ensure the rapid transfer of essential reports and documents between its teams. The company, acutely aware of the security risks associated with data, implements advanced data encryption technologies and strictly adheres to confidentiality regulations.

Level 3. An Ethernet-based architecture. This is one of the most popular ways of building computer networks, allowing data transmission between devices using an Ethernet cable. Ethernet-based architecture is applied in Local Area Networks (LANs), which are known for their high performance and operational reliability.

Level 4. An industrial Ethernet-based architecture. This specialized network configuration is designed for industrial applications and has higher reliability, security and data transmission speed than traditional Ethernet networks. Industrial networks employ special network devices such as

switches, routers and gateways that are resistant to industrial conditions like vibrations, dust and humidity. Additionally, specific communication protocols like Modbus, Profibus and DeviceNet enable communication between various industrial devices.

Level 5. A wireless communication architecture. Devices in this network connect to one another via a central access point, facilitating centralized network management. Wireless networks find applications in various industries, including manufacturing, transportation, medicine and services.

Level 6. A WAN/LAN architecture. Here, devices like routers, switches and servers connect multiple computers and devices into a network. WAN/LAN networks provide a stable connection between company branches and offices, enabling access to data and applications from different devices and locations. Various protocols and technologies such as TCP/IP, VPN and MPLS ensure fast and secure data exchange within the organization. In particular, VPN (Virtual Private Network) technology ensures secure communication between locations, which is crucial for safeguarding sensitive company data.

Level 7. A cloud-based architecture. Applications, data and resources are stored and processed in the cloud, which is usually provided by an external vendor. A cloud-based architecture allows access to applications and data from anywhere and any Internet-enabled device, allowing resources to be scaled flexibly according to needs. This enables organizations to adapt more easily to changing business requirements and reduce the costs of maintaining infrastructure. An example of cloud-based architecture is a microservices architecture, where applications are built as a set of smaller, independent services that can be easily scaled and updated.

Area 4D. Big Data analysis

Big Data analysis is a critical component of digital transformation, as it relates to leveraging vast datasets to extract valuable insights. This process employs advanced technologies and methodologies designed to efficiently analyse large volumes of data. By utilizing Big Data analysis tools, organizations can unlock profound insights into customer behaviour, emerging market trends, and intricate details of internal operations. These insights are pivotal in making informed decisions that can significantly enhance business strategies, operational efficiency and competitive advantage. Big Data analysis not only informs tactical moves but also supports strategic planning by providing a clearer picture of the market landscape and organizational performance.

Level 1. DBMSs. DataBase Management Systems facilitate effective data management by allowing large datasets to be created, stored, updated and analysed, giving them a crucial role in data collection and organization. DBMSs have applications in various fields, from business to science and engineering. MySQL, a popular solution in this category, is frequently used in web development, serving as an engine for storing and managing user data on products, transactions, and other elements that contribute to the smooth operation of websites and online applications.

Level 2. ETL systems. Extract, Transform, Load systems perform a key process in data management to enable the collection, processing and loading of information from various sources into a single database. ETL systems allow efficient data acquisition from diverse sources such as databases, CSV files, spreadsheets or XML files. Subsequently, these data are processed to convert them to a consistent format and eliminate any errors or inconsistencies. Finally, the data are loaded into the target database, where they are ready for analysis and use.

Level 3. Tools for visualizing database information. Data are far better comprehended when presented in an effective graphical form. These tools enable users, including managers and business analysts, to quickly create various visualizations like charts, tables and heatmaps that improve our understanding of the information stored in databases. These visualizations

help users detect patterns, analyse trends and identify significant relationships in data. For instance, a marketing department manager may use a database visualization tool to create an interactive chart presenting the effectiveness of different advertising campaigns in various regions. This allows for a quick assessment of which campaign works best so that the marketing strategy can be adjusted.

Level 4. Tools for analysing large databases. A crucial element in Big Data analysis, these are advanced applications and platforms, such as Apache, that enable the processing and analysis of massive amounts of data in a distributed manner. This means that data are processed on multiple servers simultaneously, ensuring scalability and significant computing performance. An example might be an e-commerce company employing Apache Spark to analyse vast sets of transactional data. The tools help a company identify customer purchasing patterns, analyse trends and optimize marketing strategies. These tools provide a deeper understanding of customer behaviour and better adaptation of the product offering.

Level 5. Data quality management software. Data quality can be checked, improved and maintained through the automated detection and elimination of data errors, standardization of data, verification of information from external sources, and completion of missing data. Often, these tools can manage the data entry and modification process, continuously monitor data quality and then generate data quality reports. For example, an insurance company might use such tools to automatically detect and correct errors in customer data.

Level 6. A data simulation methodology. Data simulation is an incredibly useful tool in various fields and involves the creation of data that mimic real-world information. This is particularly valuable for testing different scenarios and variations of system operations, algorithms or mathematical models. Data simulation can be used for safe, controlled testing without using real data, which is a crucial facility when dealing with sensitive information. In the medical field, for example, data simulation can create artificial datasets of patient information. The simulated data can be used to test and evaluate the performance of new diagnostic or therapeutic algorithms, eliminating the risk of making real-world errors or endangering patients.

Level 7. Machine learning algorithms. These powerful tools can identify and classify atypical data in ways that are often hard or impossible using traditional analytical methods. The algorithms learn from existing data in order to classify new data, making them extremely versatile. In banks and payment processing companies, for example, machine learning algorithms can be used to identify anomalous customer behaviours. By analysing extensive datasets, machine learning algorithms can detect suspect behaviours and block such operations. Thus, by working with a database of banking transactions, machine learning algorithms further protect customers against, for example, fraudulent activity.

Area 4E. Computing

In the realm of digital transformation, the area of computing focuses on the essential tasks of processing and analysing data within an organization. Utilizing a variety of modern technologies, data computing aims to dramatically enhance operational efficiency and effectiveness. By effectively harnessing these technological tools, organizations can extract and leverage valuable insights from their accumulated data. This not only aids in more informed decision-making but also optimizes business processes, thereby ensuring that the organization remains agile and responsive.

Level 1. Computation by PC. Personal Computers are used for data-processing tasks. These stations are equipped with efficient data-processing software and hardware. Data processing on PC stations is suited to various fields, ranging from financial and marketing analysis to CAD/CAM design. The drawback of this method is its lack of scalability, meaning the amount of processed data is limited by the computational power of the individual machine. In the case of CAD/CAM design, PCs can be utilized for 3D modelling and simulation, but with more complex projects they may not meet the computational load requirements.

Level 2. Computation by edge devices. Edge computing is an approach to data processing in which computational operations are executed on devices located near the data source, rather than in distant data-processing centres or the cloud. This approach allows for faster, more efficient, more effective data processing since data do not need to be transmitted to distant data centres, thereby reducing delays and network loads. Additionally, computations on edge devices improve decision-making speeds, as data are processed in real-time, even before being sent to data-processing centres or the cloud. For example, in medicine, computations on edge devices enable real-time monitoring of a patient`s condition, and crucial responses to changes can be made more quickly than if the data were to be transmitted to a remote centre for calculation.

Level 3. Virtual computing machines. The virtualization of computing machines is a technology that allows multiple virtual machines to be run

on a single physical server or computer. Each of these machines operates as a separate system, with its own hardware resources and software, and their operation is isolated from other virtual machines and the host. Virtual computing machines in manufacturing companies, for instance, can speed up simulations used to optimize production scheduling by performing them in parallel, rather than in series. This enables near-real-time adjustments to production plans in cases of disruptions to production lines.

Level 4. GPU technology. Graphics Processing Units are a type of processor specifically designed for graphics processing and parallel computing. In recent years, they have become a popular tool for accelerating computations in areas such as machine learning, data analysis, numerical simulations and more. By leveraging hundreds or thousands of parallel cores, GPUs can accelerate computations by several orders of magnitude compared to traditional CPU processors.

Level 5. Cloud computing. This is a model of delivering computational, networking and application services over the Internet. In cloud computing, computational resources such as servers, memory, networks and databases are provided as a service, allowing them to be used flexibly, based on user needs. Various service models are available in cloud computing, including Software-as-a-Service, Platform-as-a-Service and Infrastructure-as-a-Service.

Level 6. HPC. High-Performance Computing is a technology that can execute extraordinarily complex computations on multiple processors simultaneously. This allows large amounts of data to be processed quickly, which is essential in various fields such as science, finance, industry and data analysis. HPC systems consist of multiple computing nodes connected by a high-throughput network. In the field of science, HPC technology is used for simulating complex physical phenomena to process vast amounts of data and obtain results in a short time.

Level 7. Computer clusters. These complex systems consist of many interconnected computers operating as a single computing unit. In the aviation industry, computer clusters are used for aerodynamics simulations, enabling the rapid processing of large amounts of data and shortening analysis times for more efficient designing of new aircraft models.

Axis 5: Competence levels and digital culture

Axis 5, focusing on the digital culture of an organization, describes softer, yet equally crucial aspects of a company`s digital transformation. Unlike the first three axes, which directly influence the financial performance of an organization, the last three, especially Axis 5, emphasize the organizational behaviours critical for successful transformation. Experience in implementing digital transformations with client companies indicates that failures are often attributable to a lack of attention to organizational culture.

A transformational culture within an organization encompasses values, attitudes and practices that promote agility in the face of changing market and technological conditions. Such a culture values openness to change, innovativeness and a propensity for experimentation and judicious risk-taking. In organizations endowed with a strong transformation culture, employees are actively engaged in the change process and encouraged by leaders to be creative and inventive, which enhances agility.

Culture of Transformation

Type 6	Transformative	**Level 6**	Consolidation of Changes and Integration into Organizational Culture	Cross-Organizational Project Teams	Collaboration with External Entities	Availability of Partners
Type 5	Passive	**Level 5**	Implementation of Organizational Change	Mentoring	R&D Process in the Organization	Access to Experts
Type 4	Autocratic	**Level 4**	Communication of Change Vision	Self-Education	Permission for Making Mistakes	Access to Training
Type 3	Directive	**Level 3**	Formulation of Vision and Change Strategy	External Trainings	Market Trend Analysis	Access to Technology
Type 2	Supporter	**Level 2**	Creation of a Coalition for Change	Internal Trainings	Experimentation	Access to Data
Type 1	Innovator	**Level 1**	Awareness of the Need for Change	Trade Shows and Conferences	Promotion of New Ideas in the Organization	Access to Capital
	1. Leadership Styles		**2. Readiness for Change**	**3. Continuous Improvement**	**4. Culture of Innovation**	**5. Resource Availability**

Figure 15

For digital transformation strategies to succeed, they must align with the organizational culture. New technologies and processes require shifts in both thought and action across all levels of the organization. Without a culture that supports innovation, flexibility and openness to change, even the most

meticulously developed digital strategies may encounter tepid support or outright resistance. Thus, it is imperative to cultivate an organizational culture that not only supports but champions the values integral to digital transformation. This axis will explore five key areas – leadership styles, readiness for change, continuous improvement, innovation culture and resource availability – each of which is crucial for fostering an environment conducive to sustainable digital growth.

Area 5A. Leadership attitudes

In the leadership aspect of digital transformation, we shift from evaluating on a 'Level 1–6' scale to using 'Type 1–6' to reflect that no single leadership attitude is inherently superior across all contexts. The aim is to discern predominant leadership traits within the organization and identify those that should be cultivated to promote readiness for transformation. This evaluation helps pinpoint the most visible leadership characteristics in the current organizational climate and identify potential areas for development. By understanding these dynamics, organizations can intentionally sculpt their leadership culture to align with modern demands and transformational challenges. Six types of leadership attitudes – passive, autocratic, directive, supportive, innovator and transformative – are assessed. The crucial task is to determine which are the prevalent attitudes and which should be developed to prepare the organization for successful transformation.

Type 1. Passive leadership is characterized by the leader`s lack of active engagement in innovative processes and failure to motivate employees. A leader adopting this attitude leaves employees without help and support. The organization may experience stagnation as a result, and the lack of innovation and creativity in the company degrades competitiveness. A typical example of this attitude would be a leader who takes no action related to innovation and does not motivate employees to think creatively. Feeling abandoned and with their ideas for improvement ignored or trivialized, the employees who might drive change lose enthusiasm. Ultimately, market position is lost because competitors investing in innovation gain a competitive advantage.

Type 2. Autocratic leadership is an approach in which the leader makes decisions independently, without involving the team. It is characterized by a tendency to ignore suggestions and ideas from employees, significantly hindering innovation in the organization. Not being consulted, the team feels excluded from the decision-making process, and their contributions are not appreciated. As a result, innovation and creativity in the company are limited, degrading the organization`s capacity to generate new ideas and to develop.

Type 3. Directive leadership focuses on guiding the team to achieve specific goals and results related to innovation. The leader is demanding and organized but can provide the team with the necessary resources and tools to help them achieve these goals. As an example of this attitude, we can cite Steve Jobs, the former CEO of Apple. Jobs was known for setting exceedingly high expectations for his team, especially regarding innovation and product quality. However, he also provided his team with the necessary tools and resources, such as technological innovations and financial support, contributing to the creation of innovative products. This leadership attitude can result in achieving ambitious innovation goals while maintaining control over the process.[50]

Type 4. Supportive leadership is based on supporting and motivating employees to create new ideas and innovations. Such a leader creates a work environment in which people feel safe sharing ideas and taking risks. This attitude strongly encourages team members to think creatively and take initiative. A leader with a supportive attitude creates an atmosphere of trust in which employees feel that their ideas are valued. This, in turn, can contribute to the development of creativity and innovation in the organization because people are more willing to share ideas and experiment. An example of this attitude is Richard Branson, the founder of the Virgin Group. Branson is known for creating an organizational culture based on support and for motivating employees to innovate. Thanks to this approach, his company has become a source of numerous new products and services.[51]

Type 5. Innovator leadership constantly seeks new opportunities and ideas; it experiments and strives for innovation. Such a leader is open to risk and mistakes, as well as to feedback and suggestions from the team. The innovator continually seeks inspiration for further development, both in terms of operating methods and market offerings. This attitude is embodied by Elon Musk, the driving force behind companies such as SpaceX and Tesla. Musk is known for his willingness to take risks and invest in innovative projects. His approach inspires teams to think outside the box and strive for continuous development. For a leader with an innovator attitude, it is essential to encourage experimentation and not be afraid to make changes.[52]

Type 6. Transformative leadership is a style in which the leader aims to bring about changes and transformation in the organization. Such a leader focuses on building vision and motivation to inspire others to act. At the same time, there is an emphasis on values, ethics and morality and the continuous development of employees. The main differentiator of this attitude is a rejection of the status quo and a continuous pursuit of improvement and change. Warren Buffett, the renowned investor and founder of Berkshire Hathaway, is an example of a transformative leader in the world of finance. His investment strategy, based on long-term thinking and ethical principles, changed how investors perceive the financial market. Buffett always emphasized the importance of honesty and continuous learning. This approach contributed not only to the success of his company but also to shaping ethical standards throughout the financial industry. Thus, a leader with a transformative attitude can bring about significant changes in the organization, especially in companies needing cultural revolution, innovation and a long-term strategy. Their ability to inspire others and consistently set and pursue goals contributes to the success of both the organization and its employees.[53]

Area 5B. Readiness for change

This area assesses how prepared a company is to implement and adapt to new digital strategies and innovations. This evaluation focuses on the organization`s agility and responsiveness to technological shifts and market demands. It gauges whether the workforce and leadership are predisposed to embrace transformation initiatives or to resist them due to entrenched habits or a fear of the unknown. The need for change must be recognized if any transition to new processes and technologies is to run smoothly.

Level 1. Recognizing the need for change. Organizations aiming for success and competitiveness must identify the need for change and take action to implement it. It is essential to understand why change is necessary, what might happen if it is not implemented, and what benefits might arise from new solutions. Implementing change can be challenging and may require sacrifices, but organizations that embrace the challenge and actively strive for improvement have a better chance of surviving and developing. As a negative example, Kodak, by failing to recognize the need for change and adaptation to the digital revolution in photography, lost its dominant market position.

Level 2. A coalition dedicated to implementing transformation. A group of individuals or a team work together to achieve a specific transformative goal. In the context of organizational transformation, a coalition may consist of employees, managers, project leaders and other individuals with a stake in the changes. The team`s goals are to support and promote changes, to engage employees and encourage them to engage fully in the transformation, and to overcome resistance to change while also addressing conflicts. A coalition can also assist in identifying and resolving problems that may arise during the transformation process.

Level 3. Seeking a vision. Formulating a vision and strategy for digital transformation is a crucial part of the process. The vision should determine the direction in which the organization wants to go, and the strategy should describe the action plan and specific goals to be achieved by the transformation. Practice shows how important it is to involve all employees in creating the vision and change strategy and in implementing them. An

example of this level of excellence is a company in which employees from various departments are involved in creating the vision of change, identifying key challenges and developing a strategy, thereby enhancing the sense of ownership and commitment to the transformation plan.

Level 4. Communicating the vision. The vision of change must be formulated and presented in a way that is accessible to all employees. Communication should be two-way and consider the opinions and suggestions of employees so that the vision can be better adapted to the organization`s actual needs. Continuous communication of progress and achievements is also crucial for maintaining motivation and engagement in the change process.

Level 5. Implementing change. Implementing change initiatives involves taking specific actions to introduce and carry out changes. Implementing changes requires that we plan, define goals and directions, and identify the people and resources needed for change. It is also essential to define criteria for assessing progress and results.

Level 6. Institutionalizing and inculturating change. At this stage, the objective is to make the transformation integral to the company`s working methods and culture. It is important to regularly assess the effectiveness of implemented changes and modify the strategy accordingly. Also important is that adequate training and support be given to help employees adapt to the new priorities and ways of working. This requires that the leadership continuously engage in the transformation process and promote the newly implemented solutions.

Area 5C. Continuous professional development

This area emphasizes the ongoing education and skill enhancement of employees within an organization. This facet of digital transformation is essential for maintaining a workforce that is not only proficient with current technologies but also adaptable to future innovations. By prioritizing continuous learning, organizations can ensure that their teams remain competitive and are well-prepared to cope with new difficulties and technologies as they arise. This area assesses the effectiveness of training programmes, the accessibility of learning resources and the overall commitment of the organization to fostering an environment of lifelong learning and professional growth.

Level 1. Outside contact. Trade fairs and conferences are popular venues for developing skills within the organization. At such industry events, company representatives and specialists meet to share knowledge and experience, learn about the latest trends and technologies, and establish business contacts. Conferences, in turn, allow experts to share their knowledge and experience in a specific field. Lectures panel discussions and workshops engage employees in developing skills and acquiring new competencies. Conferences also provide an excellent opportunity for business networking and exchanging experiences with other specialists in the industry.

Level 2. Internal training. The training system within an organization plays a crucial role in transforming its culture, requiring employees to stay updated with the latest trends and technologies through regular training that enhances both technical and soft skills such as communication and leadership. This system should be adaptable to different learning styles and tailored to employee needs, fostering an environment that values continuous learning and improvement. Moreover, internal training – whether conducted by in-house specialists or external experts – focuses on enhancing skills, developing potential and increasing knowledge, indicating the company`s commitment to employee development and integrating training into its cultural fabric.

Level 3. External training. Training provided by external companies brings in seasoned specialists who offer fresh perspectives and diverse problem-solving techniques, enhancing the organizational transformation process by

integrating an external view on necessary changes. While external training exposes employees to a broader range of experts and knowledge, potentially breaking organizational insularity, it may not always align perfectly with the immediate needs of the company. In contrast, internal training is more adaptable to specific organizational contexts but might simply circulate pre-existing knowledge within the company. This suggests a strategic blend of both internal and external training could optimize learning outcomes and adaptation to change.

Level 4. Self-development. Self-education is a continual process of individual acquisition of knowledge, skills and experience without the need for formal education, such as through reading books and articles or participating in online training. Self-education allows individuals to develop in directions that most interest them in the way that best suits them. In the context of organizations, employees` self-education can, and should, be integrated into the transformation culture strategy.

Level 5. Working in project teams. Project teams consist of employees from various departments who collaborate on specific tasks or projects, leveraging their expertise towards a common objective. This team structure not only speeds up decision-making and boosts efficiency but also facilitates personal skill development and broader professional growth through cross-functional collaboration. For instance, when developing a new product or service, representatives from different departments can pool their specialized knowledge, enhancing the entire team`s understanding of the project`s challenges and potential solutions. This approach not only achieves better outcomes but also serves as a powerful educational experience within the context of real-world tasks.

Level 6. Mentoring. In this model, an experienced employee, the mentor, serves as a guide and support for a junior employee, the mentee. Mentors are carefully selected for their rich experience and competence in a specific field, with their main goals being to assist the mentee in understanding the demands of their job and tools and to guide them towards achieving their goals. Mentoring is often integrated into organizational training programmes but can also exist as an individual professional development programme for

employees. Through regular meetings, mentors share their knowledge and experience, help mentees develop practical skills, and provide advice on key issues related to their career paths. This process, based on a relationship of mutual trust, often significantly expands the mentee`s competencies, boosting their achievements within the organization.

Area 5D. Culture of innovation

The 'Culture of Innovation' area focuses on fostering a workplace environment where creativity and novel ideas are not just welcomed but actively encouraged. In such organizations, employees are motivated to explore new solutions and innovative approaches, contributing to the organization`s continuous development. A strong innovation culture views mistakes as learning opportunities rather than setbacks, promoting a mindset of growth and resilience. This initiative-taking stance is crucial for maintaining agility and effectiveness in a rapidly evolving market, allowing the organization to capitalize on emerging opportunities and drive sustainable success.

Level 1. Promotion of new ideas. At this stage, organizations encourage their employees to engage in generating innovative ideas. This is the moment when creativity is nurtured. This level is achieved by organizations that regularly organize hackathons and create dedicated platforms for employees to share their ideas. Furthermore, the most innovative proposals are acknowledged by rewarding employees.

Level 2. Experimentation. Organizations allow their employees to test new concepts and ideas in practice. Employees are given the opportunity to implement their ideas, which is a significant step in the process of creating innovation. At this stage, support mechanisms exist for experimental projects, but they are not fully developed. Organizations approach this process cautiously, encouraging employees to conduct research projects and prototyping. This approach minimizes the risk and costs of changes and allows for effective testing of ideas in real conditions.

Level 3. Active market trend analysis. This stage involves not only identifying trends but also seeking to understand their implications for the company`s operations. Organizations examine changes in customer preferences, market competition and innovations in their industry. This in-depth analysis enables organizations to better understand their environment and adjust their strategy. So, for example, a cosmetics company might use a detailed analysis of market trends to identify growing consumer interest in environmentally friendly products. Instead of remaining passive to these changes, the company

adjusts its offerings by introducing eco-friendly products, thus acquiring new customers and strengthening its market position.

Level 4. Acceptance of mistakes. Organizations at this stage understand that experimentation and seeking new solutions can sometimes lead to errors, but they are willing to accept this risk. Employees feel free to take risks and explore new ideas, even if it involves the chance of mistakes. Some companies, for example, run regular competitions for the biggest blunder of the week. As part of the competition, employees are encouraged to share mistakes that happened during the week. Though unusual, the contest aims to emphasize that every employee can make mistakes and that the company can accept mistakes as long as they lead to learning and improvement. This innovative approach to accepting mistakes aims to eliminate the fear of making mistakes and to create an atmosphere of experimentation. Employees, seeing that mistakes are part of the development and learning process, gain more confidence and willingness to try new solutions. This makes the organization more flexible and innovative.

Level 5. R&D integration into company strategy. Organizations at this stage invest significant resources in research, develop experimental activities, and design new solutions that are later tested in the form of prototypes. The R&D process is no longer a one-time event but a constant part of the pursuit of innovation within the organization. Employees recognize the role of this process in creating new products or services and strengthening the company`s market position.

Level 6. Integration of external collaboration into company strategy. Organizations acknowledge that partnerships with other companies, research institutes or startups are crucial for accelerating the innovation process. By being open to collaboration with external entities, organizations gain access to new technologies, knowledge and perspectives that may be hard to obtain internally. This approach allows organizations to better leverage the innovation ecosystem and more quickly put out new solutions. An example here is a medical software company that partnered with a local university. They jointly researched advanced diagnostic tools. This collaboration provided the company access to the latest scientific and technological advancements and

expert knowledge from the university. This resulted in the faster introduction of advanced diagnostic tools to the market, benefiting both the company and the entire medical sector.

Area 5E. Resource availability

Resource availability is pivotal in assessing an organization`s capacity to support and sustain transformational efforts. It involves securing not only the financial investments necessary for initiating change but also ensuring access to the appropriate tools, software and equipment that empower employees to execute and maintain new solutions. Additionally, employees must have sufficient time and be given the right opportunities to contribute meaningfully to these changes. Effective resource allocation directly influences the pace and success of innovation, enabling organizations to adapt swiftly and efficiently to new threats and opportunities in the digital landscape. This strategic approach to resource management fosters an environment where transformation can thrive, supported by a robust infrastructure of both material and human assets.

Level 1. Access to capital. Organizations direct their attention to ensuring adequate sources of funding for the transformation process. This is a key element of organizational transformation, as organizations must be prepared to finance planned initiatives and projects. The question is whether the company has a financial plan that includes expenses for implementing transformation initiatives.

Level 2. Access to training. The question here is whether various paths to training exist within the organization, including both internal and external training, mentoring programmes and self-learning. The example here is of a manufacturing company that was introducing a new management system. The company expanded its training programmes to cover various aspects of the new system. Employees were given access to internal training on operating the new software but also participated in webinars conducted by the system provider, allowing them to gain firsthand expert knowledge.

Level 3. Access to experts. The focus is on whether employees consistently access expert knowledge through both external consultations and internal training. This approach evaluates whether an organization is committed to ongoing employee development and effectively integrates expert knowledge into its transformation strategy. For instance, a marketing agency has established a continuous relationship with an SEO expert who not only

conducts workshops but also provides ongoing support, enhancing the team`s skills and the agency`s processes. This sustained engagement with specialists not only boosts employee capabilities but also significantly enhances the agency`s marketing success, thereby increasing customer satisfaction and competitive edge. This exemplifies an organization`s strategic use of experts as a core component of its innovative culture.

Level 4. Access to data. Organizations move from basic data analysis to advanced use of data in the decision-making process. The question is whether the organization has appropriate information systems and databases and focuses on securing and utilizing them. At this point, the organization realizes that data are an essential foundation for fact-based decision-making. An example could be a logistics company utilizing advanced IT tools for shipment analysis. Through a data warehouse, the company can precisely monitor, analyse and forecast shipment traffic. Decisions such as optimizing delivery routes or inventory management are data-driven rather than intuitive. Furthermore, the company emphasizes data security, which is crucial when dealing with shipment information.

Level 5. Access to technology. Organizations concentrate on providing employees with access to modern tools and technologies. The question of whether employees have access to modern technologies supported by appropriate training and technical assistance is crucial in the context of organizational transformation. Organizations realize that innovations often require tools that allow for more advanced actions, and they invest in them. Our example here is that of an advertising agency deciding to invest in the latest graphic design and data analysis software. This gives employees access to advanced tools to create effective advertising campaigns and analyse their outcomes. Furthermore, the company secures training for employees, enabling them to use the new technologies effectively. This is an example of an organization that understands that investments in modern technologies contribute to improving efficiency and competitiveness.

Level 6. Access to partners. Organizations pay special attention to the ability to collaborate with external entities. This collaboration is crucial in the context of organizational transformation because external partners can bring

knowledge, experience and capital that expedite innovative processes. The example here is a software company and a technical university entering into a strategic partnership. The university provides the company with research and knowledge in technology, and, in return, the company offers internships to university students. This mutual benefit accelerates the innovation process and contributes to the development of both parties. For the university, it means that its knowledge finds practical application and that it can provide students access to real projects. For the software company, it means access to the latest research and young, talented employees.

Axis 6: Cybersecurity

In the digital age, cybersecurity has transcended its past role as a mere safeguard to become a fundamental pillar of operational integrity and trust. As organizations increasingly digitalize their operations, the importance of robust cybersecurity measures has never been more critical. Accordingly, this sixth axis of digital transformation explores how deeply an organization has ingrained security practices into its digital and operational fabric. The relentless evolution of cyber threats means that a proactive stance on cybersecurity is not just advisable; it is imperative for protecting sensitive customer data, ensuring privacy and maintaining the trust that is so crucial to sustaining reputation and financial viability.

Cybersecurity

	1. Strategy and risk management	2. Network and System Protection	3. Data Protection	4. Education and quality system	5. Emergency plan / Contingency plan
Level 6	Monitoring and evaluation of strategy implementation	VPN	Identity verification and authentication	ISO 27001 certification	Documentation maintenance
Level 5	Human resource management	Authorization and authentication systems	Threat monitoring and detection	Cybersecurity audit plan	Testing of contingency plans
Level 4	Security policies	Security information and event management (SIEM) systems	Backup and disaster recovery (BDR)	Internal nominated auditors	Regular employee training
Level 3	Action plan	Intrusion detection systems (IDS)	Access controls	Implemented and executed security testing system	Establishment of standard operating procedures
Level 2	Risk analysis matrix	Antivirus	Password security	Training implementation plan	Setting priorities
Level 1	Strategy document and risk management methods	Firewall	Data encryption	Description of the cybersecurity training system	Threat identification

Figure 16

This axis evaluates an organization`s cybersecurity maturity across five distinct but interconnected areas: strategy and risk management, protection of networks and systems, data security, education and training, and emergency planning. Each area is assessed on a graduated scale that corresponds to the depth and sophistication of cybersecurity measures in place. From the basics of securing network perimeters to the complexities of managing a comprehensive emergency response, this axis provides a structured framework to gauge how prepared an organization is to defend against and respond to cyber incidents with the potential to disrupt operations and compromise data

integrity. As we elaborate on the specifics of each area, we underscore the critical need for an integrated approach to cybersecurity, one that stays in step with both technological advancements and emerging threats. The level of an organization`s digital development in the area of cybersecurity is assessed in five areas: strategy and risk management, network and system protection, data protection, education and quality systems, and emergency plans. Each area is evaluated on a scale from level one to level six.

Area 6A. Strategy and risk management

Strategy and risk management emphasizes the foundational need for a coherent and comprehensive approach to security within an organization. This entails the establishment and enforcement of a robust cybersecurity strategy and policy that outlines the organization`s security objectives, principles, standards and procedures. They also delineate the roles and responsibilities associated with managing and mitigating risks. This strategic framework is crucial for identifying potential cybersecurity risks. Through systematic analysis and assessment, the organization can prioritize these risks and apply the most effective risk management techniques to minimize exposure and enhance its defence against potential security breaches. This strategic preparation is vital for building a resilient infrastructure that can withstand and rapidly recover from disruptions caused by cyber threats.

Level 1. No cybersecurity strategy or policy. The organization has not developed or implemented a cybersecurity strategy or policy. There are no defined goals, standards or security procedures. Risk management is impossible, and the organization is exposed to serious threats.

Level 2. Risk analysis. The strategy involves a cybersecurity risk analysis that determines threats and risks associated with the organization`s activities, the assets exposed to risk (such as customer data) and the development of preventive measures. For example, in a financial institution, risk analysis may include assessing threats to payment systems, identifying vulnerable assets such as customer data, and developing preventive measures.

Level 3. Action plan. The strategy includes, in addition to risk analysis, an action plan that specifies the precise steps the organization will take to minimize risk. In a bank, the action plan may include regular software updates, security training and the implementation of incident response procedures.

Level 4. Security policies. The strategy also describes cybersecurity policies that define the standards and procedures the organization will use to protect its assets and data. In a company, security policies may include rules for setting strong passwords, data and system access procedures, and guidelines for software updates.

Level 5. Strategy includes human resource management. This may cover training the organization`s staff in the skills and knowledge needed to effectively counter cybersecurity threats. For example, the company includes regular security training for employees and specialized courses for the IT team, increasing readiness to respond to cybersecurity threats.

Level 6. Monitoring and assessment. The strategy includes plans for monitoring and assessing the effectiveness of cybersecurity actions to ensure that the strategy is working and being updated as the organization`s needs change. Examples of solutions include regular audits, penetration tests and log analysis to monitor and adjust the cybersecurity strategy to current needs.

Area 6B. Protection of networks and systems

The protection of networks and systems focuses on the deployment of robust technologies and methodologies essential for safeguarding an organization`s digital infrastructure. This includes the installation of firewalls, intrusion detection systems and antivirus software, which serve as the first line of defence against cyber threats. Additionally, implementing access control systems ensures that sensitive information and critical systems are accessible only to authorized personnel. Data encryption and routine backups further fortify security by protecting data integrity and ensuring that, even in the event of a breach or data loss, the organization can recover swiftly and effectively. These protective measures are integral to maintaining the security and operational continuity of the network and system infrastructure.

Level 1. Firewalls. This type of software or device acts as a barrier controlling traffic between different segments of the network, allowing only trusted sources to access sensitive financial data. This ensures effective protection against potential threats. For example, for companies in the financial industry, such as banks or investment firms, a firewall is a key tool for protecting against unauthorized access to networks.

Level 2. Antivirus. Companies install antivirus programs on all their computers to regularly scan files and systems, detecting and removing malicious software. This is crucial for, for example, maintaining the security of medical information and system stability. In the healthcare sector, where patient data confidentiality is a priority, antivirus programs serve as the first line of defence against malicious software.

Level 3. Intrusion Detection Systems. In case of suspicious activities, such as intrusion attempts or attacks on control systems, these systems immediately generate alarms, allowing for a quick response and risk minimization. For example, in the energy sector, threat detection systems are essential for monitoring network traffic and securing energy infrastructure.

Level 4. SIEM or IDS. Upon detecting abnormalities in delivery or attempts to compromise data, Security Information and Event Management systems and Intrusion Detection Systems analyse data from multiple sources and

generate alerts or reports, enabling an effective response and ensuring operational continuity. These systems are used in the transportation sector, for example. Here, where complex logistics networks and data management are commonplace, incident detection systems are essential.

Level 5. Authorization and Authentication Systems. These systems verify the user`s identity and access level. In the education sector, for example, where there is a need to secure access to university resources, authorization and authentication systems are indispensable. Students and staff must provide unique identification data and passwords to access educational materials.

Level 6. VPN. Virtual Private Networks are used as a fundamental part of cybersecurity in, for example, the e-commerce industry, where secure transmission of financial data is a priority. Online merchants use VPNs to ensure a secure connection between different geographical locations, protecting sensitive data from interception. This allows for the secure transmission of financial information over public networks while protecting customers.