



Digital Transformation

► Digital MedTech Transformation

A practical guide for MedTech companies to navigate digital transformation, outperform competition, and increase patient value

Porsche Consulting
Strategic Vision. Smart Implementation.

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1 Preface

The MedTech industry has experienced impressive growth over the last decade. The vast majority of MedTech companies are valued globally, as their products meet the highest individual patient demands in terms of innovativeness, functionality, quality, and reliability. And the MedTech industry has also been able to strengthen its market position despite globalization trends in general. Even forecasts find that the value of the worldwide medtech market will reach \$520 billion by 2022 (CAGR of 5.1%)¹. This success is not set in stone for all companies of the MedTech sector. Omar Ishrak, CEO of Medtronic, sees healthcare at a crossroads. We share his opinion, perceiving strongly disruptive forces driven by market, technology, and regulation. Siemens Healthineers are confident that digitalization in healthcare holds great promise and many of today's healthcare challenges can be overcome². Now is the time for a major transformation to shape the future of the MedTech sector. We see MedTech companies currently affected and challenged by three concurrent technology-driven shifts.

▶ **New foundation of digital technologies** – posing questions regarding value creation, product and service innovation, and required capabilities—from delivering spare parts to leveraging 3-D printing, from human experts to self-learning systems

▶ **Shift to value-based healthcare** – posing questions regarding pricing models, customer and patient relationships—from supplier to ecosystem partner, from hardware to software and data-driven digital services

▶ **Increasing pace of digitalization** – posing questions regarding ecosystem positioning, digital excellence, and data monetization—from machine automation to connectivity and analytics, from single machines to entire value networks

These shifts carry the risk of weakening the solid position of incumbent MedTech players. In an increasingly software-driven environment, MedTech companies cannot rely on their hardware

strengths alone, not even with advanced embedded software. The upcoming cyber-physical world (Internet of Things) requires competency in both fields—the Internet and Things. MedTech companies can also turn these shifts into new opportunities for further growth, greater efficiency, and increased patient value. This publication serves as a guide to successively seize the opportunities arising from the aforementioned market shifts. While the need for increased digital transformation efforts to secure competitive advantages has arrived at MedTech's top management level, the exploitation of correlated gains lags behind expectations. The reasons may be diverse and company-specific but, in most cases, are based on six fundamental shortcomings that leading MedTech companies need to overcome:

1. Efficiency-focused, short-term digital initiatives vs. leveraging digitalization to innovate products/services and build integrated solutions for patients
2. Reliance on strong hardware knowledge (with embedded software) vs. developing and integrating new hybrid and purely digital capabilities into existing operations
3. Position as single industry player with best-in-class solutions vs. new (digital) ecosystem player collaborating, cooperating, and co-innovating with partners and peers
4. Reliable, value-focused developer of complete products vs. joint prototyping with customers, patients and/or partners on new digital innovations to overcome challenges of size and scale
5. Legacy organizational structures for digital initiatives vs. new digital operating models that empower teams, foster collaboration, and create a test-and-learn culture
6. Narrow innovation focused on improving/enhancing existing solutions (10 percent thinking) vs. focusing on patient's unmet medical needs to radically rethink existing solutions (10 times thinking)

¹ "EvaluateMedTech World Preview 2017: Outlook to 2022" (October 2016) ² www.healthcare.siemens.com

Strategic areas of action for MedTech companies

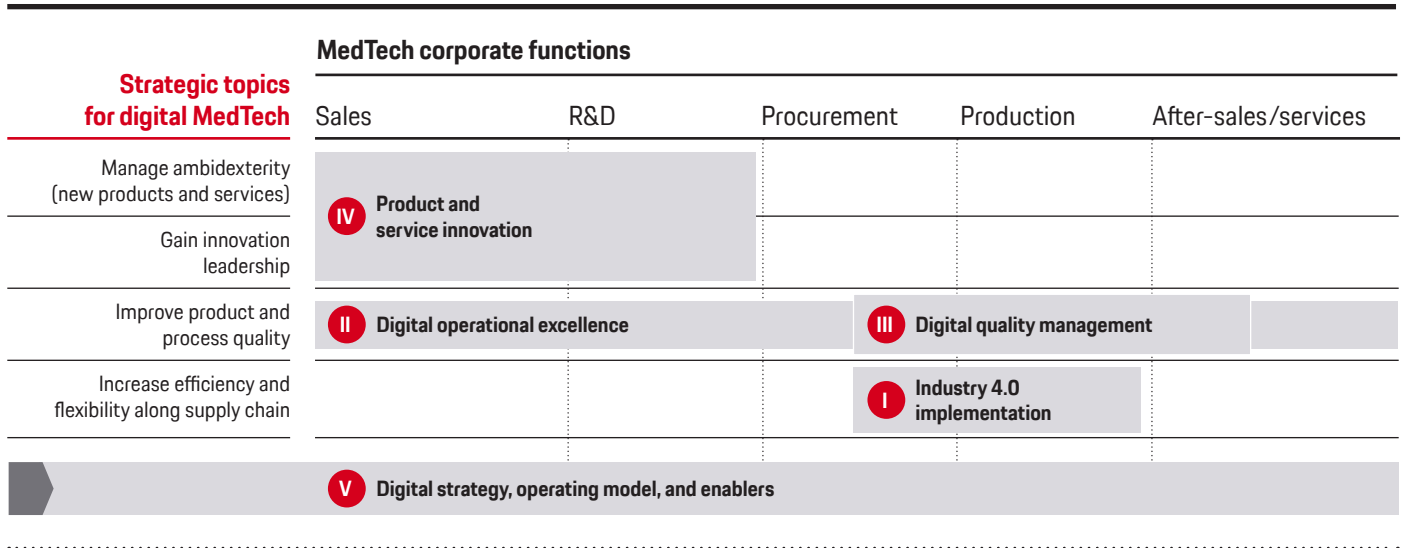


Figure 1

This publication provides proven approaches on how to resolve the shortcomings that often threaten successful digital transformation in industry. Drawing on prior Porsche Consulting transformation projects with various companies, this paper focuses on five areas of action for any hardware-driven incumbent company to evolve into an integrated hardware, software, and digital service player. Figure 1 illustrates these action fields in a matrix of the most relevant strategic digital topics.

In general, all insights and predictions in this paper are applicable to companies of the MedTech sector. As we all know, however, the MedTech sector is thoroughly heterogeneous in terms of product technology, product complexity, product risk classification, addressing patient needs, and the like. In accordance with this assumption, product-related digital approaches described in this publication are somewhat more suited to MedTech companies with high-tech product groups—e.g., diagnostic and therapeutic radiation technology like radiotherapy units, active implantable technology such as pacemakers and neurostimulators, and electromechanical medical technology like lasers and scanners.³ With this in mind, most medical products such as complementary therapy devices, technical aids for the disabled, and even hospital beds could be integrated with electronic information that will increase their value for patients.

I Strategy for Industry 4.0 implementation

Based on Porsche Consulting research activities and project experience, a large number of MedTech companies have begun their first Industry 4.0 use case initiatives, mainly with the associated goal of increasing efficiency and flexibility along supply chains. Most of these initiatives are stuck in the pilot phase, ho-

wever, while rollouts are still limited. The question is *why*.

Chapter 3.1 highlights the top fifteen efficiency use cases currently piloted in production and supply chain environments and describes the most common deployment pitfalls to avoid.

II Digital operational excellence

One of the key strategic topics of our clients and the MedTech executives is the improvement of product and process quality. In the past, MedTech companies have been devoted to operational excellence, focusing on optimizing their physical assets, but recent trends now necessitate digital excellence. The key to digital excellence is an end-to-end digital information flow along the entire product life cycle, known as the “digital thread.” These digital thread opportunities can extend to an even higher level when MedTech companies create dynamic digital models of their physical entities, enabled by the Industrial Internet of Things and advanced simulation technologies. These models are recognized as “digital twins.”

Chapter 3.2 describes how to master digital excellence with a combined digital thread and digital twin approach.

III Digital quality management

To maintain strong positioning and expand the customer base (e.g. hospitals) in an increasingly competitive environment, MedTech companies have to meet the highest quality and regulatory standards with output error tolerances far below 1 percent to ensure patient safety. While traditional quality management approaches, mostly based on manual inspections, are error-prone and not scalable, new technologies enable MedTech companies to optimize all relevant quality dimensions

³ “The European Medical Technology Industry in Figures,” MedTech Europe, 2016, page 5.

at the same time: improved quality, reduced costs, and enhanced yield.

Chapter 3.3 explains how machine-learning algorithms can boost quality management and describes the most relevant application areas.

IV Product and service innovation

Recent advances in the Industrial IoT (IIoT), ubiquitous medical device connectivity, and advanced analytics pave the way for a new era of services. Reduced costs in service delivery and closer client and patient relationships are the key areas to benefit from these new, data-driven service opportunities. In addition to the service revolution, there has also been a gradual, albeit radical shift in pricing models from ownership based to outcome or even value based.

Chapter 3.4 describes a practical path for the exploitation of these new digital service and pricing and business model opportunities.

V Digital strategy, operating model, and enablers

Independent of the strategic focus on digitalization, incumbent MedTech companies need a clear digital agenda—an overall navigation system for a company's digital transformation, unifying strategic direction, ambition levels, enablers, and the measures to achieve them and condensed into a coherent roadmap for accelerated implementation. The second core element is a coherent digital operating model designed to serve as a blueprint for the structures, digital governance, mechanisms, competencies, and culture needed to execute the digital strategy at scale. And finally, MedTech companies have to put identified digital transformation enablers, such as competencies or technologies, into action to achieve impact at scale.

Chapter 4 of this paper summarizes and outlines twelve imperatives to successfully maneuver through the digital transformation journey and master key digital topics.

2 Status quo of MedTech Sector

This chapter summarizes the results of Porsche Consulting project experience and deep MedTech market research activities. We show how MedTech companies are currently approaching and navigating digital transformation. We focus on strategic direction, deployment stages of the most value-adding digital use cases, and challenges to scaling and implementing digitalization. The following section lists the key findings.

- ▶ **Digitalization will impact the core value of MedTech companies.** Executive focus is on digital customer and patient interactions, new data-driven profit pools, and changing competencies.
- ▶ **Digitalization is no longer a production-only affair.** Prioritized objectives span patient value, product/service innovation, quality, and efficiency.
- ▶ **Digital use cases are predominantly in the proof-of-concept stage; rollouts are still limited.** Companies are pursuing multiple use cases, with a common focus on transparency of performance.
- ▶ **Although mainly committed to digital transformation, there are challenges ahead.** Companies need to overcome several “balancing” challenges to start achieving impact at scale.

Digitalization will impact the core value of MedTech companies

Business leaders of MedTech companies expect significant impact from digitalization, not only in regard to technology challenges, but also with respect to fundamental shifts of profit pools (e.g., from products to digital services to increased patient value) and new digitally enabled customer and patient interactions (e.g., connected, patient-centered care). But digitalization will have an even deeper impact on MedTech companies' core value—their engineers. To master the digital transformation, leading players need to develop and integrate a broad range of new talents with new digital competencies such as data science, digital product management, or IIoT platform architecture. While most MedTech companies see the competency gap as the most significant impact, only a few leading players have started to develop and integrate these new digital/Internet talents. The public discussions in media like Harvard Business Review, other manager magazines, or on social business platforms like LinkedIn show that executives are highly aware of this challenge. Nevertheless, its importance is often unde-

restimated. In the coming years we expect the talent gap to become one of the key challenges of digital transformation, since the demand for digital talent will significantly outstrip market supply. Especially for the relatively small MedTech companies, it will result in a war for talents against such leading MedTech players as Medtronic, GE, Philips, Siemens Healthineers, and such dominant digital players as Google and Apple.

Digitalization is no longer a production-only affair

Efficiency-centered digitalization has been replaced by a more holistic view, extending to growth and patient-value opportunities. MedTech managers are currently striving for gains in all three strategic dimensions: customer and patient interactions, growth opportunities and efficiency gains. MedTech companies are exploiting digitalization to leverage existing strengths (e.g., customer and patient intimacy, quality, and innovation) while simultaneously addressing challenges (e.g., complexity, regulatory safety, flexibility, and costs).

Digital use cases are predominantly in the proof-of-concept stage; rollouts are still limited

MedTech companies claim to having either planned, conceptualized, piloted, or implemented digitalization in at least one of the industry segments production and supply chain and IIoT-based digital services. We consider that only a few MedTech companies have implemented and rolled out digital use cases within their organization. Most use cases address performance transparency, remote monitoring, and process control.

Current project experience reveals that successful deployment is largely driven by a holistic approach as well as guidance that interlinks use cases and fosters best-practice sharing. Furthermore, quick test-and-learn cycles for prototypes and pilots are essential. Although some medtech companies have strong knowledge about hardware prototypes, new capabilities are needed to pilot IIoT use cases. Leading companies started early in building these use cases and can now benefit from more advanced maturity levels regarding their implementation.

Although predominantly committed to digital transformation, there are challenges ahead

As a basis for digital transformation, hiring new talents is the next big challenge, while ambidexterity will be a core challenge for future success. Ambidexterity refers to an organization's ability to be efficient in the management of today's business

and adaptable in coping with tomorrow's changing demands. More specifically, the challenge for incumbent MedTech companies is to balance existing core business/operations with entirely new, digitally enabled products, services, and business models. Furthermore, we observe that the majority of medtech companies are behind in terms of organizational readiness, whereas branch leaders have already incorporated agile innovation structures into their core organizational processes and mechanisms.

Conclusion

MedTech business leaders recognize digital transformation as imperative for their future, with digital initiatives expanding across efficiency, growth, customer experience, and patient value. However, most MedTech companies are still in the proof-of-concept stage and have not exploited digitalization's full potential.

To become digital leaders MedTech companies should focus on:

- ▶ **Exploiting Industrial IoT opportunities beyond production-centered digitalization initiatives**
- ▶ **Shifting from operational excellence to digital excellence**
- ▶ **Following a bolder, more highly structured, people-centric digital transformation approach, driven by the CEO**

The following chapters substantiate these imperatives and draw a holistic picture of the most relevant digital opportunities for MedTech companies.

3 Industrial IoT

Reflecting on the endless number of conference panels, media reports as well as scientific and technology vendor publications on the topic, one gets the impression that everything has been said about Industry 4.0 (or Industrial IoT, thus named for its broader scope). Yet only a small number of MedTech companies have exhausted the potential of the Industrial IoT. The success of leading companies stems from a holistic approach of piloting, connecting, and deploying digital use cases across their value network. Small and midsize MedTech companies in particular are still new to digitalization and IIoT value creation, often too production centered, and cyclically stuck in the pilot stage. Below, Porsche Consulting offers four situational analysis questions to facilitate an effective adoption process and help businesses exploit IIoT's full potential.

3.1. Industry 4.0 implementation

How can we close the gap between pilots and deployment with impact at scale?

3.2. Digital operational excellence

How can we leverage the increasing amount of data created across our value chain?

3.3. Digital quality management

How can we improve product and process quality to meet customer and patient demands while optimizing cost and yield?

3.4. Product and service innovation

How can we both monetize new digital service opportunities that arise from Industrial IoT advances and bring value to healthcare?

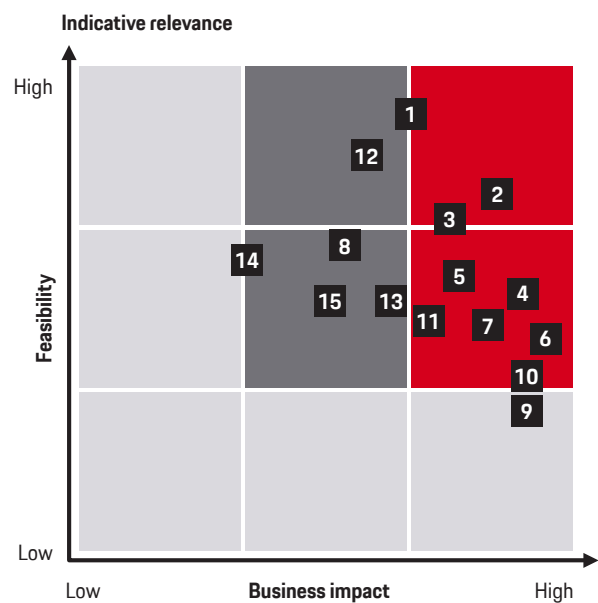
The following subchapters draw a holistic picture of IIoT opportunities and provide recommendations for finding answers to these questions. Chapter 3.1 highlights the top fifteen efficiency use cases currently piloted in production and supply chain environments and lists the most common deployment pitfalls to avoid. The digital thread and digital twin, as described in chapter 3.2, herald a new age for realizing cross-value chain opportunities, while chapter 3.3 explains how machine-learning algorithms can boost quality management. Finally, chapter 3.4 outlines how MedTech companies can exploit data-driven services for top-line growth based on new pricing models and how MedTech companies can reap the benefits from service opportunities.

3.1 Industry 4.0 implementation – from pilots to impact at scale

Porsche Consulting has gained extensive insight from working closely with leaders of various industries, including several brands within the Volkswagen Group, on IIoT adoption. Figure 2 highlights the top fifteen use case clusters currently piloted by hardware-driven companies in their production and supply chain environments.

Top 15 industrial IoT use cases

for production and supply chain



- 1** Digital performance management
- 2** Predictive maintenance
- 3** Digital quality management
- 4** Digital thread/digital PLM
- 5** Smart energy management
- 6** Demand & supply forecasting
- 7** Smart production planning
- 8** Human-robot collaboration
- 9** AI-driven supply chain & logistics optimization
- 10** Data-driven process optimization
- 11** Digital yield optimization
- 12** Digital shop floor management
- 13** Autonomous flow of materials
- 14** VR trainings production & logistics
- 15** 3-D printing for spare parts

Figure 2

Low Medium High

Optimization of overall equipment effectiveness (OEE), reduction of operational costs, increased process efficiency, and quality and flexibility are essential benchmarks for Industrial IoT implementation. Digital performance management (also known as asset management) is a common base case used to support each of these goals by bringing in required machine performance transparency and control.

Many MedTech companies find themselves stuck in the pilot phase of one or more IIoT solutions, unable to realize significant, visible results at scale. Successful, company-wide rollouts are still largely limited. As identified by Porsche Consulting's digital transformation projects, the most common pitfalls are:

- ▶ **Understanding, strategic baselining, and leadership commitment:** lack of overall understanding of Industry 4.0, lack of vision, undefined data strategy, lack of resources and allocated budgets, insufficient leadership commitment
- ▶ **Use cases and piloting:** lack of approach for use case assessment and prioritization, internal roadblocks due to data silos, security/regulatory concerns
- ▶ **Capabilities and infrastructure:** lack of digital competencies, collaboration, and communication; missing implementation of agile development approaches; insufficient partner integration; use of legacy infrastructure
- ▶ **Deployment approach:** lack of approach for use case deployment and rollout including knowledge sharing, lack of dedicated deployment resources, slack project management

Understanding, strategic baselining, and leadership commitment

Although the vast majority of managers affirm the relevance of Industrial IoT, many fail to create a clear vision and coherent plan for its deployment. The reason is a lack of understanding of the digitalization impact in general and Industrial IoT technologies in particular. Consequently, their businesses often reflect disparate digital activities without overarching objectives or realized synergies from the new initiatives. Another shortcoming is the fact that some executives take a functionally focused approach, delegating digital initiatives to business units or departments (e.g., IT), resulting in isolated transformation. Successful, company-wide IIoT exploitation needs 100 percent leadership commitment to create a burning platform for change, a bold strategy, and a robust but dynamic deployment plan with dedicated and knowledgeable teams that integrate digital technology know-how with domain expertise.

Use cases and piloting

Many MedTech companies following the narrow, department-specific pilot approach, often transforming only certain functions within each SBU, such as performance tracking within one production plant. The selection process for relevant digital use cases, especially around Industrial IoT, should instead follow a holistic approach by capturing opportunities in all three strategic areas of growth through new digital products and services, efficiencies along the entire value chain, and new forms of customer and patient interaction. This comprehensive view helps companies better assess the real value and relevance of lighthouse use-case transformations in contrast to single use cases. Data security concerns and regulatory risks are also common hurdles in the early adoption stages, often a discouragement to transformation initiatives. But while security and digital integrity are always important considerations, they should not stifle ingenuity and progress early on.

Capabilities and infrastructure

To bridge the gap between piloted use cases and implementation at scale, MedTech companies need to focus on two areas—capabilities and infrastructure. On the one hand, companies need a scalable IIoT platform as the foundation to scale pilots. On the other hand, they need active partner integration since most of the enabling technologies (e.g., data analytics) should be supplied externally. Digital capabilities are predominantly new digital competencies (e.g., data science, connectivity) but also include new ways of working (e.g., agile development) to foster collaboration and increase speed. In addition to running pilots, MedTech companies should start to design an overall governance framework to prioritize new digital initiatives, steer the rollout of successful pilots, and increase the speed of future decisions, such as budget allocation.

Deployment approach

Once clients are successful with a focused SBU transformation, they frequently struggle with implementing on an organizational scale and realizing the full benefits of IIoT use cases. Assuming sufficiently deployed resources (investment and manpower) as a base requirement, there is no one-size-fits-all deployment approach for successful, large-scale IIoT deployment. There are, however, two commonly used deployment approaches that have proven suitable for scaling up successful pilots. The first is to share best practices between all leading plants of the production network, with parallel rollout initiatives. The second approach recommends that the rollout occur successively, by segment, with one overall strategic plant to identify and test top fields of action.

Key takeaways

Many MedTech companies have initiated the digital transformation process with department and/or function-specific IIoT pilot projects, predominantly within their production facilities.

Most initiatives become sidelined or cyclically stranded in the pilot phase. Full deployments with scalable impact are less common in the MedTech industry.

Common pitfalls of Industrial IoT projects include a lack of clear understanding, misguided focus on technologies instead of pain points, too-narrow use case exploitation, insufficient project steering, and an unclear deployment approach.

but recent trends now necessitate digital excellence. Digitalization can enable leading companies to increase revenue while reducing operational costs. The key to a quantum leap is end-to-end digital information flow along the entire product lifecycle, known as the “digital thread.” However, a full digital thread can take years to implement completely, reinforcing the urgency to start the process of transformation as soon as possible.

Digital thread – the backbone for mastering digital excellence

Digital thread refers to the digitalization and interlinkage of product data and related information—from R&D, design inception, and prototyping to manufacturing and end product in service. As illustrated in figure 3, the key to a successful digital thread is the ability to build a “single source of truth” that provides consistency, traceability, and reusability of digital product information throughout the entire product lifecycle. Furthermore, the digital thread is an enabler to break up silos and integrate steps horizontally. Hence, medical device and in-vitro diagnostic builders can return to “day 1,” where customers and patients and their needs were at the center of a company’s business, instead of being restricted to organizational silos. The results are improved hit rates, increased speed of interactions and decisions, improved flexibility, and higher transparency for all stakeholders. GE, for example, has also realized an 18 percent increase in equipment effectiveness at its Pune factory location due to digital thread technology.

3.2 Mastering digital operational excellence with digital thread and digital twin

In the past, MedTech companies have been devoted to operational excellence, focusing on optimizing their physical assets,

The digital thread as the backbone of tomorrow’s digital excellence

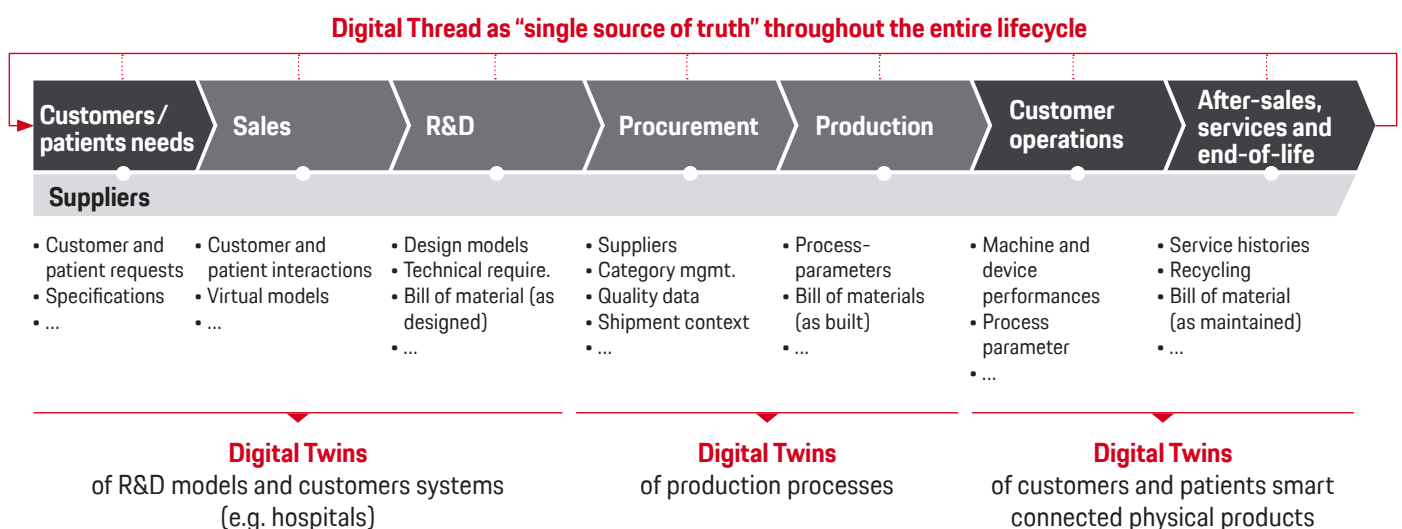


Figure 3
Based on Porsche Consulting project experiences and analysis of third-party data including IDC Future Scope: Worldwide Digital Transformation, PWC: 2016 Global Industry 4.0 Survey, and benchmarks from several consulting peers

The digital thread starts with the product's digital design of the product (e.g., CAD model or bill of material), passes through a digitally steered and controlled manufacturing process (e.g., machine parameters), applies to the machine's in-the-field usage (e.g., performance data) and service (e.g., installed spare parts), integrates the digital information of produced products (e.g., yield quality), and finally ends with product recycling (e.g., reused parts). To explore and identify opportunities within each of these steps, MedTech companies should analyze the entire digital thread along the following two dimensions:

- ▶ **Vertical gains:** solutions within silos, where insights can be used to optimize single-value chain steps. Exemplary use cases are dynamic bills of material (BOM) for engineering, automated sourcing of parts with long lead times, prediction of assembly-process issues via simulations, and recording and updating BOMs of installed machines as they are maintained.
- ▶ **Horizontal gains:** solutions that leverage information across silos and enable stronger, cross-functional optimizations that involve multiple stakeholders. Exemplary use cases are holistic digital quality management, traceability of product data throughout the lifecycle, supply chain optimization, and supplier development.

These digital thread opportunities can extend to an even higher level when MedTech companies create dynamic digital models of their physical entities, enabled by the IIoT and advanced simulation technologies. These models are recognized as digital twins.

Digital twin – the new enabler of smart, connected service offerings

Here we are not referring to the medical digital twin, the VPH (Virtual Physiological Human), as a comprehensive, multi-scale model customizable to any patient. We are focusing on the new enabler of smart, connected service offerings. GE defines this kind of digital twin as a “dynamic digital representation of an industrial asset that enables companies to better understand and predict the performance of their machines, find new revenue streams, and change the way their business operates.” A digital twin is a virtual instance of a process, product, or service. Both the physical and the virtual assets are interlinked in near-real time via connectivity, sensors, and data integration. In 2017 the digital twin was named one of Gartner's top ten strategic technology trends. Thomas Kaiser, SAP's senior vice president of IoT, explains that “digital twins are becoming a business imperative, covering the entire lifecycle of an asset or process and forming the foundation for connected products and services.

Companies that fail to respond will be left behind.” Both the digital thread and the digital twin are not mere concepts but crucial strategic journeys with several intermediary steps and junctions.

Digital twins have the potential to radically change every SBU including design, sourcing, manufacturing, sales, and maintenance within MedTech companies. To leverage the full potential, MedTech companies need to exploit three digital twin archetypes:

- ▶ **R&D twins:**
changing the way products are designed
(innovation, speed, quality)
- ▶ **Process twins:**
changing the way products are manufactured
(cost and quality)
- ▶ **Product twins:**
changing the way products are utilized

While applied digital twins are still scarce, and technologies continually evolve, only a few leading MedTech companies are already using digital twins to understand operations better, get closer to customers and patients, and transform their own businesses gradually. Figure 4 illustrates exemplary business values based on product twin deployments.

Key takeaways

To unlock innumerable product-life-cycle opportunities, digital twins are becoming a business imperative by enabling MedTech companies to better understand operations, get closer to customers and patients, and transition into offering integrated hardware, software, and digital services.

MedTech incumbents need to shift the focus from operational to digital excellence and focus on the digital thread as a foundation for future digital competencies.

As a “single source of truth,” the digital thread enables data-driven optimization of processes, costs, and quality by providing consistent, traceable, and reusable data information.

Digital Twin: impact areas and exemplary business values

Installed base



Digital Twin

- Physical instances of a machine, device or product type with different locations and customers or patients
- Platform manages portfolio of digital twins with overarching analytics
- Digital twins are connected to physical instances in real-time via IoT and sensors

Impact areas

Flexibility

Production efficiency

Quality

Efficiency (e.g., in hospitals)

Services level

New growth opportunities

Exemplary business value

- Reduce time-to-market for new products through simulations
- Update & upgrade machines /devices "over-the-air"
- Improve performance of manufacturing processes
- Reduce operations and process variability
- Improve design based on insights from real (actual) usage
- Detect quality issues and trace back to suppliers or batches
- Real-time performance management and optimization
- Immersive human-machine collaboration
- Improve customer/patient support through remote access
- Proactively and more accurately determine quality issues
- Remote expert support on real-time digital model
- Predictive maintenance and performance-based business models

Figure 4

3.3 Boosting quality management through machine learning

To maintain strong positioning and expand the customer and patient base in an increasingly competitive environment, Med-Tech companies have to meet the highest quality, patient safety, and reliability standards. Most companies in the health environment have error tolerances far below 1 percent or even zero-tolerance policies that are passed up the chain to their suppliers. At the same time, products and manufacturing processes are themselves becoming increasingly complex and, as a result, a single operational activity can simultaneously affect quality, cost, and yield. MedTech companies need reliable methods and processes to ensure sustainable quality without losing performance. Traditional quality management strongly relies on manual inspections by workers, often with inconsistent skill levels. Manual inspections may handle tasks flexibly but are error-prone and not scalable. Even highly automated production systems lack systematic data interlinkage and analysis.

Driving digital quality control with machine learning

Advanced analytics—machine learning in particular—provide an innovative approach to digital quality management. With these technologies, MedTech companies are now able to address and optimize all relevant quality dimensions at the same time:

- ▶ **Improved quality** through new insights and data-driven optimizations

- ▶ **Reduced costs** through automated quality testing and augmentation of manual work
- ▶ **Enhanced yield** through pattern recognition and root-cause analysis along the digital thread
- ▶ **Increased speed** through online interaction with customers, patients, suppliers, and other stakeholders

This is enabled by supervised machine learning techniques capable of learning from relatively small training data sets. The algorithms act like virtual engineers with the same decision behavior as their human counterparts but with the efficiency advantages of machines. Figure 5 illustrates how these advantages can be leveraged and translated into significant business potentials.

Exemplary applications of machine-learning-based digital quality management

The advantages of systems based on machine learning become even more evident in the case of real-time automated quality control along production lines. Until now, this type of inspection required steep investments in equipment, long setup times, and limited tolerance parameters. Modern machine-learning systems are capable of performing visual inspections and quality checks in near-real time, and are able to manage a wide variety of products with intelligent filters. These machine-learning systems enable multiple applications (see figure 6) while remaining affordable for companies of any size due to significantly lower costs than traditional methods.

Exemplary business outcomes through applied machine learning

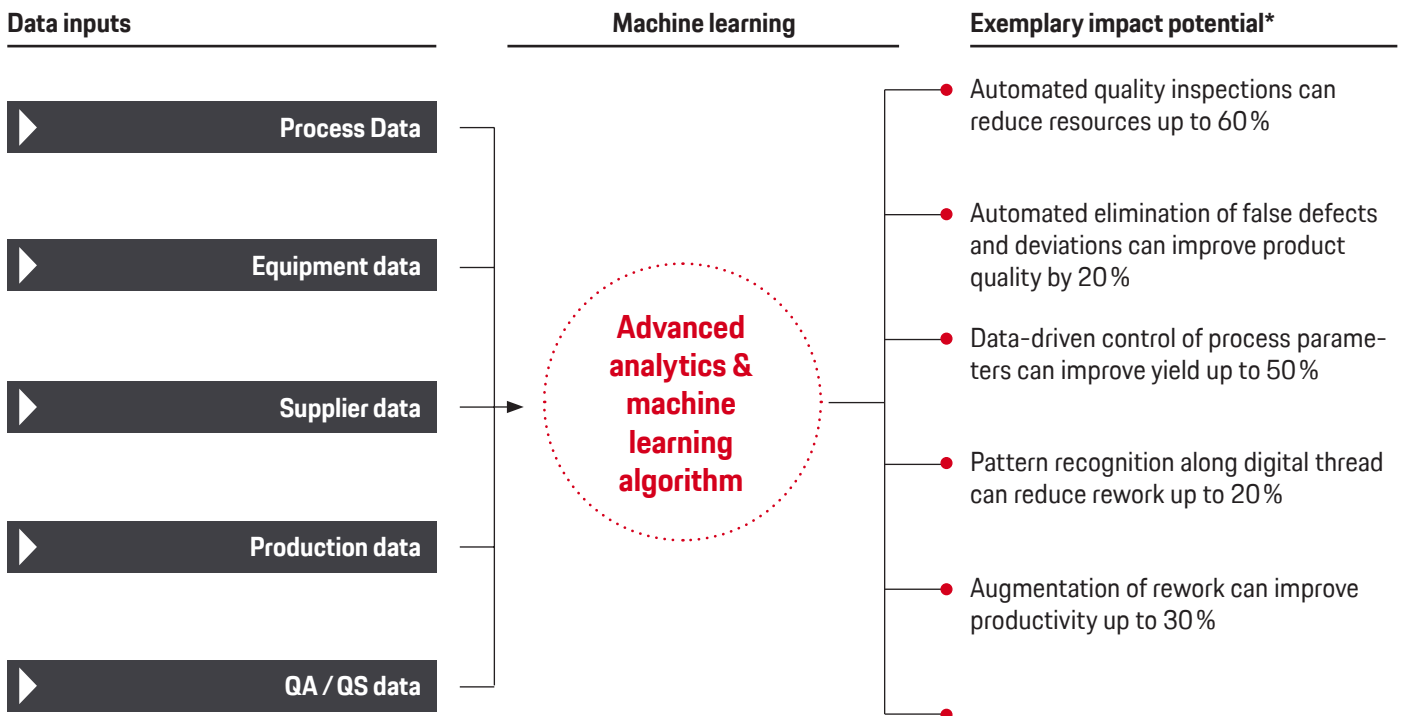


Figure 5
Porsche Consulting project experiences, Bauernhansl, M. ten Hompel, B. Vogel-Heuser (Hrsg.): Industrie 4.0 in Produktion, Automatisierung und Logistik (2014), National Institute of Standards and Technology: Focus Group: Big Data Analytics for Smart Manufacturing Systems

AI is already speeding up medical workflows in diagnostics and patient care

The prerequisites for regular use of the machine-learning approach beyond prototyping in, for example, quality management in the MedTech industry are very positive. This is due to the fact that deep learning, machine learning, and even AI have already entered the medical treatment and diagnostic processes. As an example, medical imaging is likely to undergo a fundamental transformation. “Meaningful AI will improve quality, efficiency, and outcomes,” says Keith Dreyer (vice chairman of radiology at Massachusetts General Hospital in Boston and associated professor at Harvard Medical School). Today, AI plays an important role in the everyday practice of image acquisition, processing, and interpretation. Siemens Healthineers, for example, has developed a pattern recognition algorithm (ALPHA) for its 3-D diagnostic software syngo.via. Comparable applications are an established part of available imaging software.⁴ There are also start-ups like Aidoc which drives the use of deep-learning solutions in the field of radiology. Furthermore, Aidoc's solution can be previewed as an additional series in the hospital's incumbent PACS viewer.⁵ What does all this mean? MedTech companies are in the pole position to drive digital quality control with machine learning. Disruption is already occurring in the MedTech

industry in terms of regular use of AI—even if only in another SBU of the same company.

Key takeaways

MedTech businesses face increasingly higher quality requirements from regulatory administrations, customers, and patients and require more reliable methods to ensure sustainable quality and safety without losing performance.

Traditional quality management approaches carry significant shortcomings in manual inspections and lack root cause analysis, while machine-learning-based quality control enables synchronized optimization of quality, costs, and performance.

In-line and automated production quality control systems pave the way for myriad efficiency and quality-increasing use cases.

⁴ Siemens Healthineers, “Medical Imaging in the Age of Artificial Intelligence,” (2017) ⁵ www.aidoc.com

Applied machine learning use cases for automated quality control

Machine-learning-based classification of parts via camera system ("o.k.," "rework," "not o.k.," and "unknown patterns")

Machine-learning-based dynamic adjustment of process parameters via input from cameras and codified problem-solving strategies

Automated routing and guiding of workers with real-time information to conduct rework based on AI-engine recommendation

Machine learning algorithm to detect anomalies from wireless ultrasonic sensors to identify patterns and forecast quality issues

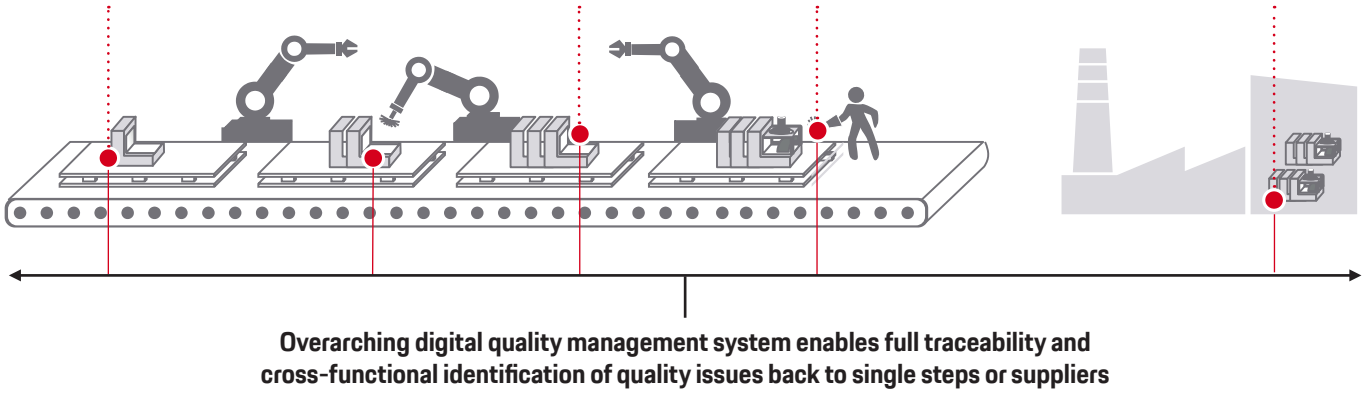


Figure 6

3.4 The data-driven service opportunity

After-sales services are an attractive growth area in the MedTech industry. Maintenance services, spare parts, consumables, and modernization usually generate higher margins than equipment sales. As described in previous chapters, the recent advances in Industrial IoT, ubiquitous connectivity, and advanced analytics pave the way for a new era of industrial services. Reduced costs in service delivery and closer client relationships are the key areas to benefit from these new, data-driven service opportunities. Figure 7 provides an overview of currently piloted and fully implemented, smart, data-driven services. The multitude of new services heralds a paradigm shift toward service revenue structures and away from traditional product-centric services.

Shifting pricing models

Despite various regional reimbursement levels and the degrees of competition in a given market, there is a gradual, albeit radical shift in business and pricing models from ownership based to usage and outcome based. Sellers, payers, and buyers are driving this shift. Whereas MedTech companies strive for new,

recurring, and profitable revenue pools, several business stakeholders are seeking opportunities to optimize cash flows, avoid risks, and increase flexibility.

For hospitals, as main purchasers of MedTech products, unplanned downtime is one of the biggest operational cost drivers. That's why the most obvious value driver of usage-based pricing models is equipment availability. Addressing unplanned downtimes is of paramount importance for new digital services, such as real-time condition monitoring or predictive maintenance. If such services were able to increase equipment availability by even a few percentage points, the impact on costs and quality would be enormous. Unsurprisingly, hospitals, for example, are open to long-term digital service contracts that aid in achieving such savings.

The root cause of more advanced pricing models is the increasing cost pressure on healthcare systems worldwide. However, MedTech companies could become part of the solution. With an outcome-based pricing model, different specifications are possible. In-vitro diagnostic companies offer their customers

The extended service opportunity for MedTech companies

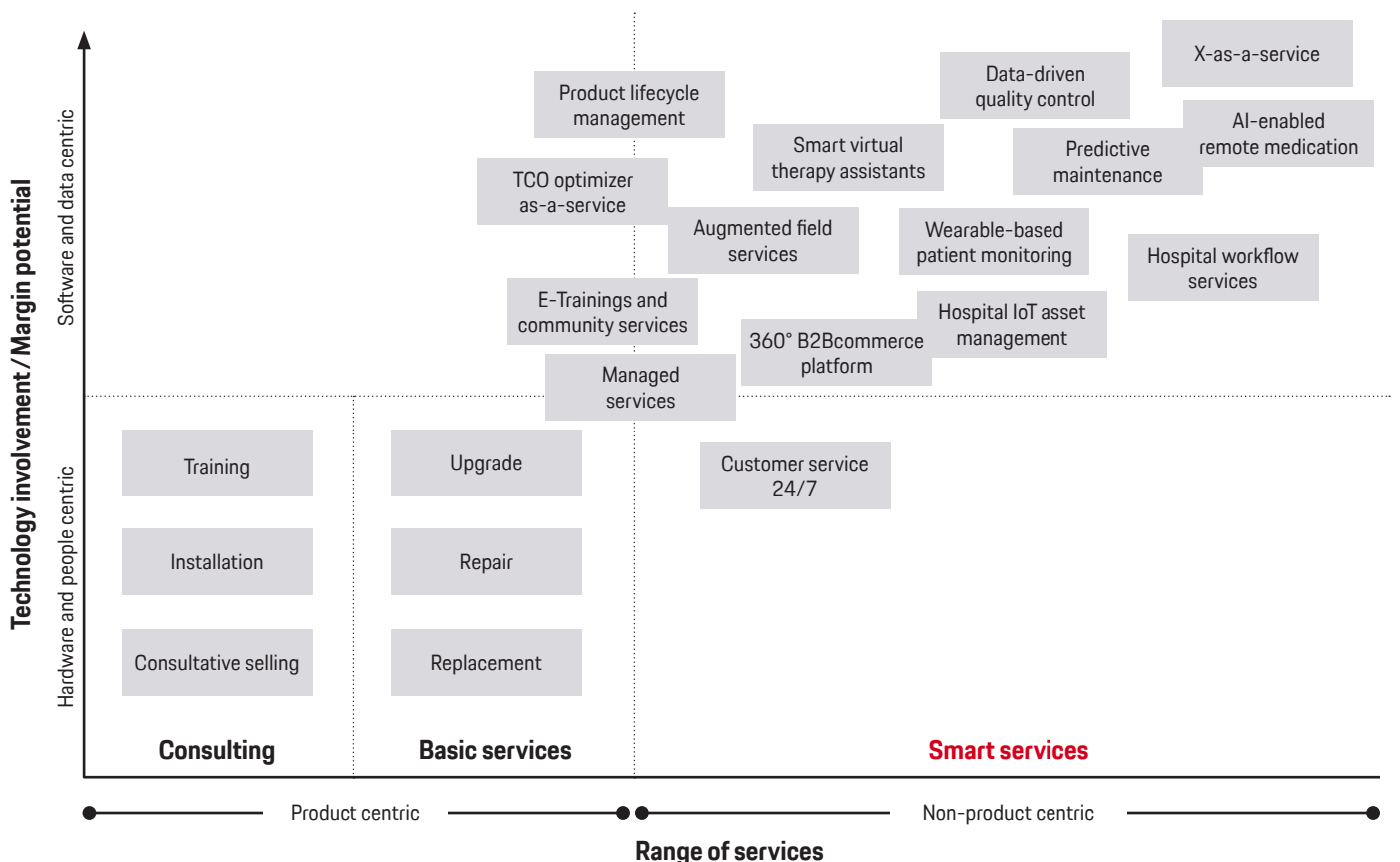


Figure 7

(not exhaustive)

an option to pay per test result, for instance, which has become very common. Why not go one step further? There is increasing demand for scientific medical evidence that indicates an interest in value-based pricing models. Michael Porter (Harvard Business School professor) on value-based healthcare in general: “This ideological shift means moving from a long-established system that rewards volume of visits, hospitalizations, procedures, and tests to a system that focuses on improving patient outcomes while lowering costs. Value, versus cost-shifting on restricting services, is a solution that can unite the interests of all system participants—and improve care.”⁵ Medical device developers have been relatively slow to take on risk, compared with drug companies, but this is changing as more value-based contracts come into the fray, says James Gelfand, senior vice president of health policy for the ERISA Industry Committee.⁶ Manufacturers of electromechanical medical technology and active/non-active implantable technology are particularly well placed to consider value-based pricing models. Medtronic, for example, will pay Aetna, a health insurance company, rebates for patients who, having switched from multiple daily injections of insulin to Medtronic’s insulin pump, do not achieve specified outcomes. This is based on an agreement between the two companies that aims to increase accountability and lower the cost of care.⁶ Another example is the value-based pricing model of St. Jude Medical. The MedTech company will rebate 45 percent of the price paid for a Quadra heart rhythm device if, within the first year of implantation, revision surgery is needed due to problems with the company’s Quartet lead wire.⁷

As we see it, however, neither usage- nor outcome-based pricing models are ends unto themselves. MedTech companies need to understand whether the approach truly addresses their customers’ needs and provides long-term competitive advantages. One thing is certain: digitalization drives new business and pricing models, especially in the direction of more outcome- or even value-based models.

Service options for OEMs

There are two basic options for MedTech companies to capture new digital-service values. Option A (“value climbing”) depicts the most common approach to strengthening the core business, while option B (“moon shooting”) is applied by only a few players with high digital maturity. The value-climbing approach supports the transformation of existing businesses into a hybrid of hardware, software, and new digital services. This approach is a reasonable starting point for digital transformation, beginning with digitalizing a company’s own hardware and followed by de-

veloping a digital thread (chapter 3.2) for the eventual deployment of new digital services based on novel business models to exploit recurring revenues sources. The moon-shot approach is not necessarily more successful or recommendable. Successful platform businesses can be highly profitable; however, many roadblocks exist on the path to mastering new technologies, including challenges to core competencies, ecosystem management, multichannel marketing, and innovation speed. These challenges are greater than with the value-climbing approach, and required investments are significantly higher.

Key takeaways

Digital services pose a great opportunity to MedTech companies for profitable top-line growth, reduced costs of service delivery, and closer relationships to customers and patients. Various health-related businesses are already seizing the new service opportunity.

The exploitation of new service potentials coincides with a shift in business models from ownership-, to usage-, to outcome-based models. To leverage this industry trend, MedTech companies must address their customers’ (e. g. hospitals and payers) greatest needs, which are predominantly centered on the avoidance of unplanned downtime.

MedTech companies have two main positioning options within the industrial ecosystem: either climbing up the value chain to strengthen the core business or following a moon-shot approach that leapfrogs existing value chains and enables completely new profitability dimensions.

⁵ Medtronic: Digital Documentation as key enabler for VBHC

⁶ www.modernhealthcare.com

⁷ <http://newsroom.medtronic.com/phoenix.zhtml?c=251324&p=irol-newsArticle&ID=2283068>

⁸ <https://www.reuters.com/article/us-usa-healthcare-guarantees/medical-device-makers-beef-up-product-guarantees-to-woo-u-s-hospitals-idUSKCN0P117R20150708>

04 Structuring Digital Transformation for MedTech Companies

Roadmap for the digital MedTech transformation: twelve imperatives that lead the way

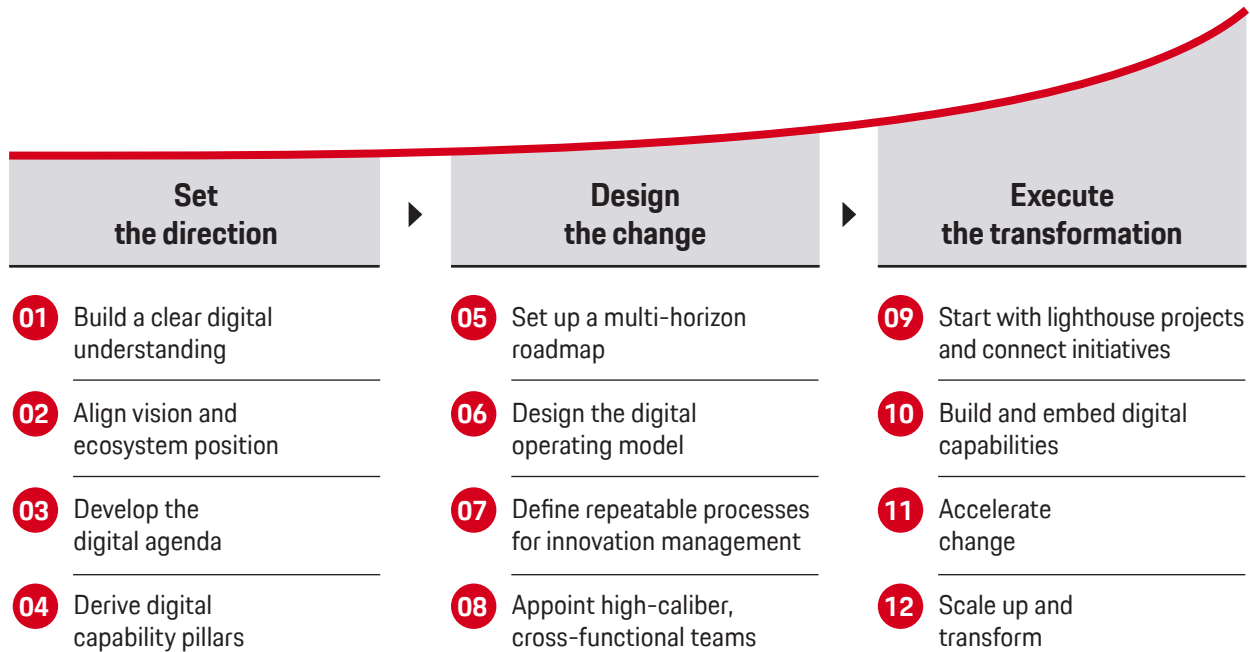


Figure 8

This chapter will outline a successful digital transformation journey. The following is a practical step-by-step guide on how to master the digital machinery transformation (figure 8).

4.1 Set the direction

01 Build a clear digital understanding

Start with “why.” The “why” question creates a sense of urgency and answers why digitalization matters to any given industry in general and any business in particular. It is important to acquire a clear understanding of any new disrupting digital technologies, changing customer demands/patient needs, or increased competitive dynamics. Executives need to understand what organizational ambidexterity (e.g., existing vs. new business, efficiency vs. innovation) means to their business and which counterparts have to be balanced. These insights lay the foundation for defining strategic areas of action and tailoring the transformation plan.

As a first step, capture macro digital trends and assess how these changes will impact the business. Although not exhaustive, the following list of strategic insights can serve as a roadmap to a thorough situational analysis.

- **Overall impact of digitalization**
(e.g., value proposition, brand)
- **Future outlook**
(e.g., self-learning algorithms, disruptive business models)
- **Customer and patient insights**
(e.g., reimbursement and inpatient needs, admissions)
- **Evolution of products and services**
(e.g., shifting to services, connected smart devices)
- **Changing operations and supply chains**
(e.g., new technologies, faster cycle times)
- **New ecosystems**
(e.g., new competitors)
- **New digital capabilities**
(e.g., data science, patient experience design)
- **New organizational cultures and ways of working**
(e.g., design sprints, scrum)

There is no one-size-fits-all approach for gaining these insights. One creative idea is guided immersion trips to startup ecosystems such as Silicon Valley or Tel Aviv. This is an effective and interactive experience in which participants can see firsthand successful digitalization and change, gather relatable ideas, and gain inspiration from leading technology companies that have built cultures of innovation and established new ways of working.

Furthermore, MedTech business leaders need to orient their strategy toward a completely new pace with respect to change and continual improvement. The exponential speed of digital developments that require faster innovation cycles than ever before and the 10 times thinking mentality of pure digital players reflects a total contrast to the 10 percent thinking approach of most traditional players in the industry (e.g., 10 percent higher performing machines).

Leaders need to be open-minded and agile, with a purely digital approach to new technology applications, enhanced levels of customer service, health platform initiatives, and the integration of innovative solutions on every organizational level.

Addressing the “why” questions will lead to a systematic understanding of how digitalization is impacting the current business model from end to end and that, as with any other industry, the biggest risk for MedTech companies is doing nothing or failing to keep pace with industry leaders.

02 Align the vision and ecosystem position

Having gained a better understanding of digitalization as it relates to any particular business through the situational analysis exercise, the formulation of a clear vision initiates the digital transformation. A bold vision is very powerful in communicating the severity of going digital. In addition, it helps to align management and employee initiatives and sends a clear, cohesive signal to the market.

Jeff Immelt, GE's former CEO, serves as a great example for conveying a vision in his address to a large audience of customers and analysts at the Minds + Machines summit in 2014: “If you went to bed last night as an industrial company, you’re going to wake up this morning as a software and analytics company. This change is happening in front of us. GE wants to be your partner.” Figure 9 shares other far-reaching visions of digital champions and selected MedTech companies. They are simple to understand, highly distinctive, and have strong identification power.

Along with a bold, innovative, and encompassing vision, it is equally crucial to explore the future of the current ecosystem and align top management with a strategy that addresses expected changes and opportunities within the ecosystem. There are three different potential archetype models within a given ecosystem in the MedTech sector, and each requires a broadened shift in perspective from traditional operational strategies. Whereas most companies view themselves as single industry players competing against comparable industry peers, any business in the digital economy can be a player within multiple

industries, as part of a broader ecosystem, at any given time. Compared with other industries, MedTech companies are on the top of this strategic shift.

The ecosystem of MedTech players includes suppliers, competing OEMs, hospitals, patients, health insurers, health NGOs, regulatory institutions, tech players, and startups. Digitalization tears down boundaries and entry barriers between formerly separate industry participants. From an opportunistic perspective, it provides growth potential to incumbents, such as leapfrogging value chains, but also implies threats of disruption from purely digital players entering the stage with platform-enabled business models.

Far-reaching visions of digital champions and selected MedTech companies

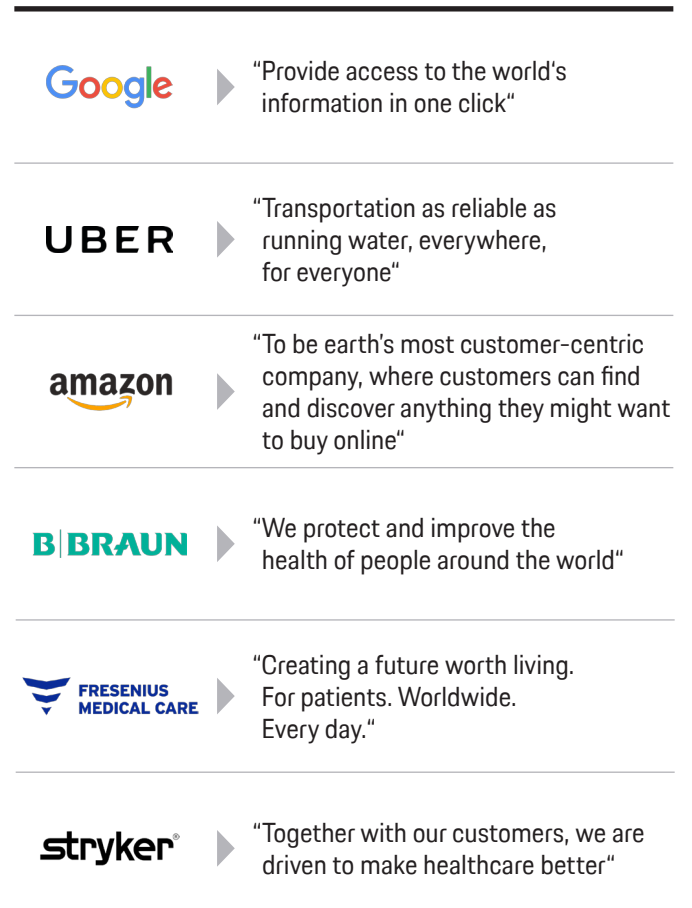


Figure 9

03 Develop the digital agenda

A bold vision and a competitive positioning strategy do not necessarily guarantee success. Digital transformation requires planning that ensures effective and fast implementation. After determining why digitalization is important, it is necessary to

determine what needs to be digitalized. What are the strategic areas of action? What are the most relevant use cases within these areas? Which functions are most affected? What are the key enablers that drive the digital program? What are the milestones for deployment?

Together with the outcome of the previous section, answers to the “what” questions create the digital agenda. A digital agenda is an overall navigation system for a company’s digital transformation, unifying strategic direction, ambition levels, enablers, and measures to achieve them—all condensed in a coherent roadmap for accelerated implementation (see figure 11).

The digital agenda should allow for course corrections and the ability to capture new opportunities along the journey. While every digital agenda is different, they generally include the following elements.

- ▶ **Digital vision**
A clear, ambitious statement that is well understood throughout the company and connects digitalization to sustainable profitable growth

- ▶ **Strategic areas**
A small set of high-impact topics tied to the corporate strategy

- ▶ **Prioritized use cases**
A set of preeminent use cases (including concrete ambition

levels) of the highest priority regarding criticality, impact / feasibility, or function enabling

- ▶ **Enablers**
A derived and described set of must-have enabling factors that are critical to delivering desired results

- ▶ **Roadmap**
a macro plan that aligns prioritized use cases with enablers to deploy the digital agenda and outlines key implementation measures and milestones

04 Derive digital capability pillars

Once the digital agenda is created, the next step is to translate strategic areas into required digital capabilities, encompassing all dimensions of the business. Instead of deriving various isolated requirements with regard to people, processes, or technologies, build a small portfolio of integrated and cross-functional pillars that are tangible and self-explanatory. Figure 12 gives examples of such capabilities with specific regard to MedTech companies. Defined digital capability pillars are important for two reasons: they guide the allocation of resources (budgets and people) and support the assessment of future digital initiatives. What matters in this respect is that the capability pillars need to be mirrored by the strategic challenges in healthcare on a continual basis.

Five different archetypes as a guideline for ecosystem positioning

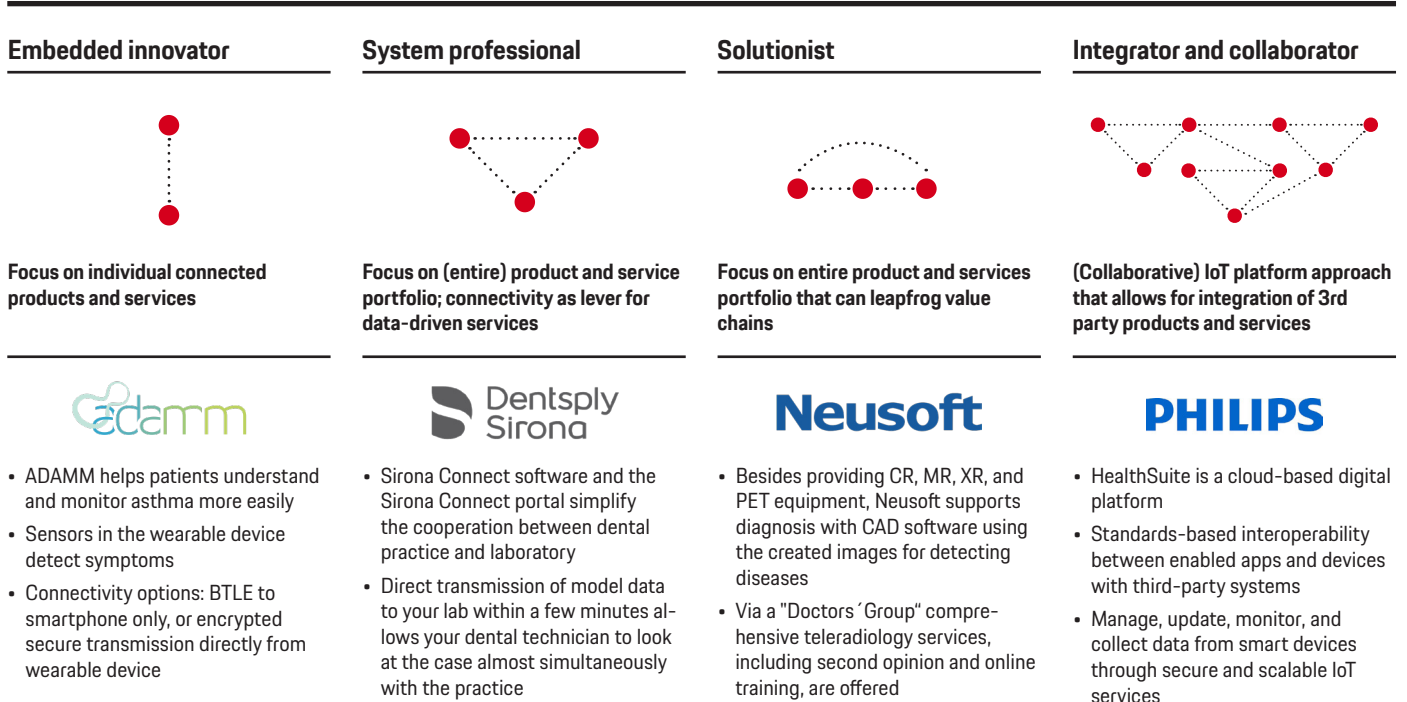


Figure 10

The digital agenda serves as the overall navigation system for the digital transformation

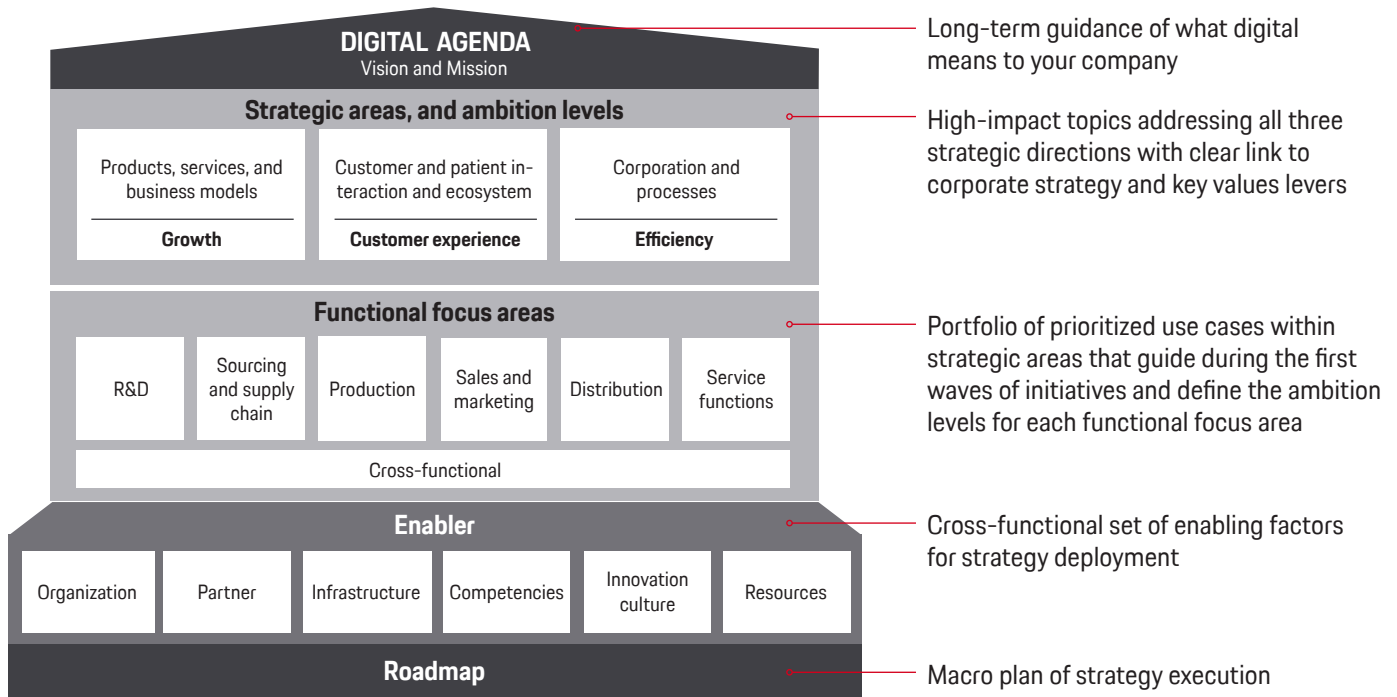


Figure 11

(Framework applicable at corporate, business unit or functional level)

Exemplary digital capability pillars for MedTech companies

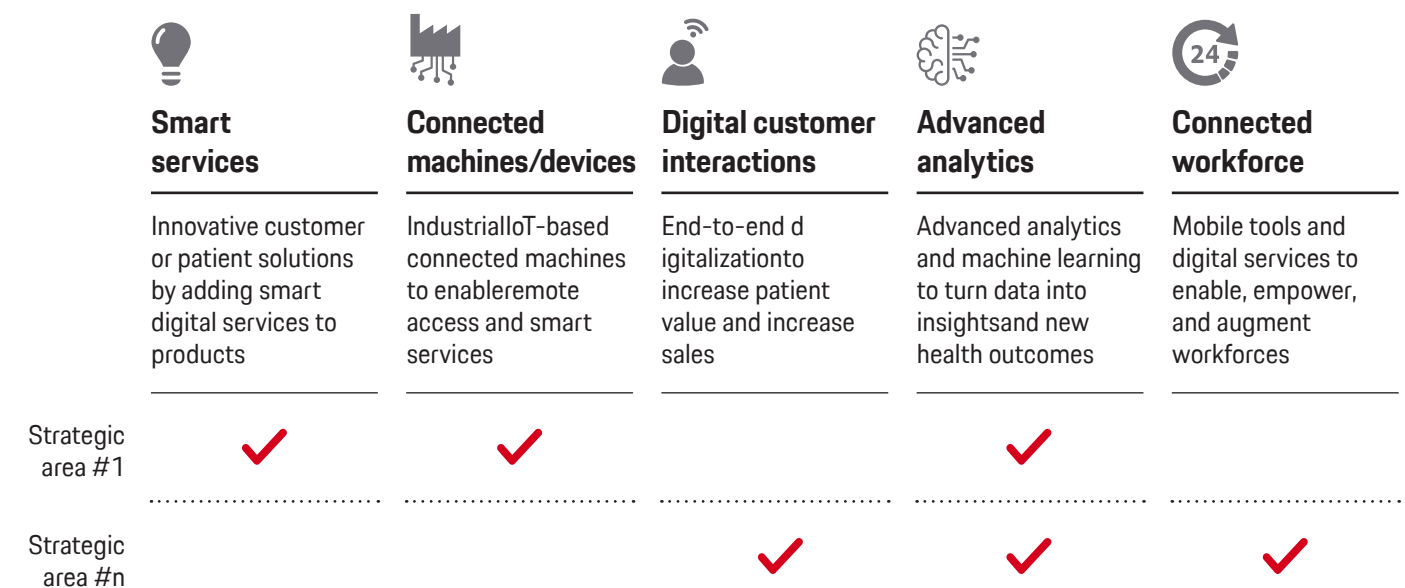


Figure 12

4.2 Design the change

Equally important to setting the direction is the design of the mechanisms for its deployment. Consider the following chapter the bridge between digital strategy and scalable transformation.

05 Set up a multi-horizon roadmap

To ensure that early efforts create the necessary momentum, give careful consideration to the selection of initial projects and the resources needed to adequately support them. Over time, it becomes mandatory to maintain a portfolio of “use case bets,” with dependencies and interlinkages. To master orchestrating these challenges, set up a multi-horizon digital roadmap that aligns prioritized areas of action with business objectives, enablers, and resources from short-, mid- and long-term perspectives. Consider it a living plan that evolves over time through continual testing, learning, and adapting the digital agenda. Figure 13 offers an example of such a roadmap.

Setting up a multi-horizon roadmap should be done in two steps. First, define the dependent and independent dimensions. Use the y-axis to map the strategic areas and the x-axis to define enablers and resources. The second step requires the use of all gained knowledge to turn the company’s digital investments into actions, focusing on those that will have the most impact

at scale. To ensure this, consider these five key factors in your evaluation and prioritization: what are the customer and patient needs to be addressed? What will add the most value? What are the low-hanging fruits that create momentum? Where and how can the company occupy strategic control points? Which enablers lay the foundation for others?

06 Design the digital operating model

With the digital agenda and roadmap defined, the next step in the transformation is the design of a coherent digital operating model that serves as a blueprint for structures, digital governance, mechanisms, and the culture needed to execute the digital strategy at scale. Most companies are working with an out-of-sync operating model that does not reflect the requirements of today’s digital economy such as speed, agility, and self-empowerment. Below is a practical framework for the design of a sustainable digital operating model.

The crucial first step in designing a digital operating model is translating the digital strategy into a selection of simple, concise, and self-explanatory design principles. This selection—typically eight to ten principles—provides the criteria for testing and adjusting the digital operating model over time, bringing objectivity to what is frequently a politically infused

A multi-horizon digital transformation roadmap

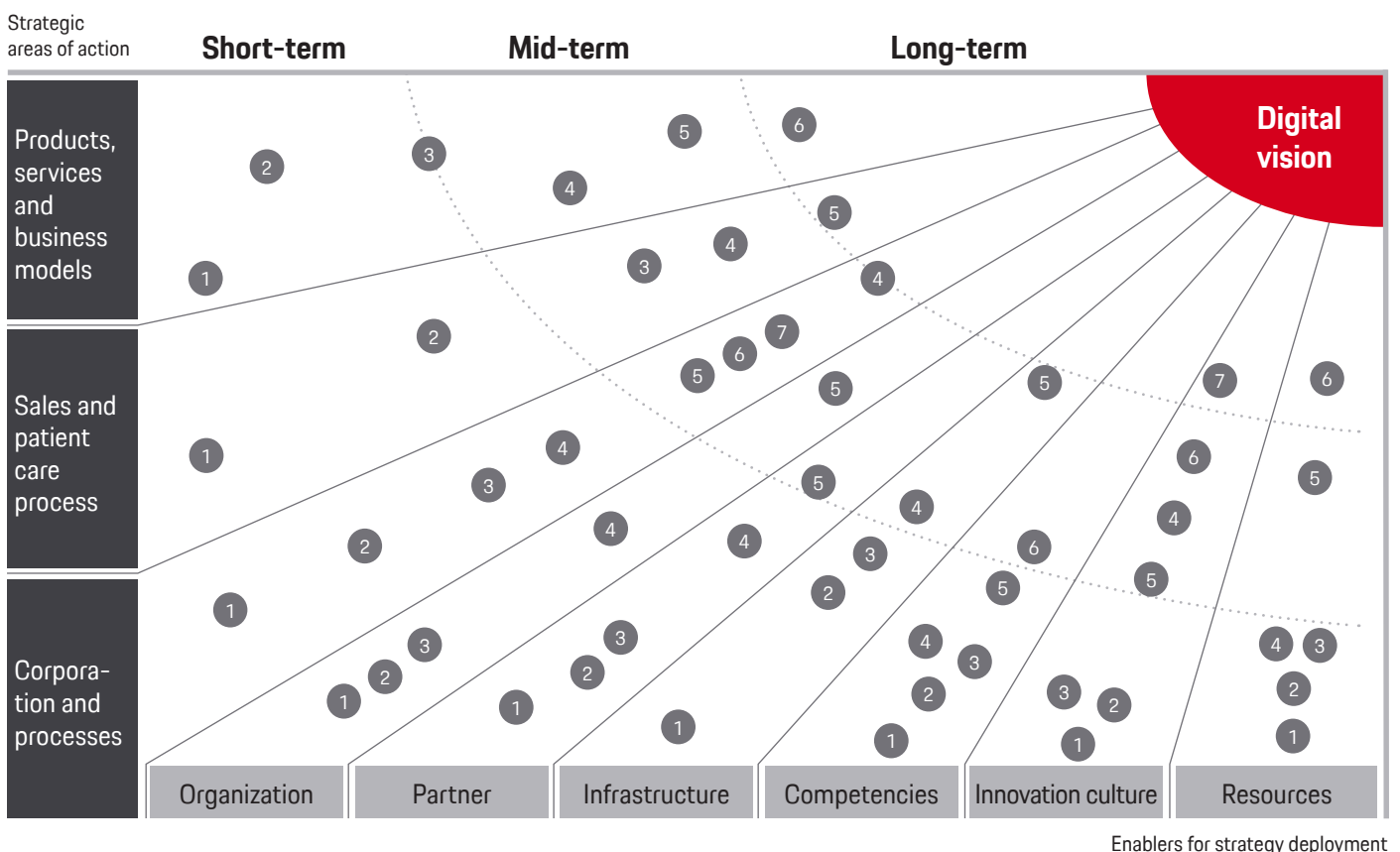


Figure 13

n Implementatin measures of digital initiatives

process. Based on these design principles, the operating model takes shape through decisions in four key areas:

- ▶ **Digital organization design** defines roles, business lines, and coordinating mechanisms to drive digital transformation while leveraging scale and expertise. Key pillars include digital leadership, the chief transformation office, centers of excellence, and business vs. product ownership.
- ▶ **Digital governance** defines the steering mechanism of the digital transformation that yields high-quality decisions on strategic priorities, resource allocation, and business performance management. Key pillars include performance management (e.g., via objectives and key results, or OKRs), innovation management (e.g., innovation funnel concept), and risk management.
- ▶ **New ways of working** define structures, mechanisms, and cultural norms to accelerate cross-functional digital innovation and go-to-market. Key pillars include digital product management, collaboration workflows, and innovation culture.
- ▶ **Capabilities and partners** describe the required digital competencies and define the mechanisms to integrate people,

partners, technology, vendors, and startups to fill the gaps. Key pillars include digital competencies, talent and skill management, and ecosystem building.

Example: Medtronic is combining IBM's Watson Health cloud analytics and cognitive computing with the diabetes medical devices and health data to develop a new generation of personalized diabetes management solutions⁹.

The last step is to derive and define the foundation, encompassing standards and guidelines (e.g., predefined requirements for agile project teams) as well as infrastructure and technology. A new approach for incumbents is the platform strategy—a crucial shift from using individual technologies, operations capabilities, and systems in a piecemeal manner to applying central platforms that leverage experience and scale to achieve more encompassing and pervasive influence throughout the business. This applies to technologies or systems (e.g., central customer platform) as well as digital skills (e.g., predictive models) and accelerates internal digital transformation, thereby enabling new external digital business opportunities. Companies in the digital beginner stage (see imperative no. 12 “Scale up and transform”) should especially look to establish centers of excellence for core capabilities such as the IoT platform or advanced analytics skills.

The digital operating model framework

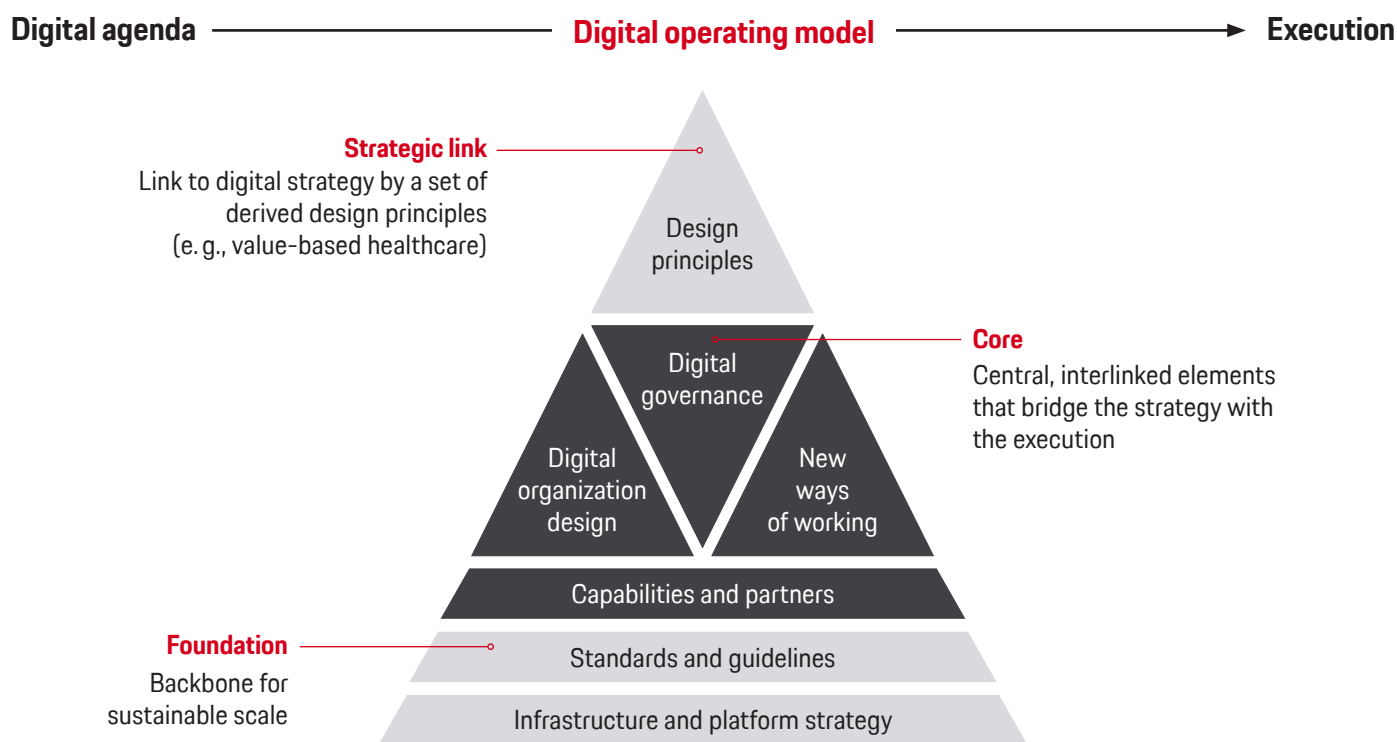


Figure 14

⁹ www.medtronic.com

07 Define repeatable processes for digital innovation management

With the definition of an overarching digital operating model, the focus should now shift to defining repeatable processes and tools that ensure a structured innovation management, while maintaining the necessary agility and effectiveness. Digital innovation management can be divided into four building blocks:

- **Idea sourcing and ideation**
- **Stage-gate innovation funnel**
- **Ownership and responsibilities**
- **Tools and workflows for test-and-learn**

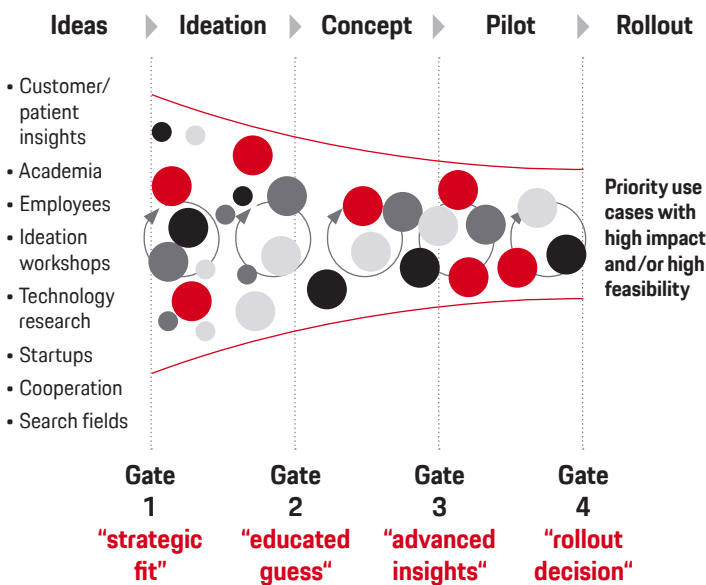
As a first step, align with stakeholders and partners on how to maintain a continuous flow of high-potential ideas that feed the portfolio pipeline. Ideas should be generated by leveraging a wide range of inputs, incorporating the newest digital trends on technologies, products, and business models as well as a di-

verse set of perspectives on internal and external stakeholders, problems, and opportunities. Second, define a stage-gate process through which to funnel ideas, including an assessment tool to evaluate and filter ideas against a robust set of criteria. Figure 15 illustrates a funnel example with four "gates" and a proven two-dimensional assessment matrix. Both dimensions—feasibility and business impact—are backed with a set of detailed sub-criteria. For example, benefit can be measured with direct monetization potential, ecosystem potential, data potential, or customer experience.

Together with the funnel and gateway mechanism, the ownership and decision rights for the evaluation processes need to be aligned. Lastly, employ a test-and-learn approach by providing standardized tools and workflows. For example, design sprints help to spark innovation, encourage user-centered thinking, align the team under a shared vision, and achieve product launches much faster in an agile way of working.

Innovation funnel and assessment matrix for portfolio planning

Innovation funnel along four "gates"



Assessment matrix for planning and evaluation

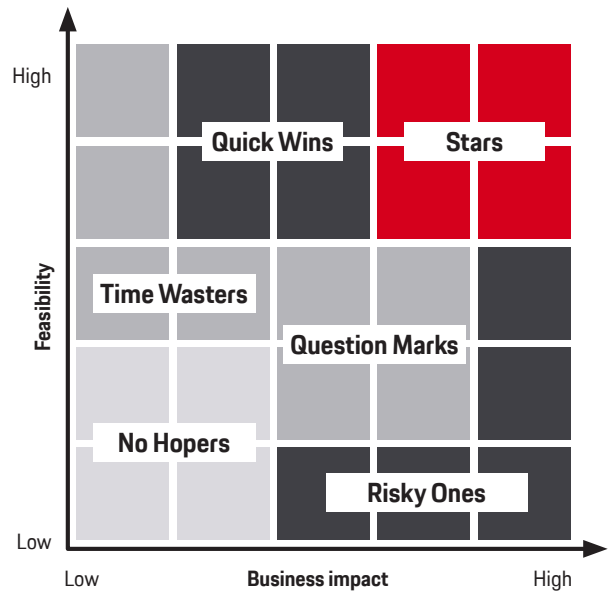


Figure 15

08 Appoint high-caliber, cross-functional teams

The importance of high-caliber, cross-functional teams cannot be overstated. They are key to any successful digital transformation. Companies need to establish these teams together with agile project structures and new ways of working to drive digital transformation (see also imperative no. 6 “Design the digital operating model”).

First, start with a small, high-caliber launch team to jumpstart the digital transformation. This team, often headed by the Chief Digital Officer (CDO), is an important catalyst for digital transformation and drives lighthouse projects¹⁰ by ensuring relevant technologies and skills are in place, monitoring progress against targets, and coordinating initiatives across the organization. Key recruits of a launch team should reflect the required capabilities (derived from imperative no. 4 “Identify digital capability pillars”) and can include the following members:

- **Digital product managers**
- **IoT platform experts**
- **Data scientists**
- **Multichannel specialists**
- **Scrum masters**
- **Software engineers**

The competitive market for digital talent makes finding high-caliber candidates a critical challenge. One way to meet this challenge is to appoint a well-known CDO with an established network that serves as an anchor hire. A high-caliber launch team is only one key component for going digital—albeit a critical one—that can help overcome the gap between first digital initiatives and transformation to scale.

4.3 Execute the transformation

With a fully designed transformation program, the next step is to switch over from planning to deploying digitalization to scale.

09 Start with lighthouse projects and connect the initiatives

Executing digital transformation depends on aspired goals, existing (infra)structures, resources, and capabilities of the organization. In practice, consider a three-step deployment process, following the core transformation approach described below, which we call “Learn. Make. Connect and Scale.”:

► **Share lighthouse** best practices across the organization, evaluate and sharpen use cases, and optimize top fields of action. If necessary, tear down any existent barriers to foster collaboration.

► **Translate the lighthouses** into pilots by connecting and rolling them out across the broader organization and leveraging their impact to scale.

Two alternative approaches have also proven suitable for scaling up pilots. The following paragraph describes the two approaches with respect to production pilots, but they can also be applied to other types of lighthouse projects such as new products or digital services.

One approach is the “rollout of best practices.” Companies define one leading plant per segment, share best practices between them, and optimize the most promising fields of action. Afterwards, these high-potential use cases are rolled out to all plants.

The second approach is the “rollout segment by segment.” Plants are divided into segments with individual leading plants and one overall strategic plant; this serves as a starting point to identify top fields of action and evaluate potentials. Initially, all top fields of action will be implemented and optimized at the strategic plant and rolled out to other plants in the corresponding segment. Subsequently, the next segment will follow with the same implementation sequence.

10 Build and embed digital capabilities

Parallel to implementing digital initiatives, it is crucial to focus on digital capability building. This includes technologies, tools and methods, and, more importantly, skills and digital talents. Without a digitally enabled (and digitally extended) workforce, companies will struggle to continuously leverage the latest technology advancements—from IoT, robots, and advanced analytics to artificial intelligence and virtual reality.

To build and embed a strong set of digital capabilities, you must first answer three important questions:

► **Which** skills, technologies, and other capabilities are generally required based on the defined digital capability pillars (imperative no. 4, chapter 5.1). Which are specifically required to derive digital job profiles for the waves of initiative in the near future?

► **Where** should the required capabilities be sourced—fully internally (e.g., via hidden “digital champions” in business units or supporting functions), fully externally (e.g., via startups), or in some form of hybrid (e.g., mixed teams of internal and external experts)? External examples include:

¹⁰ A lighthouse project is a short-term, well-defined, measurable project that serves as a role model for other projects within the broader digital transformation initiative.

- Startups, tech vendors, and digital platform companies (for technology sourcing)
- Other corporations, headhunters, academia, and hackathons (for talent acquisition)
- Venture capital funds, startup innovation hubs, crowdsourcing, or data-driven customer insights (for innovation sourcing)
- Third-party field service operators and value-added resellers (for sales and service fulfillment sourcing)

► **How** should these capabilities be embedded (e.g., recruit, develop, and retain digital talents; integrate startups' technologies into own offerings)? Keep in mind, a digital strategy is only as strong as the people who execute it.

Digital capability sourcing map

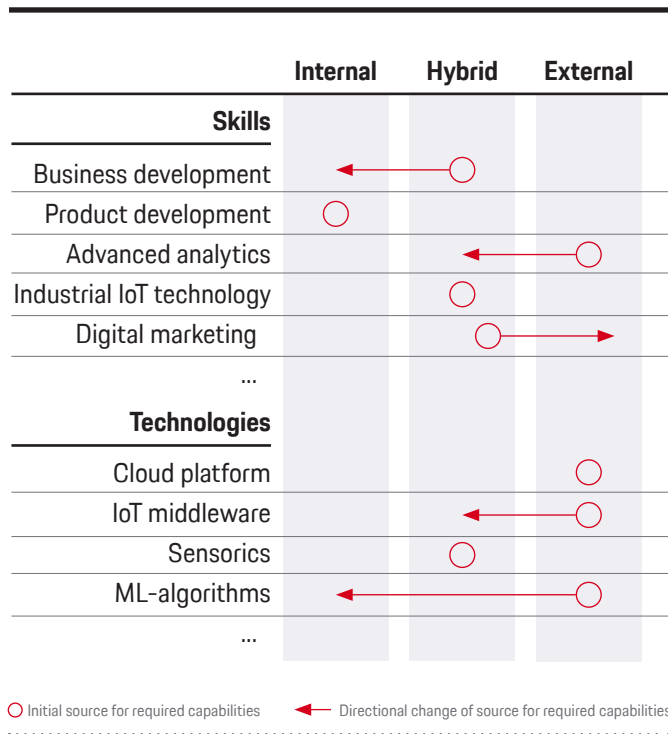


Figure 16

Figure 16 illustrates an approach to elaborate and map the digital capability building strategy to each of the defined digital capability pillars (for example, "Smart services").

Capability building includes sourcing and the digital operating model which brings these newly established capabilities into action.

One paradigm for the deployment of the digital operating model, as learned from recent digital transformation mandates, is the substitution of existing, hierarchical, and silo'd organization structures for modern structures with agile project management, autonomous teams, and patient-centric, innovative cul-

tures. Without this foundation, both skills and digital initiatives cannot develop sustainably or contribute to the success of the digital transformation.

Transformation is infinite in every application, and the same applies for building capabilities. Some MedTech companies, therefore, set up in-house academies or excellence centers to support learning on an on-going basis. Alternatively, companies can also create knowledge platforms that enable sustainable knowledge sharing, invest in startups, or hire external experts to update learning. Regardless of the method, the ultimate goal of continuous learning is to establish digital change as a routine.

Counterparts to be balanced for successful digital machinery transformation

Hardware vs. Software

Should we invest 10 million for 10% machinery performance improvements (hardware) or for generating 100% new opportunities (software)?

Core vs. New business

How can we strengthen our core business and generate new business at the same time (ambidexterity)?

Integrate vs. Separate

Should we develop new business within the organization or externally?

Tradition vs. Innovation

How can we maintain our core values and innovate beyond?

Competition vs. Cooperation

How can we differentiate ourselves from the competition and join forces where needed?

Control vs. Agility

How can we maintain (process) control and generate required agility for digital?

Figure 17

11 Accelerate change

Technological progress may well play a dominant role in the digital MedTech playbook. Three additional but often neglected principles will impact the digital MedTech future to an even greater extent—the balancing of business counterparts, digital leadership, and continuous communication. Close attention to these elements accelerates change.

▶

Becoming a digital leader is not an easy game for MedTech players, as they have to balance various business counterparts at the same time. Below are six key initiatives in the MedTech industry that have to be carefully balanced to drive change (see figure 17).

The second change accelerator is digital leadership. Non-negotiable components include:

- ▶ **Digital transformation** must be driven by the CEO and his/her C-level colleagues; transformation will fail without top-management commitment.
- ▶ **Digital leaders** must have the power to bridge functional silos.
- ▶ **Digital leaders** must set the pace and constantly facilitate roadblock mitigation measures.
- ▶ **Digital leaders** must foster data-driven decisions.
- ▶ **Digital leaders** must provide core principles that the entire organization will adhere to and believe in, while leaving room for autonomous team decisions.
- ▶ **Digital leaders** must provide just-in-time feedback.
- ▶ **Digital leaders** must be risk-orientated and leave their comfort zones.

The third driver of change is communication. Communication plays a dominant role throughout the entire digital transformation journey—from communicating an initial sense of urgency and, once the digital agenda is formulated, the vision, strategy, and opportunities ahead to communicating successes and failures in the pilot phase. After the pilot phase, it is crucial to share successes (lighthouse cases) and significant progress; this generates the highest impetus to recruit not only those individuals most directly involved but also others throughout the organization that have not yet had any connection to digitalization. Communication should be a multichannel approach beyond traditional management meetings and newsletters. Digital communication platforms and collaboration tools such as “slack” connect relevant parties instantaneously, eliminating unnecessary middlemen and resolving issues or facilitating discussions on new ideas faster and more effectively.

12 Scale up and transform

By successfully mastering imperatives 1 to 11, MedTech companies can achieve the following:

- An established, long-term digital vision
- A clearly, defined digital strategy and concrete ambition levels
- Established lighthouse cases, partly rolled out to several plants, divisions, or regions
- Unique digital initiatives for every division and functional area
- All initiatives across the organization fully aligned through the digital transformation office
- Core digital capabilities and development of new digital products driven by centers of excellence
- Digital transformation needs embraced by majority of management and staff
- First startup collaboration experiences

Now the transition from a “digital transformer” to “digital (out)performer” can take off. As illustrated by figure 18 the fundamental characteristic of a digital (out)performer is that digitalization has become integral and is ingrained in every business or functional unit of the organization.

As such, digitalization is now a matter of course and no longer a necessary evil. Diverse digital use cases are up and running and positively impact almost every unit, either in terms of productivity gains, new revenue streams, or newly created customer experiences. Product ownership of mature digital topics have migrated from centers of excellence into business functions. The role of the digital transformation office has switched to digital topics in the nascent stage, where capabilities in business units do not exist.

What should MedTech companies do to accomplish the migration from a digital transformer to a digital (out)performer? Although the answer depends on individual ambition levels, allocated budgets, and actual transformation progress and speed, there are four key components for scaling up digital business.

Evolutionary path of digital organizations

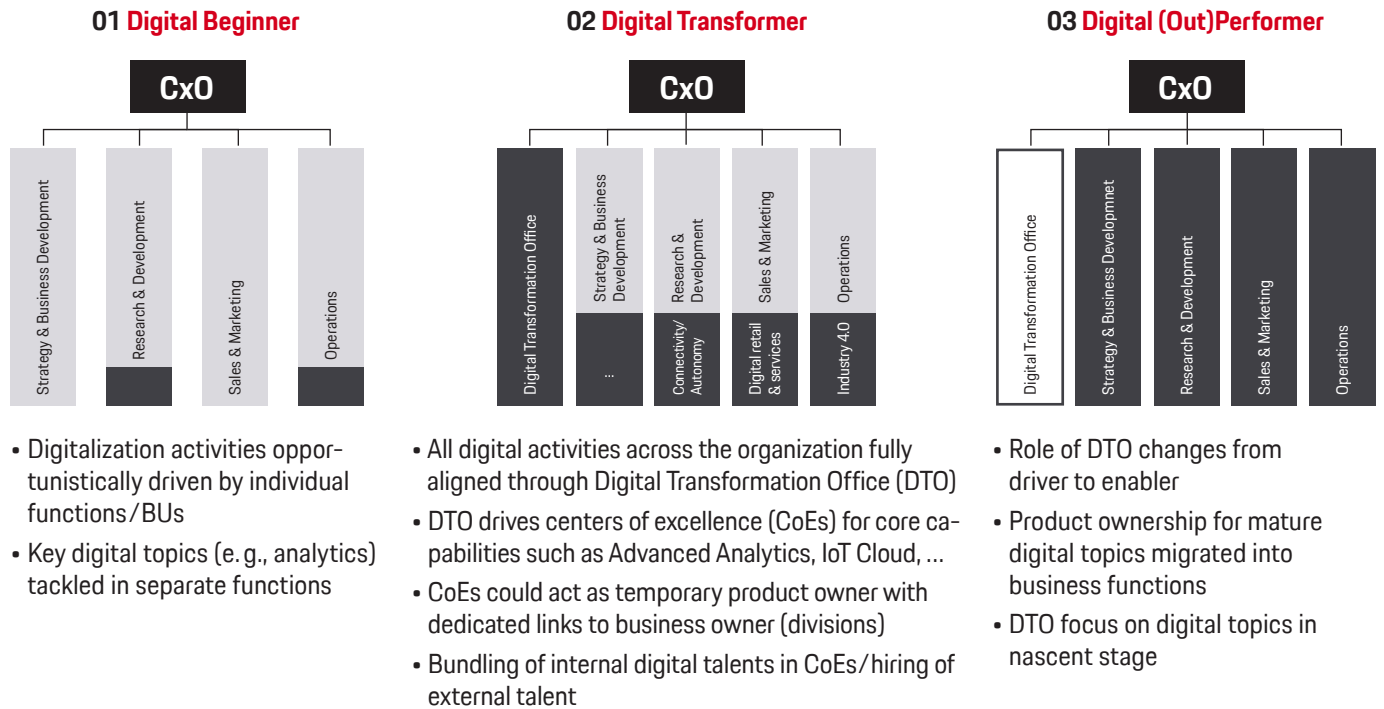


Figure 18

■ Digital activities/initiatives

Continuous improvements

As in any lean transformation, continuous improvements are a fundamental driver for sustainable digital transformation journeys, although at a much faster pace. In any traditional industry, incumbent companies that are continuously adopting and improving strategy, use cases, operating models, skill sets, innovation management, and ecosystem building can improve performance KPIs four to five times more successfully and sustainably. Porsche Consulting has experienced these higher success rates through continuous improvements in lean transformation client engagements over the last twenty years, and now in digital transformation project settings.

Adoption of operating model

The digital operating model as described in chapter 5.2 is an adjustable framework. All four key elements of the operating model require adaptations over time as priorities shift, digital maturity advances, or customer demands change. The digital organization design, for example, may evolve as illustrated above. The scope of new ways of working, in terms of collaboration workflows or applied tools, may be broadened due to higher involvement of units, regions, and functions. Digital governance structures and performance KPIs need to be changed due to adopted business models. Ideally, digital transformation KPIs are wired to individual incentive schemes, preferably implemented C-levels, and for second- and third-level management.

Constantly innovate IT infrastructures

Only a digital IT operating model that integrates core and digital IT infrastructures can unlock the potentials across the entire organization. Regardless of the design of the mechanisms or the rollout plan, the overarching goal is to constantly optimize the core infrastructure with new technologies and minimize the divide between digital and conventional IT groups. Mechanisms and stakeholders should ensure that integrated teams are supporting common strategic objectives and investments in systems, processes, and talents to drive future success.

Sustain pace of change

“The only constant is change.” This well-known saying could not be more apt in describing digital transformations. Exponential developments in technologies, competitor dynamics, and customer demands require constant change and correlated communication measures.

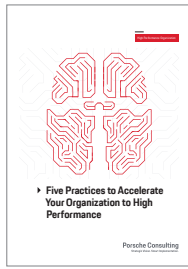
Following this playbook of twelve imperatives will be challenging. But it will also facilitate and significantly accelerate the digital transformation journey, in particular Industrial IoT adoption.

Further reading

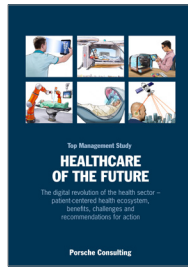
Porsche Consulting regularly publishes reports and articles on major trends, innovations, and ways to keep companies competitive.



Strategy Paper
**MedTech Operations –
A Strategic View**



Strategy Paper
**How Companies Become
High Performers**



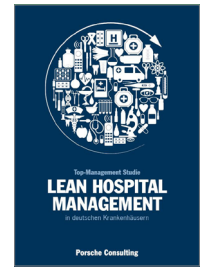
Top Management Study
**HEALTHCARE
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Top Management Study
**IMPROVING
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AT HOSPITALS**



Patient Survey
**Patient Centricity
in Hospitals**



Top Management Survey
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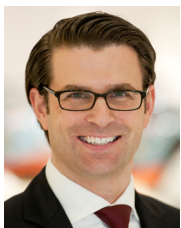
Porsche Consulting

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