Digital Playbook 2.0

A #digitalfirst approach to business success

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1. Introduction

This whitepaper provides an overview of the #digitalfirst approach to business success. It forms the starting point for the work on the new Digital Playbook 2.0, which will over time replace the current version 1.0, available on www.digitalplaybook.org. The principles outlined in this whitepaper apply to different domains, including digital.industry, digital.auto, digital.home and digital.building.

Motivation

The digitalization of physical products is constantly advancing. Modern smart home products are tightly interconnected with AI-based cloud services. Low-cost PC printers have migrated most of their application logic and user interface from the printer itself to smart phone apps. Modern cars are moving control logic to touch display functions, away from physical buttons and levers.

More and more traditional, physical products are also transitioning into Product-as-a-Service (PaaS) models. Historically, companies like Rolls Royce have shifted from selling products to services, such as offering "power by the hour" instead of aircraft turbines. Today, subscription and on-demand models dominate the digital landscape, with similar trends emerging in the physical world through digital platforms enabling services like ride-hailing and car sharing. These models thrive on constant innovation fueled by customer feedback, offering detailed insights into customer preferences and behavior, a practice that is extending to traditional companies, pushing them to focus on customer lifetime value beyond the initial sale through add-on services.

However, transitioning to PaaS models poses significant challenges for physical product companies compared to their digital counterparts. For instance, cloud-based companies can quickly iterate on new features based on customer feedback, a process that is considerably slower and more complex when physical products are involved. This difference underscores the difficulty of adapting to customer needs and incorporating feedback into physical product offerings.

For these companies, successfully merging digital and physical elements into their service offerings requires a deep understanding of customer needs, usage patterns, and satisfaction levels. It involves a shift towards a customer-centric, digital-first approach to innovation, acknowledging the legacy and constraints of traditional physical product companies while navigating towards more agile and responsive business models.

Digital Business Success

In her keynote at Bosch ConnectedWorld 2024, Tanja Rückert (CDO and Member of the board of management, Robert Bosch GmbH) outlined a strong vision for Digital Business Success. She explained that in an engineering and manufacturing company like Bosch, digitalization would often be seen as a matter of technology.

Technology is not responsible for the creative spark that launches an innovation, or the change in strategy that puts a company ahead of its competitors. That's the work of people. Only people are in a position to understand customer and user needs, and to leverage technology to meet them.

Dr. Tanja Rückert, CDO Bosch

Adding her own perspective, she makes the strong point that "technology is not responsible for the creative spark that launches an innovation - that's the work of people".

Drawing an analogy to the working of the human brain, she defines three success factors for Digital Business Success: connectivity, intelligence, and trust. Connectivity is required to bring together the intelligence that already exists in different domains. Human and Artificial Intelligence will have to be combined to leverage their respective strengths. Finally, she added that "Information leads to deliberation, but emotion leads to decisions. Feeling trust, above all, plays a central role in our decision-making."

Target picture: Product-as-a-Service

So how to apply the formula for Digital Business Success to Products-as-a-Service, creating connected, intelligent, and trustworthy solutions and services for customers? The PaaS navigator published by the Bosch IoT Lab at St. Gallen is providing an excellent starting point for this. The navigator provides a set of PaaS patterns which help companies to drive the PaaS transition and realize PaaS-based business models:

- Starting point for the PaaS Journey: Identification and definition of the starting point, e.g. Asset-as-a-Service, Fleet-as-a-Service or Feature-as-a-Service
- Identification of customer problems and requirements: addressing CAPEX-to-OPEX transformation, reduction of Total Cost of Ownership (TCO), optimizing Overall Equipment Effectiveness (OEE), or reducing operative or market risks
- PaaS service offering: financing and ownership models, service activation, service monitoring, maintenance, repair, updates, upgrades, and operations
- Managing PaaS payment methods: how to manage payments for usage, results, performance or consumption
- Strategic motivation: strengthening economic and environmental sustainability, increasing demand, closing supply gaps, increasing revenue and profit per customer, increasing market share, avoiding market risks
- Systematic utilization of technology: utilizing remote monitoring, remote access, predictive maintenance, updates and upgrades via the Internet, automated operations, automated sourcing, and order-to-cash management

Physical products will continue to generate the lion's share of sales and employment in the manufacturing industry. However, for many manufacturing companies, software and services are becoming strategic necessities rather than optional opportunities.

Prof. Felix Wortmann, Universität St. Gallen

Foundations

The concepts outlined in this whitepaper are building on state-of-the-art research, which documented in several key publications, including:

- The original digital playbook, which provides a framework for OEMs and manufacturers to apply AI and IoT to create new business models (www.digitalplaybook.org)
- The book “Produkte als Dienstleistung verstehen“ by Felix Wortmann et al., which defines the PaaS navigator and outlines the basic ideas for understanding products as a service
- “The Platform Business Navigator” by Felix Wortmann et al. provides a set of well-established patters to design and implement platform business models
- The whitepaper “How to compete in disrupting industries” by authors from Bosch and the Bosch IoT Lab at the University of St. Gallen and ETH Zurich
- The Ferdinand Steinbeis Institute „Business Transformation Toolbox“, which provides patterns for building digital driven business ecosystems
- The research paper „Design Principles for Creating a Pay-per-Part Value Proposition in Data Ecosystems” by Authors from the Ferdinand Steinbeis Institute Heilbronn

2. Evolution

Many industrial companies such as product manufacturers, OEMs, and equipment operators have undergone several waves of digital transformation in the past decade. Reality seems to have proven that this is not an easy feat for companies with a proud history of often many decades. Differences in business models, different technology-related processes and methods, and last but not least cultural differences between the physical product organization and the digital organization are often the root cause.

In order to better understand the target picture, let us start with a brief analysis of where many of these kind of companies are coming from.

The heritage: digital last

Let's first take a look at the old world, the world of digital last. In it, the design and development of the physical product dominate the product creation process. Digital or software-based components are often hardware-centric and closely intertwined with the physical components. The nature and extent, as well as the functionalities of the digital components, depend on the purpose of the product. In this understanding, service takes a subordinate position and is primarily seen as a service for maintenance and upkeep after the distribution of the physical product. Customer benefit arises when the customer can use their product for its intended purpose.

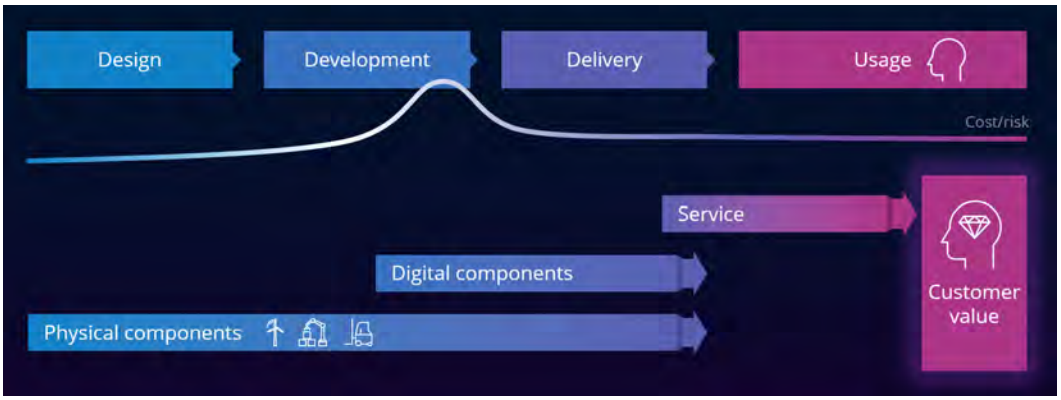

FIGURE 1: DIGITAL LAST

For the manufacturer of the products, the greatest risk and highest efforts fall into the late development phase. Consider a traditional manufacturer of production machines. Together with the customer, requirements for the machine are gathered and transformed into the product. After the completion of design and development, the machine is handed over to the customer. Often, this is the last point of contact of the manufacturer with his machine; he has no further information on its use or a feedback loop of data. There may be maintenance and upkeep contracts if these are not the responsibility of the operator. Figure 1 summarizes the world of digital last in one image.

Target picture: #digitalfirst

So what is the quintessence of #digitalfirst? When fully embraced, #digitalfirst transforms the product creation process and the entire lifecycle. At the core is the development of the product/service bundle, with its digital and physical components. Compared to the classical lifecycle, the prioritization in the development of physical and digital components is, however, turned on its head. The development of the physical components follows the requirements of the digital components. Service is no longer understood as a service after the sale of the physical product, but as continuous interaction with the customer. Customer benefit increases.

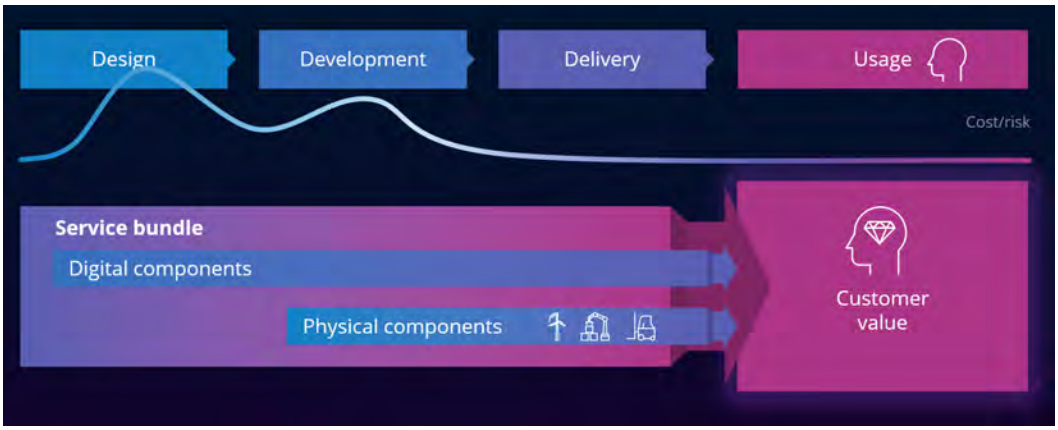

FIGURE 2: DIGITAL FIRST

Through the shift left, risk and efforts are moved to earlier phases of the lifecycle. The machine manufacturer from the example is now not just a producer but ensures the

operation of his machines at the customer's site. To this end, he has information about the use on-site and a constant flow of operational data, which provide the basis for his predictive maintenance management.

Thomas Fechner, Bosch Rexroth
(Board of Management)

Embracing #digitalfirst revolutionizes how we create and sustain product-service ecosystems, inverting traditional development priorities to ensure digital needs lead. This approach transforms service into an ongoing dialogue with customers, significantly enhancing customer value.

3. #digitalfirst paradigm shifts

In order to support the digital first approach to creating successfully digitalized products and PaaS offerings, five paradigm shifts have been identified: the creation of service bundles, application of the customer-centric "build, measure, lean" approach, establishment of digital platforms, and consequent adoption of a "shift left" and "shift north" strategy.

FIGURE 3: #DIGITALFIRST PARADIGM SHIFTS

Digitalized products: Service bundles

To offer future-proof service bundles, primarily physical products are extended with digital, software-based services, as well as human services. The goal of hybrid service bundles is to be adaptable and respond quickly to flexible customer requirements, in order to provide the maximum benefit.

FIGURE 4: SERVICE BUNDLES

For a machine manufacturer, hybrid service bundles could mean: What additional services can he offer with his production machine? Could he, for example, offer assurances for smooth operation beyond the sale of his machine and guarantee their fulfillment? How would his product need to change in order to offer these services?

Build, measure, learn

Platform-based services open new interfaces and interaction possibilities with customers. Usage behavior and customer feedback can be actively analyzed and evaluated, forming the basis for continuous development of the services. The user experience can thus be repeatedly aligned with the needs of the customer over time, allowing the service to provide lasting benefits.

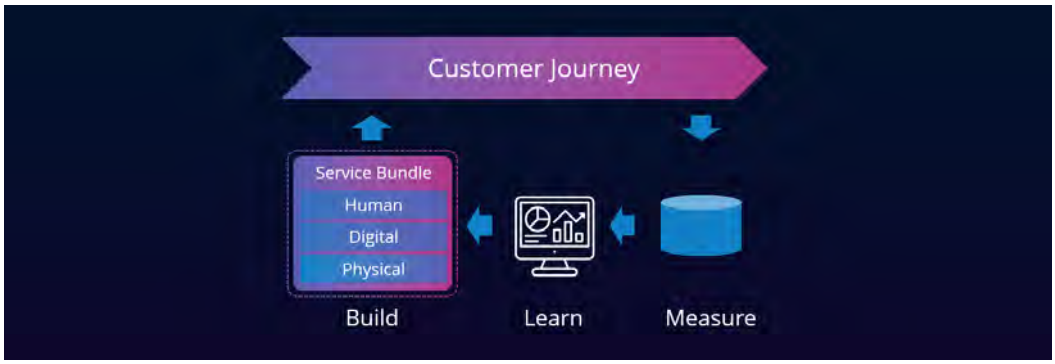

FIGURE 5: BUILD, MEASURE, LEARN

Digital platforms

Digital platforms serve as the central hub between physical and digital components to enable hybrid service bundles across the product portfolio. They allow for a consistent service-oriented alignment of the functionalities of the product/service bundle.

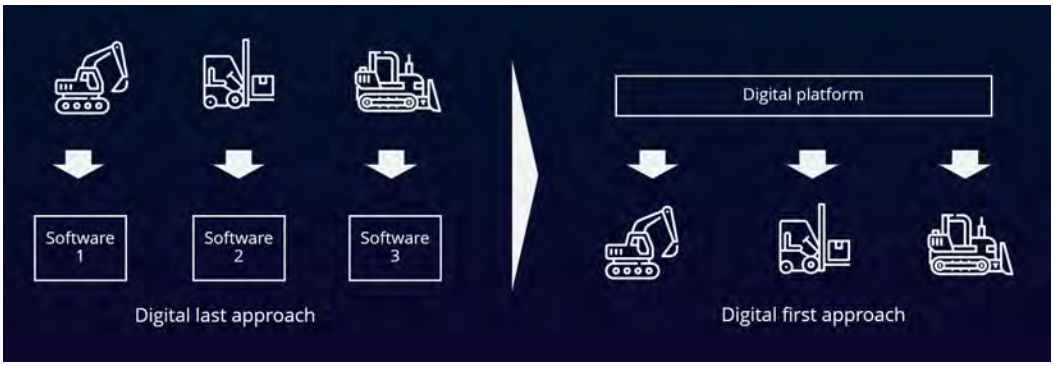

FIGURE 6: DIGITAL PLATFORMS

In the past, for many OEMs and machine builders, the digital last approach was leading to a situation where the physical product was designed first, with software being an after-thought. This has often led to situation where software is highly redundant and heterogeneous. With value creation – and complexity – being shifted to the software side, this no does not longer make sense. Consequently, companies with similar physical product categories should create re-usable software platforms, which can then be customized and applied to different physical product variants and configurations.

An example for an innovative digital platform was shown at Bosch ConnectedWorld 2024 with NEXOSPACE, a digital platform for building management – a suite of intelligent, connected and integrated services to digitally transform buildings.

Another good example is Rieter. Rieter has been a leading supplier of systems for manufacturing yarn from short-staple fibers for more than 200 years and can look back on a rich tradition of innovation and quality. Rieter's machine control software has evolved over time to optimize the performance of each machine. The different technologies within the machine portfolio led to bottlenecks in the development of functions, as synergies were not utilized and the boundaries between Operational Technology (OT) for real-time process functions and Information Technology (IT) for machine management functions were blurred. To address these challenges, Rieter embarked on a transformative journey, creating a new modular hardware and software architecture that clearly separates OT from IT. This strategic overhaul included a revamped software delivery setup, consolidation of technology stacks, standardization of common components, and consistent standardized interfaces that ensure seamless integration between machines and the overarching mill management system Essential. The expected advantages of this initiative include: Increased efficiency in rolling out new customer centric features to machines and Essential, thanks to more rapid release and innovation cycles, improved quality at lower costs through early error identification, and greater flexibility in selecting electronic components . This progressive strategy is summarized by Max Schmitt, Head of BU Digital: "Our #digitalfirst strategy is crucial to keeping us in the lead and offering our customers solutions for digital profitable spinning."

Laurenz Kirchner, Managing Partner
mm1 (a valantic company)

Transitioning from ‚digital last' to 'digital first' is crucial for OEMs and machine builders. Rieter's new control platform was established with this thought in mind: High quality Software will be the key differentiator in ever more competitive markets, enabling faster innovation, less effort for quality assurance and improved Hardware flexibility

Shift left

Through simulation and virtualization, the validation and testing against user requirements become independent of the physical component of the product. As a result, these activities can be moved to earlier phases of the lifecycle. The shifting of risk and effort associated with validation is referred to as "shift left."

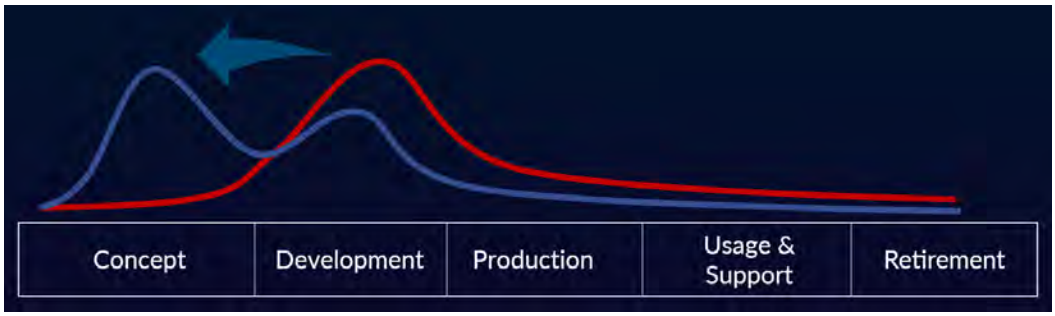

FIGURE 7:SHIFT LEFT

For example, the autoverse concept introduced by digital.auto allows car manufacturers to deploy new algorithms for the Software-defined Vehicle (SDV) into a virtual environment, where they can be tested by UX testers and potentially also real-world customers. Mixed- and Virtual Reality platform make access for testers easy, without costly investments into physical test vehicles. This concept was introduced at Bosch ConnectedWorld 2024 by Bosch, ETAS, Dassault Systemès and TestBirds.

Tom Acland, CEO Dassault Systèmes 3DEXCITE

The autoverse concept by digital.auto marks a revolutionary step for car manufacturers, enabling the deployment and testing of new SDV algorithms in a virtual environment, accessible through Mixed- and Virtual Reality platforms. It significantly reduces the need for physical test vehicles, democratizing innovation in automotive development

Another example is the virtualization of embedded software development. Being able to move complex development environments for embedded software development into the cloud can significantly increase team productivity, especially for international team setups as are often the norm for OEMs. An example for a virtual embedded software development environment is the Virtual Workbench introduced by ETAS and AWS at CES 2023.

The same concepts can also be applied to industrial use cases. In her keynote at BCW24, Tanja Rückert and Siemens CDO Cedrik Neike introduced the concept of an industrial metaverse for the design and testing of hydraulic systems and other industrial applications.

Shift north

Extracting digital functionality from programmable controls and hardware-centric embedded environments into a cloud setting enables tailored approaches (DevOps) for the continuous development of software-based services. The transfer of functionality from a hardware-centric environment into a digital cloud-native environment running either in the cloud or on the asset is referred to as "shift north."

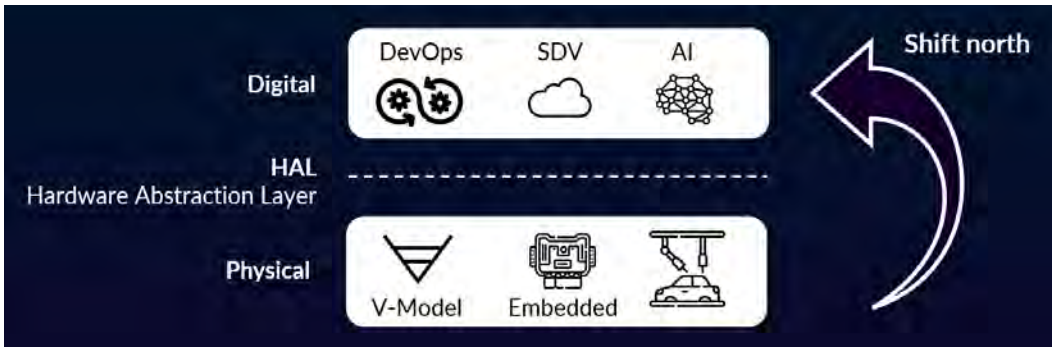

FIGURE 8: SHIFT NORTH

In automotive, the Software-defined Vehicle (SDV) is a key concept supporting such a shift north. Utilizing standardized vehicle APIs such as defined by the international COVESA alliance, the underlying complexity of a safety automotive architecture can be abstracted, so that non-automotive experts can develop new, digital features against these APIs – effectively shifting value creation “north” of the hardware abstraction into an easier to maintain environment. Utilizing cloud-native runtime environments on-board the vehicle helps speeding up development of new, digital features, and significantly improves upgradeability. ETAS and digital.auto showcased this at Bosch ConnectedWorld 2024. In addition, Bosch and SAP`s LeanIX division showcased how to manage the architectural complexities when integrating on-board and off-board software components into end-to-end solutions spanning multiple API layers.

Thomas Irawan, CEO ETAS

As the automotive industry embraces the Software-defined Vehicle (SDV) concept, we're leveraging standardized APIs, like those from COVESA, to simplify complex automotive architectures. This shift not only accelerates digital innovation but also enhances feature upgradeability, as demonstrated by our showcases with ETAS and digital.auto at Bosch ConnectedWorld 2024

In industrial automation, the Bosch Rexroth ctrlX AUTOMATION platform supports a similar approach: With its ctrlX OS industrial automation operating system, functional safety-critical and time sensitive features can be developed in a highly reliable, real-time environment. Through a set of system APIs, higher-level functions can be

developed “north” of this, in a cloud-native environment running on or close to the machine. Again, this de-coupling and shifting north of non-critical functions helps significantly with digital value creation. For example, this allows the development of holistic energy-management functions outside of the machine system core, continuously optimized to match requirements of the factory network and the energy grids.

In the industrial environment, Rexroth's Factory Orchestration Platform (FOP) is the system bracket for the CTRLX control platform, the intelligent floor (which provides the complete infrastructure from below) and the other products from partners, provided that there is a administration shell via which the products are described.

Adding GenAI to the picture helps significantly utilizing the power of machine data and Artificial Intelligence. An example blueprint architecture for this (including GenAI) was shown by Bosch Rexroth in a robot cell with a quality inspection system together with Dell Technologies, Vathos and Mairotec, Another example blueprint was shown in a handling system with Capgemini at BCW24.

4. Implementing #digitalfirst

When implementing the #digitalfirst approach for digitalized products, machines or even advanced PaaS concepts, the key paradigm shifts identified before have to be mapped to the revised life cycle perspective.

A new life cycle perspective

At the center of the new world are the service bundles, combining the human, digital and physical perspective. Together, the service bundles are creating the customer lifetime value, as shown in Figure 9.

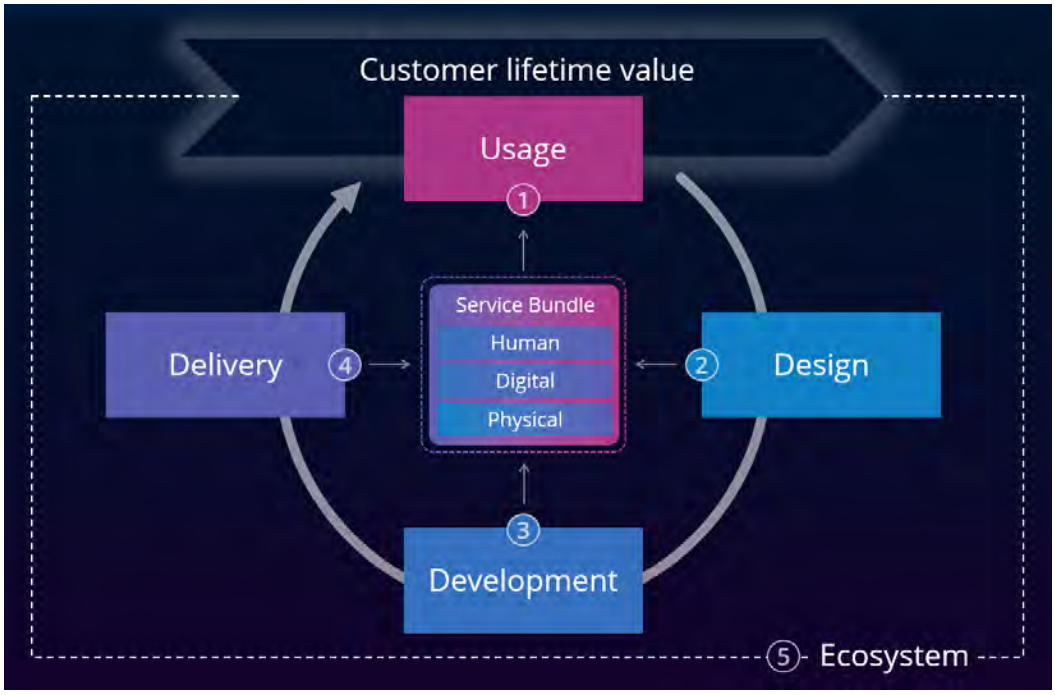

FIGURE 9: #DIGITALFIST LIFE CYCLE

A deep, data-based understanding of customer usage is giving input to the design phase. The design of the service bundles must carefully balance out the human, digital, and physical perspective. Early customer feedback through prototyping and simulation is helping to optimize the user experience. During development, virtualization helps with left-shifting critical development tasks. The delivery again has to take into consideration aspects of manufacturing, digital system operations and human resource management.

Applying the digital first paradigms to the life cycle

#digitalfirst signifies a profound paradigm shift in how products are created and used. It describes the integration of the digital world with the physical product, laying the foundation for new service business. It enables consistently and permanently aligning services and functionality with flexible customer needs. The application of core principles results in changes in almost every phase of the traditional product lifecycle, as shown in Figure 10.

FIGURE 10: APPLYING THE DIGITAL FIRST PARADIGMS TO THE NEW LIFE CYCLE

During the design phase, the product-to-value perspective should come first. Which value-adding services can be derived from the underlying physical product? And how can they be enabled by the digital platform?

Furthermore, the product design should aim to follow the shift north paradigm: hardware design should follow software design. The consequences for mapping a specific feature to a hardware vs a software solution must be well understood, from a UX perspective as well as from an implementation / manufacturing perspective.

Dirk Slama, VP at Bosch and Professor at Ferdinand-Steinbeis-Institute

Prioritizing the product-to-value perspective is crucial, focusing on how digital platforms can elevate the physical product. Embracing early validation with digital prototypes and continuous feedback ensures decisions align with strategic paradigms, enhancing customer engagement and service innovation.

Especially in the early phases of product/service creation, the boundaries between design and development will be fluid. Especially during this phase, the shift left paradigm applies. Digital prototypes, simulation or even metaverse-like UX testing should be utilized to validate assumptions about user preferences and get early

feedback on technical architectures and required interfaces – especially between the digital and physical world.

Further downstream in the development phase, virtualized development – moving embedded function development to the cloud – can help to shift left critical development tasks.

For the delivery perspective, continuous deployment of the offering is critical. In addition, software-based customer support models help improving customer service.

During the usage phase, data-based customer insights help intensifying the exchange with customers. New service models can be adapted through continuous deployment.

Ecosystems

Integrating and developing digital ecosystems is vital to crafting solutions that offer customers attractive options to choose from. PaaS offerings can create more attractive service bundle options through an ecosystem approach. As highlighted in works like "Platform Revolution" by Geoffrey Parker and colleagues, along with numerous success stories from major internet companies, digital platforms offer substantial scaling effects. This approach allows businesses to expand their offerings and reach within larger ecosystems effectively. To achieve a lasting success, it is important to establish a platform strategy and develop complementary offerings. “The Platform Business Navigator” by Felix Wortmann and colleagues offers a range of established patterns for designing and implementing platform business models.

It is worth noting that there are alternative approaches to ecosystems. Cooperative business ecosystems can provide a feasible solution for medium-sized companies that are facing challenges in establishing a dominant digital platform themselves. These ecosystems comprise various actors with their own capabilities, centered around a core value proposition. They collaborate and leverage their capabilities to offer complementary services and develop distinctive offerings. The competitiveness of these ecosystems arises from the capacity of diverse actors to collaborate and leverage their capabilities.

Professor Heiner Lasi
Ferdinand Steinbeis Institute

In the new world, business success is achieved through superior offerings that generate the best possible customer lifetime value. Therefore, companies need to develop business capabilities that enable the best possible interplay between the human, the digital and the physical perspectives and learn to orchestrate them in a cooperative ecosystem.

From a management standpoint, it is imperative to give careful consideration to the company’s ability to integrate into such an ecosystem setting. In the paper "Design Principles for Creating Pay-per-Part Value Offers in Data Ecosystems", researchers from the Ferdinand-Steinbeis-Institut Heilbronn, Germany, illustrate the functioning of a cooperative business ecosystem around the development of pay-per-part solutions for the production of batteries for electric vehicles. Based on their

experience in creating cooperative business ecosystems, they developed a "Business Transformation Toolbox" that provides patterns and methods for developing focal value propositions.

5. Summary and conclusions

In this final chapter, we emphasize the crucial shift to a #digitalfirst strategy for business success in the digital era. The journey has highlighted the transition from treating digital as an add-on to making it the core of business strategy and innovation.

Embracing #digitalfirst: Digital transformation requires making digital the cornerstone of business operations, underlining the shift from traditional to digital-centric models.

Integration and Transformation: We've outlined a roadmap for embedding digital-first principles, advocating for agile methodologies and a continuous iteration lifecycle that fosters innovation and resilience.

Digital Platforms and Shifts: The strategic use of digital platforms and embracing shifts like "shift left" and "shift north" optimize efficiency and create value, proving essential for competitive differentiation.

A New Lifecycle Perspective: Adopting a #digitalfirst approach involves rethinking product and service development cycles to be more iterative, responsive, and data-driven.

Hans Jörg Stotz, Bosch SVP, Digital Strategy & Transformation

Adopting a digital-first approach to strategy requires one to think from a different perspective: How will digital inevitably transform the way we conduct business? Digital technology provides us with the means to solve customer problems more easily and affordably. It reshapes market structures and competitive dynamics. Embracing digital necessitates new skills and methods of operation. Moreover, it demands that leaders develop and successfully execute a digital vision in harmony with the existing business.

In summary, the digital-first journey is ongoing and requires curiosity, adaptability, and a commitment to pushing boundaries. The digital era offers vast opportunities for those ready to embrace change and lead with a digital-first approach, shaping a successful, innovative future.


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