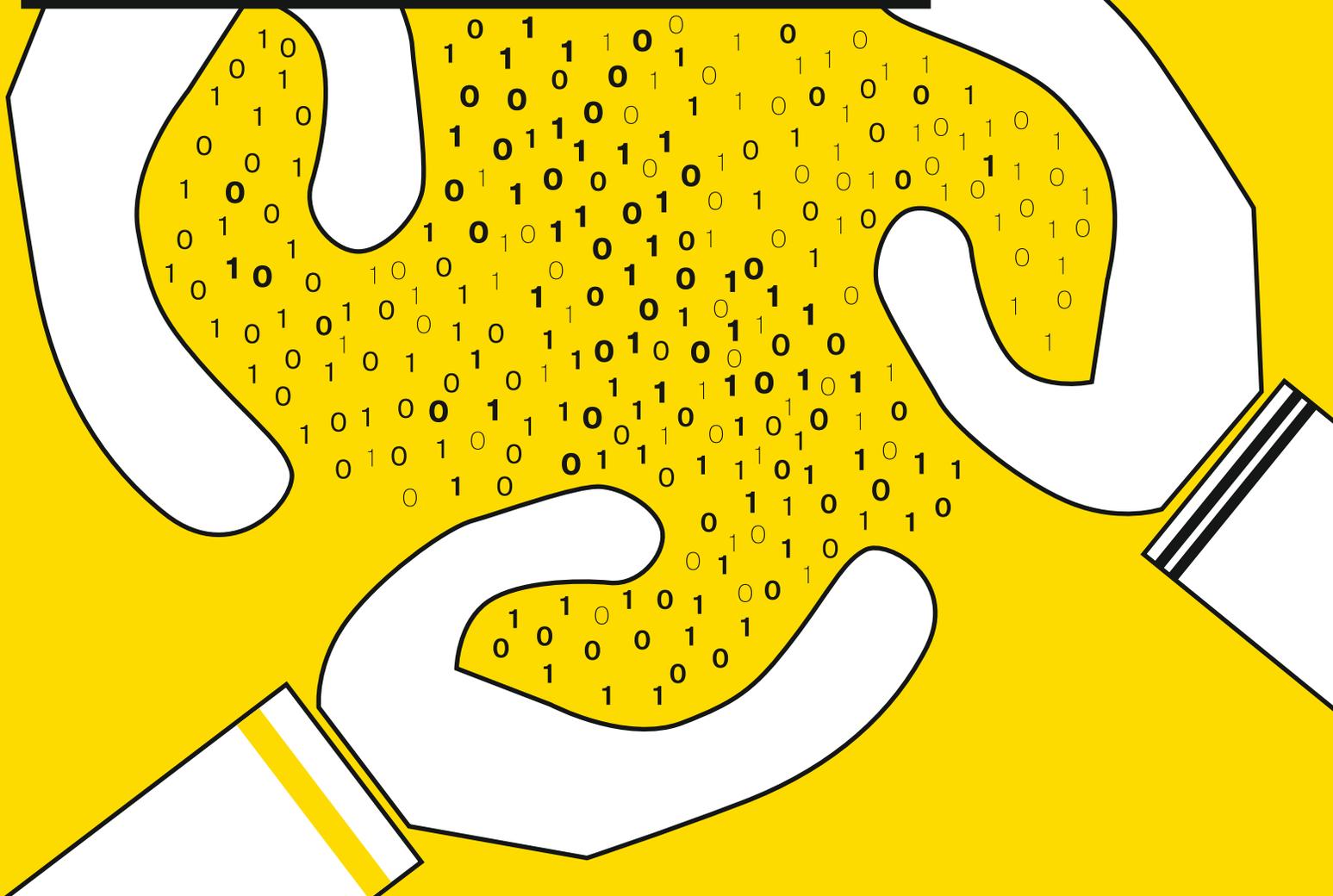


OPEN SERVICE LAB NOTES

DATA-DRIVEN SERVICE BUSINESS MODELS



EDITORIAL

Dear Reader,

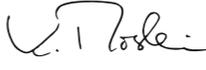
Digitization influences the way companies do business, today and in the future.

While the collection of large amounts of digital data has already become a standard procedure, the utilization of data for new services and the development of sustainable business models are still demanding challenges. The innovation of data-driven service business models can influence different parts of doing business and is accompanied by specific, data-related challenges. These Open Service Lab Notes aim to explore this highly relevant and exciting new field and to guide you through the first steps to datatize your business.

Open Service Lab Notes are published as a series showcasing recent research and the latest discussions of the Open Service Lab (OSL) members. The virtual open laboratory OSL is hosted at the Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU)

in partnership with the Service Factory of the Fraunhofer IIS in Nürnberg. The aim of this network is to bring together national and international experts from service science and future of work, pioneers in service innovation as well as sponsors and research partners. As a platform for interaction between researchers and practitioners, the OSL seeks to establish a networking space for key players in the field of services, service innovation and future of work. The OSL Notes will keep you up-to-date with the lively exchange on current relevant topics in the field.

Feel free to join our conversations online at <http://openservicelab.org> or to provide us with service innovation challenges that need to be solved!



Albert Heuberger

Kathrin M. Möslin

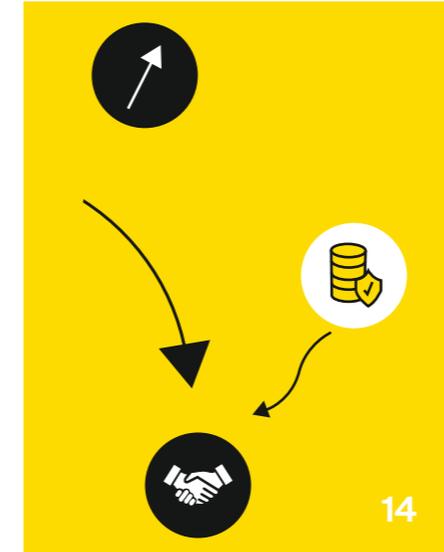


Prof. Dr.
Albert Heuberger



Prof. Dr.
Kathrin M. Möslin

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DATA-DRIVEN SERVICE BUSINESS MODELS

The continually growing amount of data collected or accessible from various sources opens up huge potentials for companies to innovate. In particular, the influence of data on service business models gives rise to new data-driven solutions. These data-driven service business models rely on data as their key resource, what means that the delivery of these services to the customer would not be possible without the usage of data.

The core elements of a traditional business model – value proposition, value creation and value capturing – can be infused by data in five different ways:

First, data is able to infuse the value creation within a company and increase efficiencies as well as provide better foundations for decision makers – first without adding any additional value to the customer.

Second, the usage of data can infuse the value capturing. Here, the value is captured by conquering new markets that were not addressed yet by the current value proposition. This can lead e.g. to both, new revenue models as well as individual pricing for different customers.

Third, the value proposition can be improved through a data-infused value creation that adds new services coming from data analytics to the current portfolio that is offered to customers. Usually this happens without any further payments to strengthen the relationship to the customer.

Fourth, a data-infused value capturing is able to have an influence on the value proposition as well. This happens e.g. if individual prices – that take special customer needs into account – are offered to the customer and add an additional value to them.

Finally, when all core elements of a business model are infused by data, a completely new data-driven business model emerges. In this case, companies use the full possibilities of data and analytics to extend their business model. On the one hand, companies can infuse all core elements of their current business model with data and analytics to provide completely new solutions. On the other hand, companies can innovate their business model completely by utilizing existing data in a new way and move away from their former business model.

Genennig, Jonas, Schymanietz & Möslein

HOW TO LEVERAGE DATA & ANALYTICS

Nowadays, data & analytics stand on par with capital and people as core assets of an organization. In fact, the exploitation of data & analytics is expected to drive the next wave of servitization – as a promising and necessary path to build a competitive advantage. Organizations find a wide range of alternatives to benefit from data & analytics for innovating their existing business. These alternatives may be structured along the following three dimensions: First, data-enabled improvements are internally focused endeavors to optimize process efficiency, increase productivity, support strategic decision making and create additional insights into their customer base by applying analytical methods on data created by their business operations or externally acquired data. However, this internal application of data & analytics does not directly affect a company's value proposition to its customers.

In contrast, data enrichment and data-driven services are related to organizations, which augment their externally directed value propositions by applying data & analytics:

Data-enriched products and services refer to the integration of customers facing data & analytics into existing products and service offerings with the objective to create additional value for their customers.

Finally, data-driven services are extensions to an organization's existing product and service portfolio by creating completely new stand-alone services that utilize data & analytics.

Data enrichment and data-driven services mark an advanced step of servitization, which is therefore referred to as "datatization", as it is the innovation of organizations' capabilities and processes to change their value proposition by utilizing data & analytics.

Hunke, Schüritz, Seebacher & Satzger

DATATIZATION OF AN ORGANIZATION

Looking at the immense potential, the application of data & analytics may not simply provide "some" competitive advantage, but rather turn out to be a necessity for economic survival. Datatization extends the current understanding for the concept of servitization, shifting the frontier of knowledge. The pioneers, who are exploring data-enriched products and services as well as data-driven services, have to cope with both existing, general servitization challenges, and also new, data-related challenges: Servitization refers to the development of capabilities to move from a product-centric portfolio to an integrated product-service offering. The required organizational transformation challenges the organization, as it requires the development of new processes, organizational structures, a service strategy, new service offerings and demands the adoption of new skills as well as a culture to cope with an unknown market. When pursuing datatization, organizations also face some of the challenges, which can be perceived during servitization. However, data & analytics add an additional layer of complexity and change. Thus, successful transformation approaches need to consider the following aspects:

Strategy: Datatization requires a data-strategy that defines how data is accessed and used.

Network: Organizations need to establish and maintain a partner information ecosystem, in which information is shared between relevant parties for developing, delivering and consuming data-driven and data-enriched services.

Customer relationship: Datatization requires a deepening in customer relationships by establishing a high level of trust and a close integration of the operating infrastructure between a provider and its customers, for instance via new interfaces (API, portal, etc.).

Development practice: Organizations need to develop new services in an integrated and cross-functional manner. Furthermore, development practices need to become highly software-oriented.

Revenue stream: In datatization, additional revenue might be realized by adding an additional revenue stream or indirect pay-off through product and service uplift.

Culture: A data-driven culture needs to be cultivated, which entails an open mindset towards technology and data, while also acknowledging customers' security and privacy concerns.

Skills & capabilities: The organization needs to acquire data science and software development skills.

Hunke, Schüritz, Seebacher & Satzger



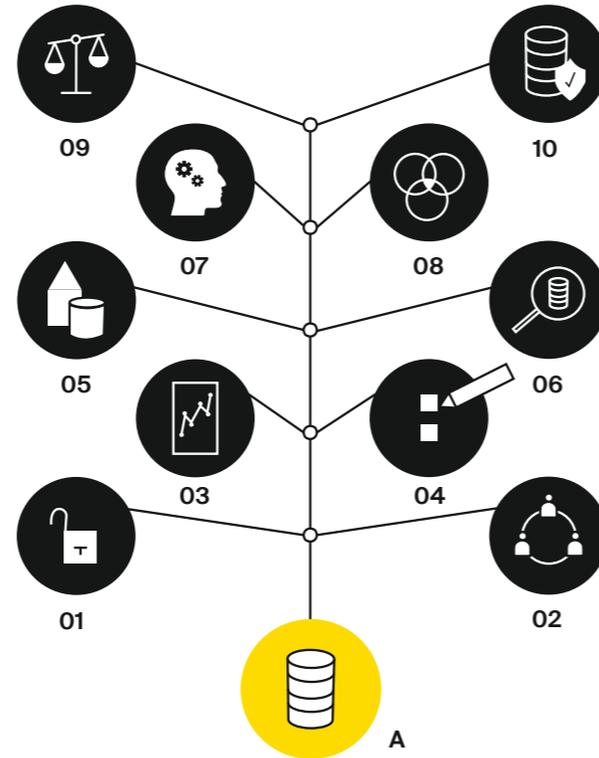
NEEDMAP FOR DATA-DRIVEN SERVICES

During the innovation of data-driven services, companies can face different aspects that result in needs that should be addressed. These needs can be clustered into four categories: **A** data, **B** business models, **C** external partners and **D** internal processes.

Data

The first category covers different aspects in regard to data and results in the following needs:

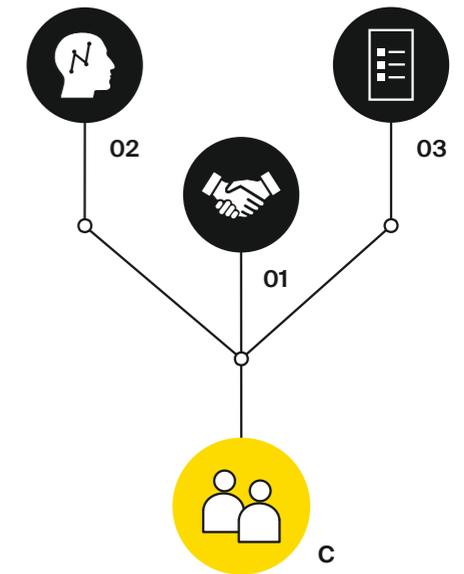
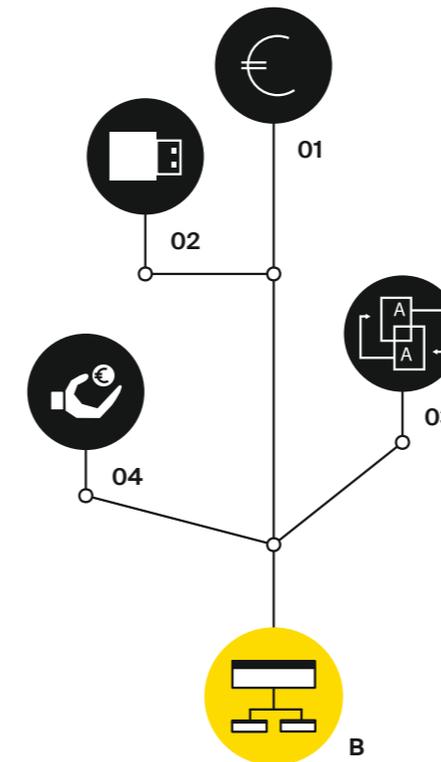
- 01 Access to existing data and clarity about ownership,
- 02 competences to generate data with sensors,
- 03 abilities to analyze and interpret data,
- 04 visualization of the collected data,
- 05 clarity about the location of data storage,
- 06 abilities to identify relevant data before collection,
- 07 usage of the available internal competencies to collect data,
- 08 standards for data exchange and communication,
- 09 legal frameworks for data exchange and ownership as well as
- 10 data privacy.



Business model

The second category splits up into needs like the development of

- 01 pricing models for data and
- 02 suitable data-driven business models,
- 03 the generation of a demand for data-driven services and
- 04 the setup of required sales competencies.



External partners

The increasing importance of data requires the collaboration with a variety of external actors that leads to the following needs:

- 01 clear regulations for inter-organizational collaboration,
- 02 flexibility of data-driven services to match different customer requirements and
- 03 the buildup of strategies to gain the customers' trust in the offered data-driven services.

Internal Processes

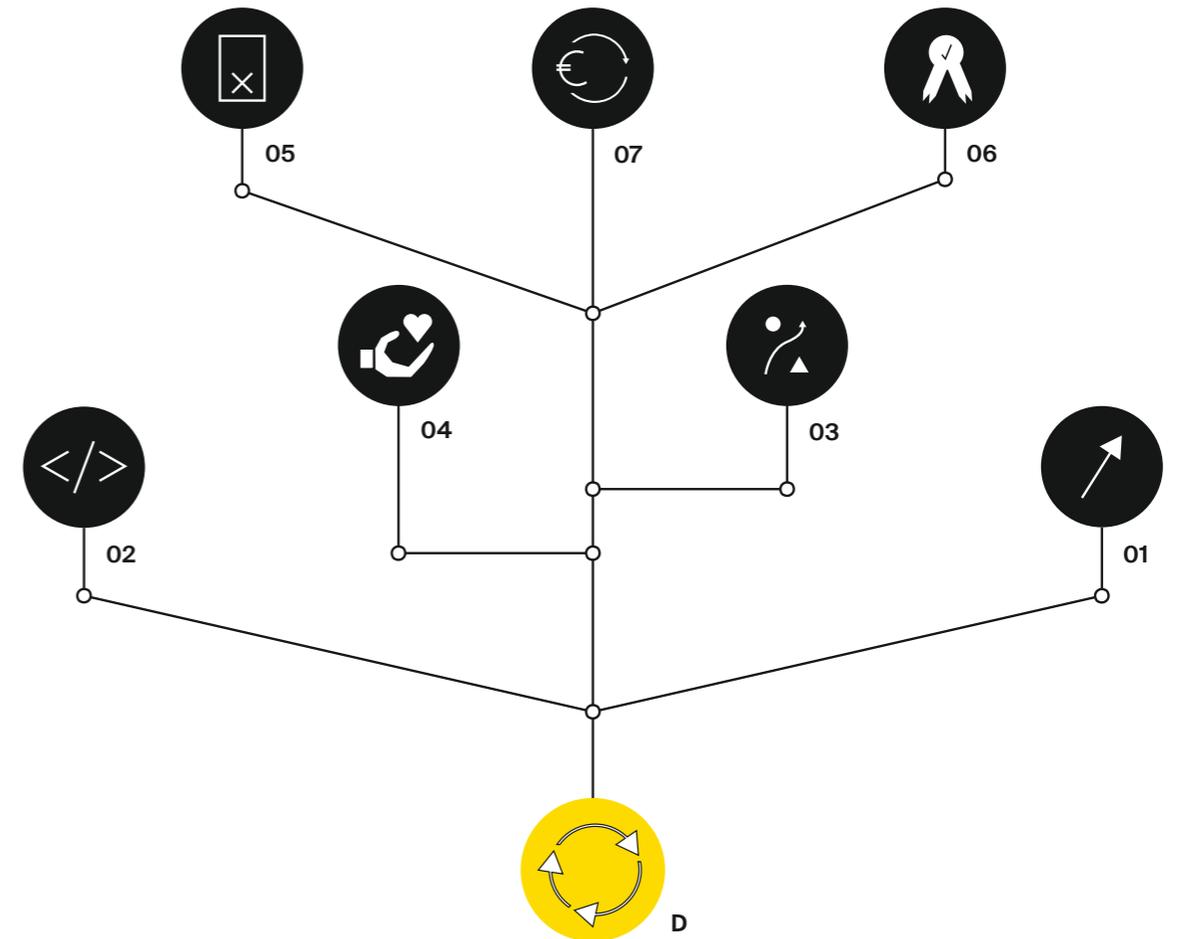
Finally, there are also evolving needs within an organization that can be summed up by the following points:

- 01 increase of the intra-organizational collaboration and break-up of silo mentality,
- 02 development of suitable processes for the innovation of data-driven services and business models,
- 03 establishment of a compatible corporate philosophy,
- 04 top management support and clearly communicated corporate strategy,
- 05 creation of freedom to test ideas,
- 06 consciousness about own and external competencies as well as
- 07 the provision of a sufficient budget for data-driven service innovation.

In a nutshell

Altogether, the innovation of data-driven services extends current needs by specific, IT-related ones. While aspects like 'the establishment of a service culture within an organization', 'budgetary constraints', 'top management commitment' or 'clear corporate strategy' already play a crucial role for service innovation in general, others aspects evolve specifically through the usage of data. This resolves in needs like the 'clarity about data access and ownership', 'analytical competencies', 'data privacy' and 'suitable revenue models'.

These aspects for data-driven service business model development require the integration of additional actors that did not play a vital role in service innovation before. For example, companies need to make sourcing decisions (according to their competencies) whether to carry out data analytics internally or to outsource this process step to specialized partners. Furthermore, legal departments that help to clarify questions about the possibilities of the utilization of data increase in importance to provide legal certainty to innovators of data-driven services. Finally, revenue models for data-driven services require collaboration with actors that already have experience with contractual relationships that go beyond traditional one time sales and provide solutions like subscriptions or variable usage fees and their conditions of payment.



BUSINESS MODELS 4.0

The digitization demands a lot of changes to service-oriented businesses. The processing of data keeps many secrets. Processing the right data can reveal new ideas for products or business models. The innovation of the business model is an important factor today for many companies as well as a difficult challenge. Hence, questions for organizations appear, like how to represent data-driven business models and how to design them.

Handling customers' needs require a special attention and data can help you finding out these needs whereas a framework for the implementation is still required. To create the right business model to encounter the customer's needs, a framework as a kind of a construction kit is developed within the project "BigDieMo". It leads the user step by step through the development of a data-driven business model based on the Business Model Canvas.

The construction kit includes a guide which supports the user to develop his idea in form of a workshop. Single modules for each field are exemplified and tools for the correct completion to describe the user's business model are given to hand. As it is described like a guide the potentials of the framework are an effective way to produce and handle new data-driven business models. Each tool is easy to handle by the user and ensures an easy to understand and applicable data-driven business model.

Kühne & Böhm



THE FESTO CASE

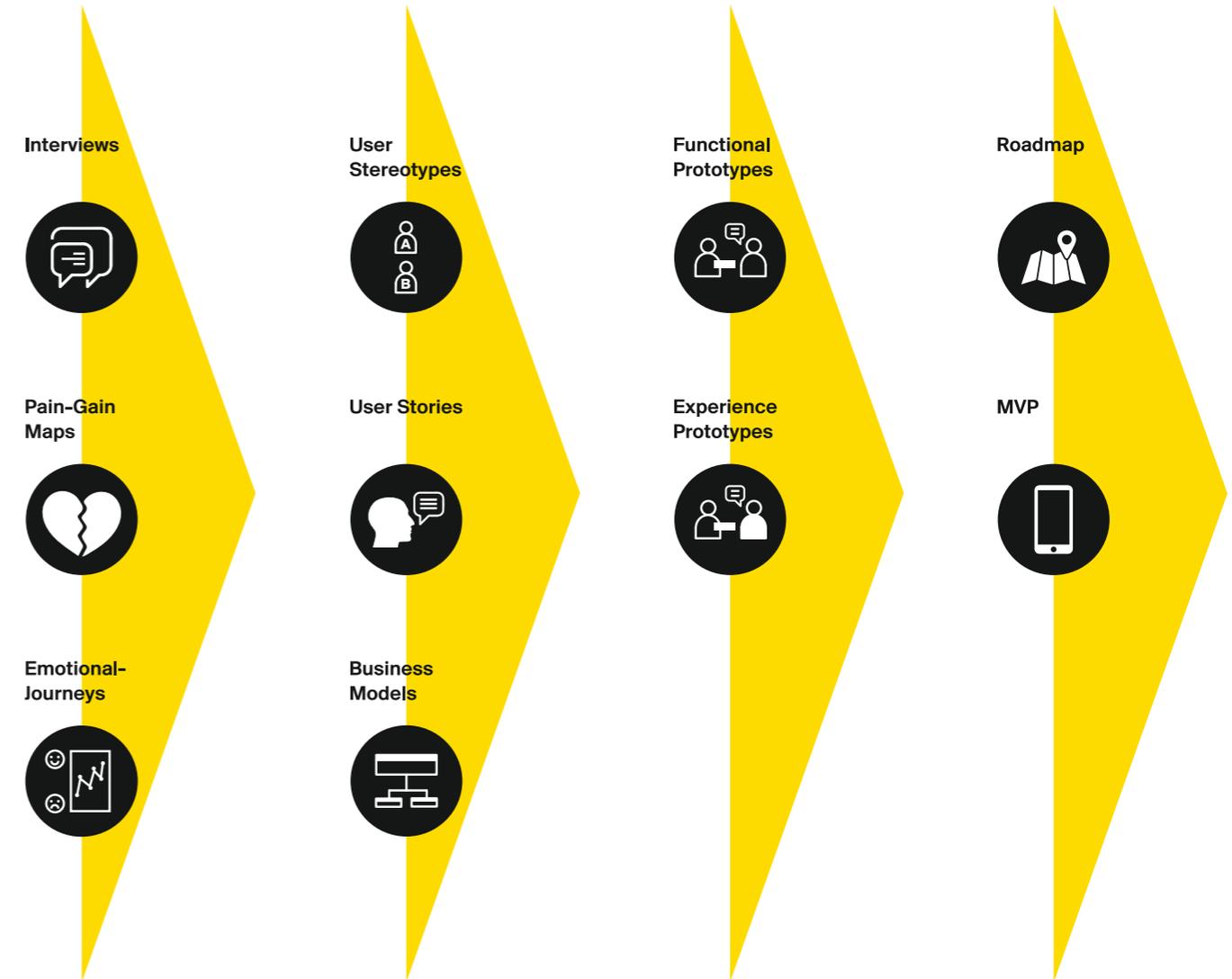
Festo – a German multinational industrial control and automation company based in Esslingen am Neckar – is producing and selling pneumatic and electrical control and drive technology for factory or process automation. Festo Didactic is a world market leader in industrial education and consultancy and is a founding sponsor partner of the WorldSkills Mechatronics Competitions. Sales subsidiaries, distribution centers and factories are located in 61 countries worldwide.

In the context of their digital product strategy, Festo has set up a number of projects to develop new services in the context of Industry 4.0 that build on the potential of digital resources. Within two years, the group has, amongst others, developed the digital service Smartenance. Smartenance is an intelligent maintenance management system that aims to replace former analogous maintenance manuals, plans and documentary records. It offers a digital solution to the customer that consists of three modules:

01 mobile digital maintenance manuals that are enriched by pictures and videos and enable a mobile access for smartphones and tablets,

02 a mobile calendar that reminds the responsible machine operators of their upcoming tasks and provides them with the possibility to give feedback and

03 a dashboard that visualizes all machines and tasks, provides the production manager with an analysis that includes all machines and creates a detailed documentation that can be used during audits.



The Smartenance service will be distributed through license sales via the Festo App World that is expected to be the central platform for digital solutions and apps from Festo in the future. After the license purchase, the Smartenance dashboard just needs to be complemented by tasks and maintenance intervals that were delivered with the machine documentation to be ready to use. To develop the digital Smartenance service, Festo followed a new service development process:

01 In a first step, the innovation team, with some method-support of a specialized innovation consultancy, started with the mission to create services around their sensor-equipped intelligent components. To identify user needs, they followed a Design Thinking process and started with the conduction of inspirational interviews with their clients and created pain-gain maps. A true advantage for the innovation team was that they could implement parts of their research within their own organization, at their own "clients" in the Scharnhausen technology plant. Based on the insights they gained from conversations with technology appliers, they mapped the client's emotional journey to illustrate their emotional experience through the interaction with Festo and their components. This way, they found out about the painpoints and needs in the clients everyday business practices.



02 These insights were aggregated in a second step, based on the analysis into strong or repeatedly arising needs and issues. In an ideation workshop, the team identified solutions based on these insights and created a map of the derived idea concepts. For these concepts, they built user stories, i.e. a clients' user journey of the future. User stories aim to put the customer's needs into the context of the overall picture and were created to help for an understanding of client's goals, experiences, needs and behaviors. Based on insights and user stories, Festo's innovation team then developed suitable business models for their ideas, amongst others the designated solution Smartenance. This solution was selected for further development, keeping in mind factors such as impact, expected effort and strategy fit.

03 In a third step, first prototypes were realized and tested – including functional and experience prototypes. Thereby the experience prototype was developed as a click-dummy to show the process of service application, the functional prototype, represented the working service which was implemented by adapting a conventional reminder system. This prototype created reminders for maintenance tasks on the one hand and on the other hand asked for a response like the duration, experience, a picture or other feedback of a completed maintenance. After two weeks of implementation at a plant, this functional prototype was discussed with its users and iteratively developed further. Overall, the experience and the functional prototype were discussed with internal and external clients

04 Only after that, Festo roadmapped the market introduction of their digital Smartenance service and developed the first software application as a Minimum Viable Product (MVP). The early version of the product Smartenance was tested with pilot customers and presented at major trade shows. As of April 2018, the software has been programmed and is ready for market launch. Yet, the business models and even the resulting products for data collected from implementing Smartenance are still under development.



Asked about the specific characteristics of innovating for digital services, Jost Litzen, product owner of Smartenance at Festo explains:



"When it comes to digital innovation, some aspects are easier than in pure hardware development, where ongoing production capacities and warehousing need to be established. The new service development process can be shortened significantly, in comparison to hardware development. On the other hand, security issues and data protection topics are highly relevant and need to be targeted. Also, we needed to engage in specific issues such as infrastructures and contracting for data storage as well as legal aspects in this context. For software license management, new service partners were needed. Still, the human resources and knowledge to develop our digital solutions were either already existing at Festo or developed over time, including new positions such as digital product managers. We are proud of the innovation methodology know-how we were able to develop within the past few years. And we are sure that this will give us a competitive advantage now and in the future!"

BIGDIEMO



The research project BigDieMo (German: BigData-basierte Dienstleistungsgeschäftsmodelle) is a joint work of the partners Karlsruhe Institute of Technology, Friedrich-Alexander-Universität Erlangen-Nürnberg, University of Hamburg, Festo GmbH & Co. KG and the Cyber Forum e.V.. The main goal of the project is to enable companies, especially SMEs, to leverage the potential of data within their business models. Therefore, the following steps are pursued:

01 Assessment of existing data-driven business models regarding their composition and potentials as well as development of a framework for current models.

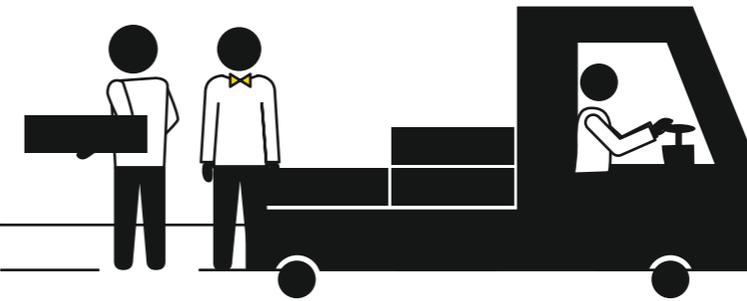
02 Identification of innovation needs in enterprises through interviews and workshops.

03 Development and piloting of a toolbox consisting of methods and instruments to design data-driven services and business models.

04 Creation of a handbook summarizing and spreading the results of the research project.

BigDieMo is a research project funded by the German Federal Ministry of Education and Research (German: Bundesministerium für Bildung und Forschung, BMBF) in the research program "Innovationen für die Produktion, Dienstleistung und Arbeit von morgen", during the period from 2015 to 2019.

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INTERVIEW



Mohammed Zaki

Dr Mohamed Zaki is Deputy Director of the Cambridge Service Alliance at Institute for Manufacturing (IfM), University of Cambridge. His internationally renowned research is in Big Data modelling and its application on Digital Manufacturing and services.

How to create value from data?

Could you tell us why many people talk about 'data is the new oil'?

Data is ubiquitous and everywhere. However, like oil, data is mined and not usable at the first moment. Data needs to be processed, organized and stored in the correct manner for insights to be drawn. In developing the right architecture, we can better use data to predict inferences and trends. Additionally, many organizations are either moving or have moved to digitized-based recording systems. In this case, data is the new oil because we can use the past to predict the future.

From your view, under which conditions does this apply?

A lot of companies use data as a key resource to drive new business opportunities and revenue streams for their firms. Start-ups normally have the agility and the skills to turn data into insights to do their business better or to predict things for decision making etc.. Big firms have the richness of the data set. Sometimes it is just about finding the right scale and building the right structures.

Basically it is all about understanding how firms can use data to generate the insight to build a business model opportunity for them.

How would you characterise a data-driven service business model?

Data-driven service business models have two main elements: The first being the value creation part which entails the necessary resources that will be incorporated to come up with new services. This element is dependent upon whether these resources. Namely data, are available in your ecosystem, company or firm. Or whether this data has to be sources from outside your given context. So it is best to start off with some initial data as a resource and determined how this could possibly be enriched via external data collection methods. Moving one step further concerns the activity. Or put more directly, what are you going to do with this data? For example, is it just simple analytics that could drive new revenue streams or is the output going to be very sophisticated analytics? The last step within the first element concerns value capture. Namely, now

that you have the resources and the objective, how are you going to convert this data into a revenue-based service? This is where you start thinking about the right customers that match your service offering. At the beginning stages this doesn't need to be set in stone, because quite often the target customers turn out to be different to the ones that you had initially intended. However, the point is to have a clear target market in mind when transforming value creation into value capture.

The second element that subsequently follows is deciding upon the type of revenue model to be used. This plays an important role in making your value proposition appealing to your targeted customers. With the correctly-fitting revenue model, you could in turn ensure your business's sustainability. Additionally, an integral part of the second element is deciding on how data can be obtained if it isn't immediately available or if the workload in processing this data is unfeasible to be done alone. In this case it is important to decide whether working with partners is a necessary venture.

What would be an advice to small and medium sized companies that are just starting their journey towards data-driven service business model?

The important key points are:

- 01** You should first start by having a clear goal on what your value is and who you'll be offering this value to.
- 02** Afterwards, it is necessary to think about how this value can be created. In terms of data, is it something that you already have? Or is it something that someone else has and hence, it is necessary to partner with the owning party?
- 03** In order to obtain this data, is it worth developing a platform for people to engage? Or is this information publicly available at which point your value creation is essentially your intellect?

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