

Entering the Next Level of Value Generation: Creating cyber-physical customer relations at ifm electronic

Case study on Master level

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Abstract

Ifm electronic is a mid-sized world market leader in sensor electronics for industry and automotive applications. The hidden champion shows an impressive growth trajectory in the last 20 years from around 200 mio. € to 1 bn. € in 2019. The company started as a sensor manufacturer in 1969, became an automation specialist for industry 4.0, and develops towards a full digital solutions company. In this case study, the ambitious leadership team starts to discuss options for organizing the transformation of the company for the age of smart services. Thus, students will discuss the implications of strategic decisions for servitization in industry 4.0 on customer relations from different perspectives.

Keywords

Growth strategy, industry 4.0, cyber physical systems, hidden champion, business model, value proposition, smart services, servitization, digitization

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Integrated Case Method

The case researchers / writers have conducted primary research by collecting qualitative (interview managing director and marketing manager) and quantitative data from ifm electronics and developed a student-centred, problem-based teaching case study (cp. figure I).



Fig. I: Integrated Case Method IFM.

Disclaimer

Prof. Dr. Jan-Philipp Büchler and Robert Ciszewski are the authors of this case study, which is intended solely for teaching purposes in management education at institutions of higher education. The case is designed to be used as the basis for class discussion rather than to illustrate either effective or ineffective handling of a management situation.

The contents of the case study are carefully researched based on interviews with company representatives as well as publicly available primary and secondary sources. Nevertheless, mistakes cannot be fully eliminated. The publisher, editor and authors can assume neither legal responsibility nor any liability for incorrect information and its consequences.

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1. Case Study

Rethinking service

“Moving toward smart services even creates more challenges than providing physical services” Sascha Rahman finished his presentation on the sales and service conference at ifm electronics in front of senior management. “Now I would like to ask you: In which areas do you see the most important challenges for us?”

“You are absolutely right Sascha” Andreas Daum started the discussion. “My customers are manufacturing companies. When they decide to provide smart services, it entails a more invasive reaction on the configuration of their organization and subsequently of our organization than just introducing physical services.”

“In how far do we need to change?” Michael Marhofer, co-chairman of the board of ifm electronics asked promptly.

“Well, after they introduced the remote monitoring and dashboard service to their customers, their service managers anticipate the potential and need for providing a predictive maintenance service. So far, they collaborated with external software companies or sometimes with us to develop the remote monitoring service. But now, they understand that it could be beneficial for the future to leverage the knowledge for smart service development in-house.” Andreas answered. “The predictive maintenance service consists of a software that uses machine tool data based on our sensors to flag potential failures after reaching or surpassing a predefined threshold. Consequently, their service department has to define the business concept behind the new offering. Their IT or a dedicated software unit needs to build the program. The product organization must ensure that the right data is transmitted accordingly on-time.”

“I see. That will change the intensity and sequence of collaboration among several units in their organization with far more touchpoints than they used to have before. Consequently, they will have to restructure their business and processes. How do they think about their optimal organizational configuration?” Michael asked.

“This is difficult. According to a recent benchmarking study, forty-two percent think that separation in a functional unit could be the best choice, while thirty-two percent opt for an integrated structure. The residual twenty-six percent opt for either staff function, decentralization or project teams. Obviously there is not a single optimal configuration.” Andreas explained.

“Well, companies are unique scaffoldings adapted to individual contingencies of each company. There won't be a one-size fits all solution” Sascha commented.

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“OK. That’s true, but what are the consequences for us? What are the opportunities and threats arising for us?” Michael asked. “Please develop scenarios for us on how to adjust our organizational structure to the requirements of our customers in an age of smart services.”

Global market leader

The ifm group (ifm), headquartered in Essen, is a global manufacturer and distributor of automation systems and components for industrial companies. ifm's exceptionally large product range does not only consider all relevant standard solutions, but also the specific requirements of individual industries. Apart from position and process sensors, this product range also includes sensors for motion control and safety technology. In addition to this, ifm offers products for industrial image processing and communication as well as identification systems for mobile machines.

ifm serves customers from all kinds of industries like packaging, automotive, food & beverages, mobile machines, machine tools and equipment manufacturers, wind energy, hydraulics as well as steel and metal. Beside the coverage of many industries, ifm is represented by more than 7,300 employees in over 95 countries worldwide and manages a portfolio of more than 150,000 buying customers on all continents. The family-run ifm group operates fully owned subsidiaries, development and production sites in more than 70 countries. Their sales and service team of about 1,450 employees offers the best advice to their customers in every country.

Family business with successful transition

The founding fathers of ifm were driven by a passion to develop sensors with extraordinary quality and to provide incomparable customer service. It was with this Vision that Gerd Marhofer and Robert Buck started ifm in October 1969. Starting out from humble beginnings – not in a garage space, but similarly in the bedroom of a 80qm flat in Tett nang in the South of Germany – the engineer Robert Buck developed the first touchless microswitch having been inspired Gerd Marhofer, who worked as technical sales manager for different electronic device companies before.

In 1972, three years after foundation of the company in Essen, 32 employees generated 2.5 mio. DM. In the following years, the founders established sales offices overall Germany and headquarters in Essen while research, development and production remained in Tett nang. In 1976, ifm went international and opened-up the first subsidiaries abroad in France and Japan. The ECASA project (2019-1-DE01-KA203-005037) is financed by Union funds (ERASMUS+). But the content of this document only reflects the views of the authors, and the European Commission cannot be held responsible for any use which may be made of the information contained therein.

In the same year, sales revenues exceeded 10 mio. DM. To the end of planning reliability and options for further company growth, ifm invested strategically in land of 52.000 qm for in Tett nang.

In 1980, ifm was one the first companies to enter the production of optical sensors which turned to be one of the most attractive growth segments. Consequently, the company increased production capacity and invested in 1988 in a second production site in Le Bourget-du-Lac in France.

The reunification of Germany in the early nineties set the opening stage for expansion to Eastern Europe starting with a sales and service unit in Eastern Germany and further international subsidiaries in Slovakia (1993) and Czech Republic (1993). The further international expansion was driven by market opportunity and customer demand, thus ifm established a further subsidiary in Malaysia (1994) and a sales office in India (1994). In 1996, the US-American market entry was manifested with a production site in Pennsylvania. Further subsidiaries in Austria and Australia were established in 1998. In the same year, ifm introduced a successful range of innovative safety sensors to the market.

In 2001, the next family generation took over the leadership of ifm. Michael Marhofer and Martin Buck - the sons of the founding fathers – continued this successful growth journey. The second generation consolidated the independent German legal entities and simplified the legal structure and organization. In 2003, the acquisition of i-for-T GmbH allowed for entering a new strategic business field of vibration sensors. An accelerated wave of international expansion took place from 2003 to 2005, when ifm entered Canada, Mexico, Netherlands, Poland, Portugal, Russia, Turkey and Hungary. A breakthrough innovation was presented in 2006, when the IO-Link as the fundamental platform and linking device for industry 4.0 applications was developed together with strategic partners.

In 2010, ifm expanded the geographical scope for research and development activities by opening up a research and development site in India and a production and development unit in Singapore. In addition to the internationalization efforts, ifm realized several technology-driven acquisitions in 2012. The acquisition of Handke Industrie Software layed the basis for ifm datalink and the takeover of pmd technologies, a specialist developer of 3D-technologies, followde by a majority equity participation in TISC AG – software developer and IT infrastructure specialist - in 2016. To show the shift towards digitization and realize cross-synergies between ifm units and the new acqusitions, ifm opened up a software- and technology center “The Summit” in 2019.

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Today, ifm is a privately-held global manufacturer of industrial sensors and controls as well as software solutions for industry 4.0 applications located in all major countries producing more than nine million sensors annually. ifm's global reach ensures that customers can count on local support all over the world.

ifm in Germany: A powerhouse for development and production

Nevertheless 70 % of their products are developed and manufactured in Germany. They feel closely connected to the location Germany. But they have reached a point at which they want to further extend the vision of their commitment "close to you". With manufacturing and development locations in the USA, Singapore, Poland and Romania they follow their principles and can respond to the requirements of the different markets with high professional competence, high speed, flexible adjustments and professional consultation. All their manufacturing and development locations are set up according to the reliable German quality standards, whether it concerns the working conditions for their staff, environmental protection or the highest quality standards in development and production.

After many years of intensive cooperation with their customers, they have established themselves in the market as service-oriented sensor specialists. Even though ifm has grown into a big company, they have still maintained the virtues of the founding years: The flexibility and individuality of a small enterprise and the quality and professionalism of a group. The customers are still today in the centre of their work: "close to you".

Over the last 25 years ifm has grown by an average of +6% CAGR until they reached a sales of 1 billion Euros in 2020. Even right before the first billion was reached, several ambitious employees asked themselves how do we reach the second billion? The strategy workshops defined smart services as the new business opportunity to trigger profitable growth.

Reshaping the business focus for the 2nd billion goal

Currently ifm's main pillars are the position and process sensors which are the main contributors to ifm's growth history. The third and upcoming pillar are the products from the field of Network & Control. The newest product field of the company's product history is ifm solutions. An overview of ifm's core business fields is shown below (cp. fig. 1).

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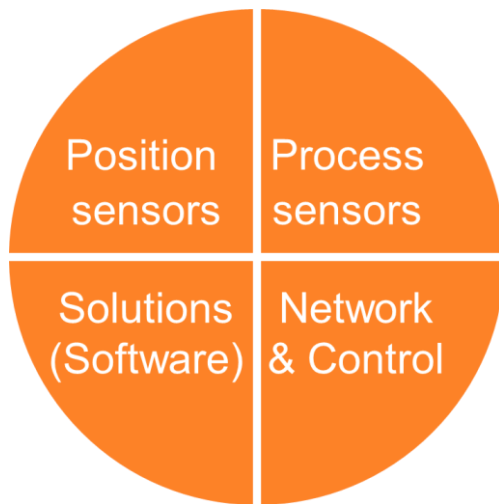


Fig. 1 Business fields of ifm electronics (source: ifm).

ifm solutions GmbH is the holding company for all software subsidiaries of the ifm group. It is responsible for the strategy and management of the associated companies. In addition, ifm solutions GmbH bundles and provides central services with the company's ifm services GmbH, ifm software GmbH and GIB mbH:

- ifm services bundles the expertise around IT, software and production systems and thus offers worldwide support at the highest level.
- ifm software offers a continuous, seamless connection between the world of sensor technology and management. The customer can thus be offered a holistic flow of information that makes the supply chain process transparent and optimizes it.
- GIB is a manufacturer of SAP-based and licensed software that optimizes all supply chain processes. With more than 25 years of experience, 60,000 satisfied users and around 600 customers worldwide, GIB is a central key player among the manufacturers of SAP-based supply chain software.

In order to reach the strategic sales growth, ifm owner, Michael Marhofer, defined some crucial conditions for the company, so that the company is able to cope with the associated challenges as illustrated in figure 2.

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-  We must be a problem solver.
-  We must be reliable and provide exemplary services.
-  We want to develop whole industries.
-  We will digitize business models.
-  We must practice cross-selling.
-  We shall tackle new market (America, Asia, Africa) and maintain established markets (Europe).

Fig. 2 Capabilities and conditions that are necessary for the 2nd billion goal (source: ifm).

Industry 4.0 and Digitization as transformational drivers for ifm

Industry 4.0 and digitization are megatrends that concern all industries. In 2005 ifm took the first steps towards Industry 4.0 with technologies such as IO-Link and other activities. Ifm's current approach is to work with "use cases": The focus is on the digitization of individual machines in order to build an all-encompassing network of production locations. Ifm sensors are designed for manifold applications and requirements of various industries.

In preparation for the strategy workshop Michael Marhofer discusses together with the co-chairman Martin Buck the impact and chances of industry 4.0 and digitization on ifm. "We can not only produce sensors, but also systems for industrial automation and individual solutions for special requirements of our customers that go beyond the standard", says Martin. "I mean, we should sell more systems instead of just individual components in the future."

Today ifm's products form the basis for automation, networked production and Industry 4.0. "It's no longer just about controlling machines," says Martin Buck, "but collecting data, evaluating it and drawing conclusions about the condition of the systems or increasing their productivity. Ifm is increasingly developing into a solution provider. Ifm no longer offers sensors only as components but deals with a problem at the customer's and offers him several components which, in combination, represent a solution to the customer's problem. In addition to the components sensor, connection technology, IO-Link master and edge gateway, such a solution also includes parameterization and software."

Therefore, in addition to the sensor technology, ifm has expanded its portfolio in recent years and offers complete systems. Among other things, the sensor experts were involved in the development of the IO-Link communication standard, which is considered the basis for Industry 4.0 applications. Ifm also supplies the appropriate hardware with so-called masters. Sensors are connected to them in order to transfer data to the IT environment or to a cloud.

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IFM was already involved in the development of the IO-Link communication standard, which forms the basis for many Industry 4.0 applications. “Do you remember our big moment in Hannover?” Michael asks. “Sure! The Brave New World Moment”, Michael answers and smiles. The two of them remember an important visit on the Hannover trade fair: "It's a brave new world," said the then US President Barack Obama when he together with German chancellor Angela Merkel visited the IFM stand at the Hannover Messe 2016 and stayed longer than planned. An unforgettable highlight in the company's annals.

Sensor market overview

Defining the exact market or the exact competitive environment of ifm turns out to be more difficult due to ifm's heterogeneous product portfolio. In many cases, competitors are relevant in certain specific product areas, but not at all in others. In addition to the product range, the companies also differ in the markets they are targeting. Most of the time, the sensor providers, especially the larger ones, have a fairly broad industrial portfolio, but mostly also have industrial applications in which they are particularly specialized.

For an initial overview, however, the most relevant market participants from Europe and their development in recent years can be considered. The market participants listed can be clustered into three groups according to their size (turnover and number of employees). Festo, Endress + Hauser and Phoenix Contact are among the three largest market players. Sick, Wika, ifm and Pepperl & Fuchs can be assigned to the midfield and Turck, Balluf, Vega and Jumo as smaller market participants. In terms of development, the listed sensor manufacturers achieved an average growth of + 10.6% in the years 2016-2018. While some participants, especially the medium-sized ones, achieved double-digit growth in sales and employees, Festo and Endress + Hauser as well as Vega and Jumo are growing below average. Overall, ifm achieved above-average growth in the sensor market in terms of sales and personnel in the years 2016 to 2018 (cp. figure 3).

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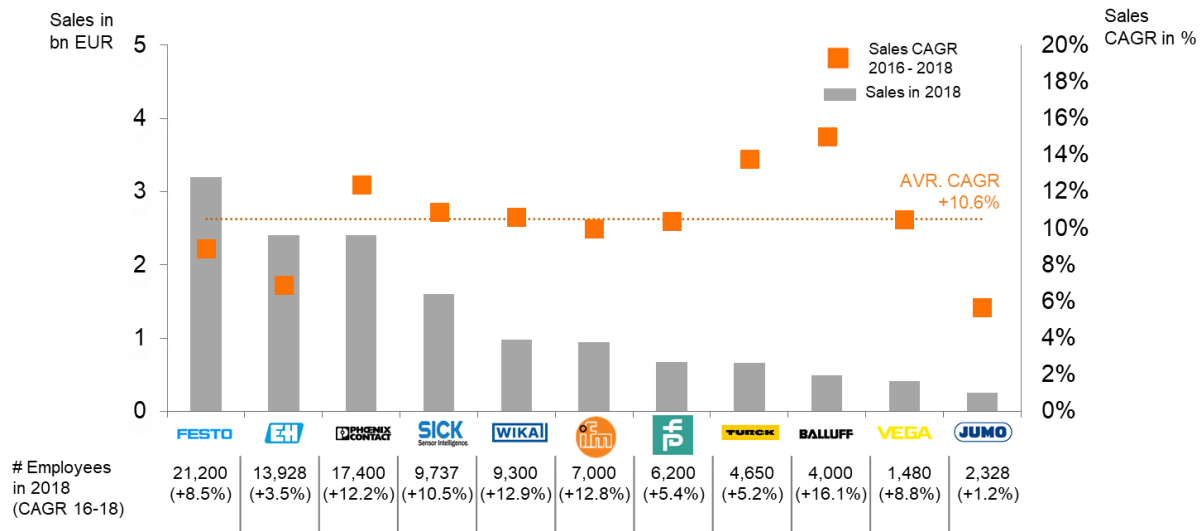


Fig. 3 Selective overview of sensor producers.

The role of services in the industry and within ifm

Within the sensor market, the long-term business focus is shifting towards the offer of solutions. The aim is that customers can rely on the fact that their applications and processes are guaranteed by the solution of the sensor provider through connecting the various components of the solution within the customer process and acting smartly with one another in order to make it as successful as possible.

When it comes to offering services, the perspective of market participants in the sensor and automation market is different, especially when it comes to monetization and the underlying business model.

One of the larger players within the automation market, Endress + Hauser, developed a huge service unit within the organization and invested heavily. Their worldwide strategic service organization counts around 1,000 employees with 150,000 customer requests per year. The added personnel increase within Endress+Hauser's sales channel will add even more resources in project management, inside sales, outside sales, application engineering, industry, solutions and services. Their service business grew disproportionately. For example, their competence in the maintenance and calibration of measuring devices is increasingly in demand. Knowledge transfer is also gaining in importance, increasingly in the form of webinars. The monetization of the services at Endress + Hauser becomes clear through a four-stage offer (cp. figure 4). Thereby the availability, type of technical help and support with the performance review differ.

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	ESSENTIAL	STANDARD	PLUS	PREMIUM
Online access to Endress+Hauser knowledge base	Basic	Extended	Extended	Extended
Support request online & phone hotline	✓	✓	✓	✓
Technical support availability	8/5	8/5	8/7	24/7
Priority Callback		4 hours	2 hours	1 hour
Visual support (live video transmission)		✓	✓	✓
Support Success Program & performance reviews			Quarterly	Monthly
Business Model	Free of charge	Contracted offering	Contracted offering	Contracted offering

Fig. 4 Service packages from the sensor supplier Endress + Hauser (Source: Endress + Hauser).

However, ifm has a different perspective when it comes to the organizational set-up of the service area. Regarding building up people and hiring process: They currently do not want to become a ‘service company’ with hundreds of service employees and organizational structures. Rather, they want to attack service offerings from competitors with smart and digital solutions. Also, they want to identify and monetarize existing service offerings where the customer is willing to pay for. This means they want to identify services in the market that are worth attacking – as well as identifying services that are worth charging for. Right now, many sales and service offerings are not charged by ifm. They are more likely to be seen as part of the product offering and are monetarized through higher prices for the respective components. Services that are currently monetarized are Inspections (follow-up time measurement), training activities for personnel, consultation, calibration & programming, repair, certificates and references as well as reporting & documentation.

The challenge for ifm is, that their claim „close to you“ might soon mean to not only sell hardware components to their customer, but to also offer a complete range of complementary services along the value chain of their customers. Certain competitors are already working in this direction and have proven success in this area. However, it must be noted that in addition to the numerous opportunities for portfolio expansion with services, there are also some risks for ifm, when it comes to the alignment of resources, capabilities and strategy of the company. Some of the chances and risks are displayed in figure 5.

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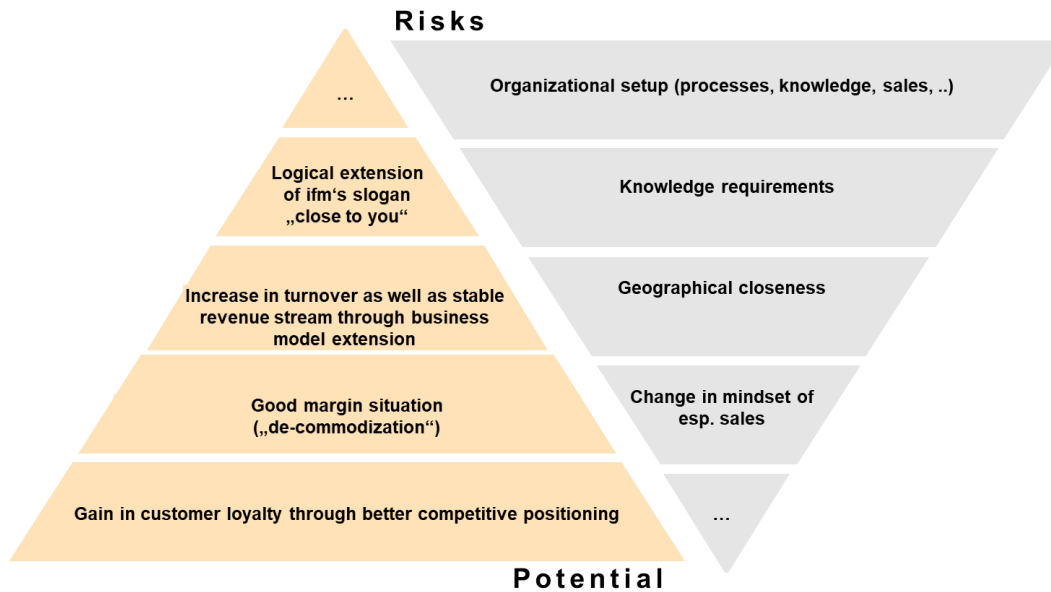


Fig. 5 Comparison of the potentials and risks for ifm of expanding the service business (based on Turunen and Neely (2012)).

Development from component over service to solution selling

It can be observed that the service business is becoming increasingly important for the portfolio of companies in many industries. The development to a service provider is very lucrative for companies and relevant for their sales growth. The maturity of a market is relevant to the speed and pressure of companies to develop. The more mature a market is, the shorter the life cycles of the products. The blue curve in figure 6 clearly shows that the total sales of a product decreases with a shorter life cycle, shown with the area between the curve and the X-axis.

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Sales

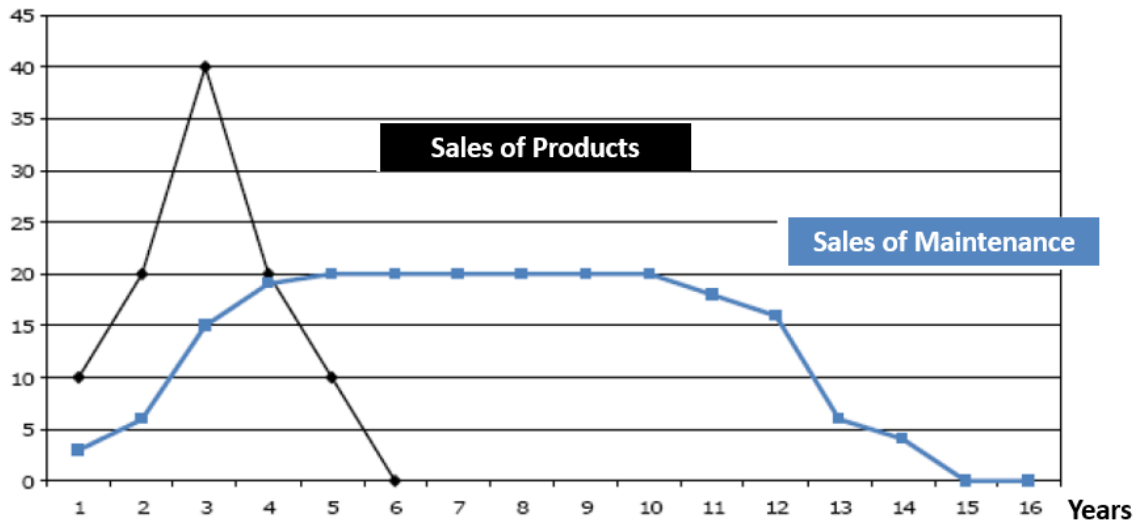


Fig. 6 Example of a product and maintenance life cycle (source: Simon (1993)).

When the market is getting more mature and the cycles are getting shorter and shorter, companies have to develop products and bring them to market more and more frequently in order to maintain total sales. If development costs remain the same, this has a negative effect on profit. In comparison, studies show that service offers for certain products can, for example, result in two times the sales of the product, since the life cycle is longer than that of the mere products.

Services themselves can be viewed differently, depending on the revenue model and the degree of sophistication of the service offering. One way is to cluster services into three different types. Transactional services have the lowest level of sophistication of those three of Fig 7. This service type is usually carried out in one transaction by the provider to the customer and contains value added services like consulting, payment handling, delivery, customization, spare parts and one-off services. The decisive driver for the success of these services on the market is the communication of the value-added by the service and the selective monetarization of it.

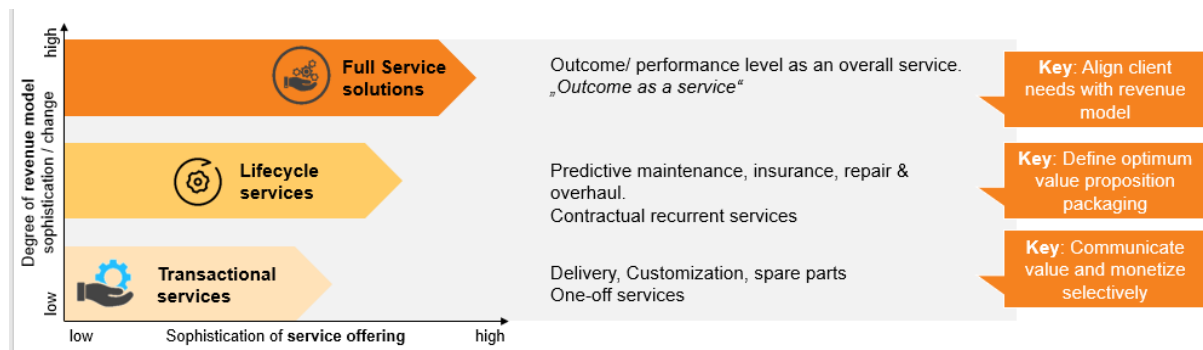


Fig. 7 The three sub-stages of services (based on SKP).

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On the other hand, lifecycle services deal with extending the life cycle of customer products. They are not completed with a transaction but are characterized by constant and ongoing support. Typical examples of lifecycle services are predictive maintenance, insurance, repair & overhaul, contractual recurrent services, enhanced technical support and planning regarding specifications, design as well as training. Mostly lifecycle services are not offered as one single product but more likely a package of service. It is therefore crucial to define an optimum value proposition packaging in order to successfully bring these services to market.

The service with the highest level of sophistication are so-called full-service solutions. The focus here is less on the actual performance than on the actual outcome for the customer. Full-service solutions are characterized by usage-dependent monetarization (shifting from CAPEX to OPEX for industrial goods) and dynamic contracts (e.g. demand-based shipping). Additionally, so-called new digital solutions (Internet of things / cloud) are increasingly being classified in this service category.

Scenarios for reorganization

A couple of weeks after the sales and service conference, Sascha Rahman presented the result of his team and explained the selected scenarios for reorganization to Michael Marhofer (cp. figure 8).

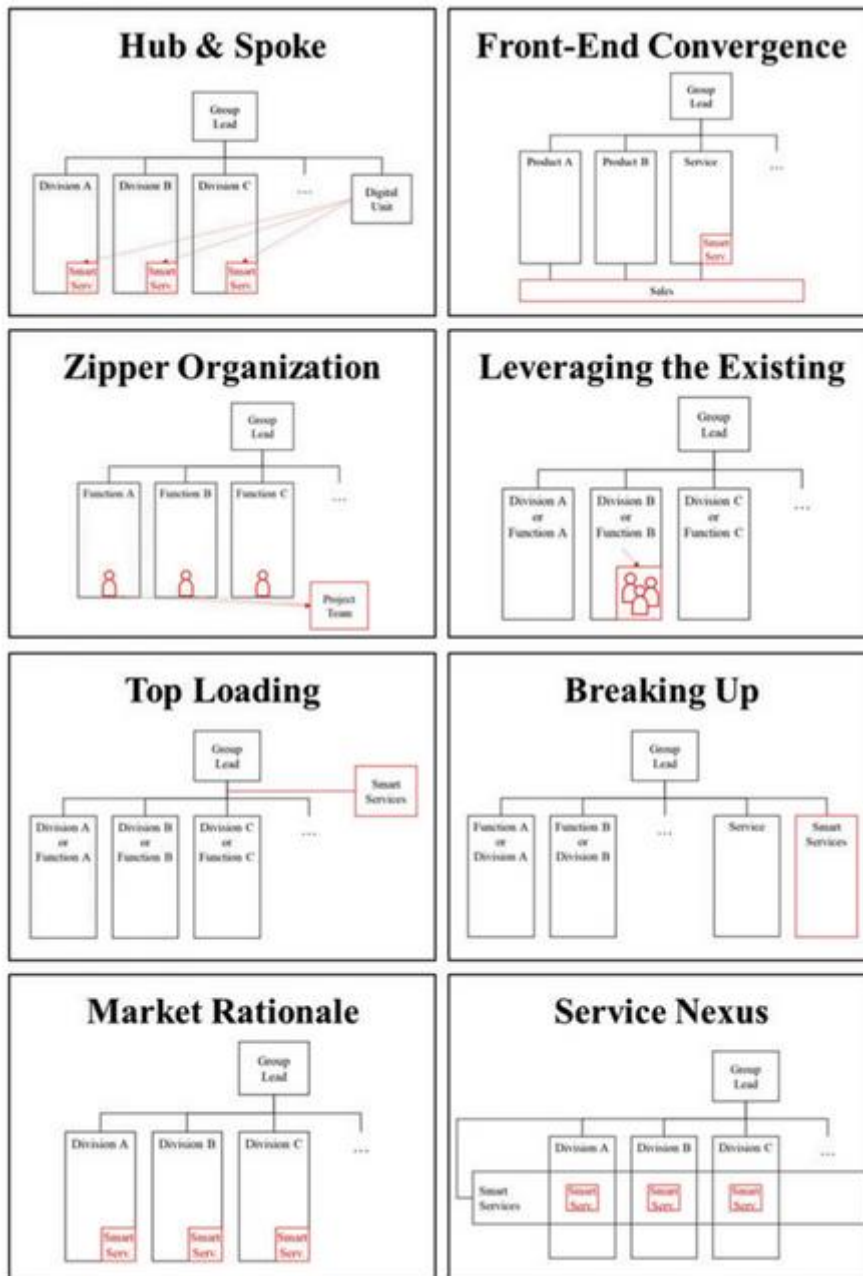


Fig. 8 Scenarios for organizational redesign.

The organizational configurations would allow for different levels of customer centricity, agility, product complexity, uniformity of IT structure and platforms, centralization of power and decision-making. Each scenario had its benefits and limitations. How should the company decide? How can it sustain its capability to innovate in the long-term? What are the requirements for the organisation? In how far will it need to (re-)structure its resources?

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Markides C. (2008) *Game-Changing Strategies*, pp. 37 => Redefine what you are really offering this customer / table 2.2. Innovating by offering the same product but selling it on a different value proposition

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Teaching Note

Target group: Master students with a specialization in:

- Innovation Management
- Strategic Management
- Sales Management
- Organization
- General Management

Teaching objective: The case study invites students to:

- reflect and discuss the requirement for reorganization when offering smart services
- evaluate limits and benefits of different organizational configurations for smart service offering.

Learning Outcome: Students should be able to:

- apply appropriate management frameworks to analyse organizational requirements
- decide and substantiate the choice for organizational models based on the contingencies of the case company

Case Type

This case is a complex decision case on smart service reorganization.

Case Format

The case is a written case that can be supported by infographic, video interviews and photographs.

Evaluation criteria:

Evaluation shall take place based on the following criteria

Evaluation criteria	Weight
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research and analysis	high (40%)
problem solving	high (40%)
communication	moderate (20%)

Grading:

Grading shall take place according to the following assessment structure:

German Grade	in words	ECTS grade	% of points
1.0	sehr gut / excellent	A	100%
1.0	sehr gut / excellent	A	99%
1.0	sehr gut / excellent	A	≥ 95%
1.3	sehr gut / excellent (-)	A	≥ 90%
1.7	gut / good (+)	A	≥ 85%
2.0	gut / good	B	≥ 80%
2.3	gut / good (-)	B	≥ 75%
2.7	befriedigend / satisfactory (+)	C	≥ 70%
3.0	befriedigend / satisfactory	C	≥ 65%
3.3	befriedigend / satisfactory (-)	D	≥ 60%
3.7	ausreichend / sufficient (+)	D	≥ 55%
4.0	ausreichend / sufficient	E	≥ 50%
4.7	mangelhaft / fail	FX	< 50%
5.0	mangelhaft / fail	F	< 50%

Preparation

We recommend that students are already familiar with the strategic management and basics in sales & service management. The case study invites to analyze and debate options for the design and development of new business models in the context of servitization and digitization. Ideally students have already discussed and solved PART I of the case study. However, the case could be taught also stand-alone.

Instruments

The case study is designed to teach and apply the following strategic management tools:

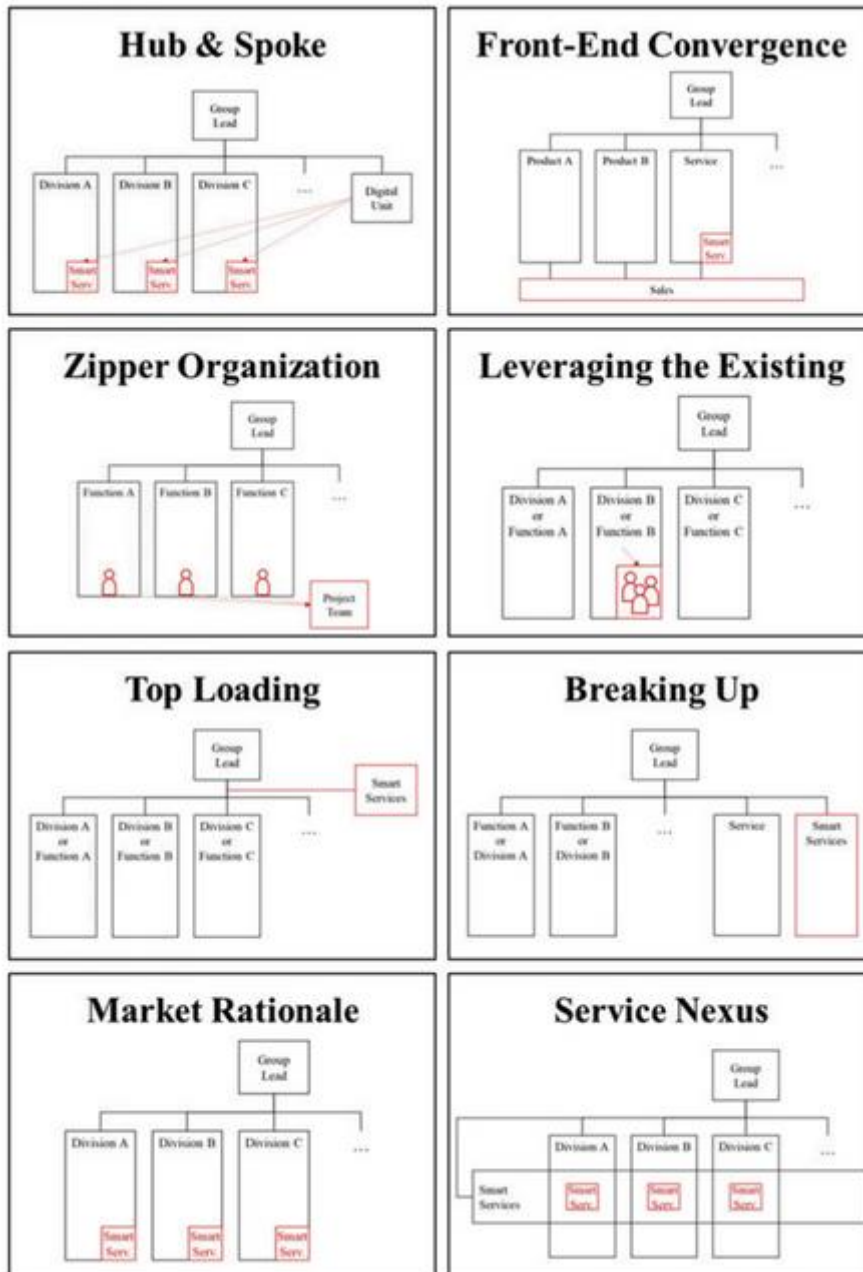
- organizational design
- service-driven business models
- Servitization-Digitization-Portfolio

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Solution Outline:

The discussion of the scenarios of possible types of organizational designs could be based on the Springer book series Management for Professionals: Managing Industrial Services - From Basics to the Emergence of Smart and Remote Services (2021) by Friedli, Osterrieder, Classen (editors), pp. 59. The book is an open resource and available on:

<https://link.springer.com/content/pdf/10.1007%2F978-3-030-72728-4.pdf>



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Hub & Spoke: The first type accentuates the collaboration between a central digital unit and the smart service teams within each division. The digital unit may be an independent department with a focus on digital technologies, technology-centered research, and all competencies pertaining to gathering, handling, or processing data. It could be consolidated with the corporate IT or established next to it. On the other side, the market-oriented divisions have sovereignty and responsibility for the service business, while the digital unit supports the technological aspect of service development. Particularly, manufacturing companies that tend to be active in diverse product markets, where the specificities of each product are complicated to scale throughout the entire portfolio, might opt for industrial service teams close to the product business. In combination with a central digital unit, uniformity in terms of platforms, tools, and IT infrastructure can be ensured to prevent undesired redundancies.

Front-End Convergence: The main focus of the second type lies in the dominant sales department. Here, the functional arrangement of the company culminates in the mighty sales unit. The idea behind this type is that no matter which product, physical, or smart service each department develops, the ultimate goal is to satisfy the needs of the customer. Therefore the sales force needs to have all the munition the company may offer when discussing the current situation with customers. Perhaps the best solution is to offer a leasing contract for expensive machinery or a combination of physical and smart services to prolong the usable life of existing equipment. In any case, customer-centricity is the magic word for companies that represent this structure. Concerning the smart service business, it can be part of the industrial service unit or erected as an independent department next to the product and physical service business. Depending on the compatibility among the industrial service portfolio, it could be reasonable to unite or separate the different service businesses.

Zipper Organization: When manufacturing companies begin serving existing customers with new smart services, they frequently opt for a project organization. Here, we describe a version of a project organization where the team consists of knowledgeable employees from different functions (including product development, IT/software, and service). These can be representatives for their functions cooperating to build a new smart service, while most of the actual work is executed within each unit. Or the project team involves temporarily delegated employees comprising all necessary competencies for smart service development. In both cases, the long-term sustainability of this configuration is questionable. The advantages lie instead in fast and agile working conditions paired with its easy and resource-poor implementation, when the responsibilities are clearly defined and communicated. In practice, we often realized that manufacturing companies try to settle the uncertainty about the potential. The ECASA project (2019-1-DE01-KA203-005037) is financed by Union funds (ERASMUS+). But the content of this document only reflects the views of the authors, and the European Commission cannot be held responsible for any use which may be made of the information contained therein.

and consequences of introducing smart services within project teams. The manufacturer then decides to transition to a more stable organizational structure once it specified the strategic direction and objectives of the service business.

Leveraging the Existing: Leveraging the Existing mirrors a highly integrated organizational structure in contrast to Breaking Up (see below). Companies that choose to integrate the smart service business typically assign the additional tasks to units, teams, or individuals who have a strong background in related fields, such as software or service. Often, they do so because the new smart services align with the existing business to a great extent, or the company feels that it has the right competencies in place. Sometimes it can even have been organically grown within one distinct unit, when they started to advance into the field of smart services on their own initiative. Manufacturers can use this organizational structure to build coherent and sound value propositions involving products, physical, and smart services. The closeness to each other helps shape complementing and supporting strategies. However, measuring the effectiveness of the newly introduced smart service on performance enhancements is difficult. Steering indicators could focus on values such as recurring revenue, the number of service contracts sold, or the project backlog in terms of secured service months. But only when the business and pricing model of the smart service allows to measure these values, it could provide an option to indicate the success of selling the service, as well as its contribution to the overall revenue.

Top Loading: Centralized decision-making typically characterizes manufacturing companies that select a Top Loading configuration. Here, the smart service unit mirrors a staff position with a short distance to the top management. The business side of service development takes place at this prominent position to enable fast and flexible decision-making besides highlighting the importance of the new business to the employees. However, other divisions or functions are responsible for the technological development of the smart services, which may lead to bottlenecks, as the regular product development departments access the same resources. Longterm sustainability could be an issue for this type. Yet, it reflects a good starting configuration due to a relatively cost-efficient establishment of the smart service business.

Breaking Up: The fourth type is the closest representation of a separate service organization. Figure 3 illustrates the separation of the smart service business on the divisional level, while it could also be done at the unit or team level. It surely allows good measurability and accountability in terms of financial figures (e.g., profit and loss) but requires intensive resources for its setup. Often the acquisition of new talents is part of erecting a separate service organization, and long-term sustainability should not be an issue. However, a manufacturing company needs to balance the advantages and drawbacks of going for a separate smart or

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industrial service business in general. Following this approach leads to the investment of vast financial and human resources with limited reorganization flexibility in the future. Once the company ramped-up such an organization, it may contribute to the overall performance significantly, but fast-changing market or environmental conditions may be absorbed less easily. In practice, we experienced that separating the smart service business at least for some time is repeatedly the only choice for a manufacturing company since the new business is substantially different from the existing product and service portfolio. It naturally entails the need for novel processes, approaches, and personnel in a detached organizational form.

Market Rationale: When companies engage in diverse markets with diverse products, they often mirror a divisional base structure. These divisions then have sovereignty about what to offer to whom. Consider Liebherr, the company is active in branches ranging from mining and earthmoving technology to refrigerators and hotels. Accordingly, the specific requirements for a remote monitoring service and the characteristics of typical customers can vary a lot. Establishing a central industrial service unit is, therefore, at least disputable. Consequently, the Market Rationale configuration suggests that these companies have individual service units within each division. There might be project groups or committees that meet every quarter to exchange ideas, strategies, and standards. But in general, the division determines the entire service, including its development, sales, and delivery. While companies usually show a good fit for the smart service aiming at the needs of the customers in the interplay with the respective products within their division, the main challenges concern the redundancy and standardization among the entire company. Platforms, tools, or software that are used by one division might not be used by another. In the worst case, divisions have overlapping customer groups and do not offer compatible service approaches, or even do not know about their colleagues, who just sold a similar service one month before. Transitioning to the Hub & Spoke type, or something similar, including a central unit overseeing these topics, could be a possibility to relieve these problems, whereas giving up tasks and responsibilities is often not associated with the strengths of division heads.

Service Nexus: The last type is the sole representative of a matrix organization. While other configurations can be adjusted or super positioned to result in a similar design, Service Nexus describes an example of a configuration where a smart service function overlaps with the market- or product-oriented divisions. The advantages are obviously that the service unit can coordinate the development centrally, while the knowledge from each division provides valuable input to increase its suitability for and compatibility with the specific products and customers. This configuration helps to ensure standardization among the platforms, tools, and software, besides offering the opportunity to scale developed solutions at one division.

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throughout the adjacent departments. However, frictionless operations may be an issue as its implementation can be difficult. Division heads could fight for scarce resources, wherefore this type is prone to political games. Yet, if manufacturing companies install a nearly seamless working version of this type, long-term sustainability is not a problem. We showed that each type has certain advantages and shortcomings. Various attributes characterize the configurations, on which we elaborated briefly during their descriptions. When a company feels the need to reorganize its current structure, it has to meticulously assess which design might be suited best depending on its contingencies. As we already stated in the introduction of the typology, selecting a configuration is one thing, but it entails the customization and implementation of the new structure into the firm. Cycling back to the example of the machine tool manufacturer presented before, we remember that it partnered with an external software company to provide their mote monitoring service, while the company leveraged the skills of its employees to develop the dashboard service. Moreover, the CEO declared preferring to build up the knowledge required for the predictive maintenance service internally. Browsing through the available types, we could propose multiple options. Assuming that the company offers a wide portfolio of machine tools, but nothing greatly different than that, to customers with similar requirements, there is no need for strong market orientation. As we introduced the manufacturer as a mid-sized company, we suggest a separate service organization. The service organization splits into one unit handling physical services and a team addressing the smart service business. Technological developments in terms of software, sensors, and data should be clustered into another separate organizational entity adjacent to the product and service business. Each competence center can nurture its skills individually, while a project team or steering committee ensures the alignment of all activities toward the mutual goal of developing the predictive maintenance service. Establishing the committee is key to preventing solo efforts but may cause discussions and dissatisfaction among important players in the game. Restructuring measures are often highly political endeavors, which may lead to tough decisions. As communication and transparency are crucial in these situations, we focused on logical arguments for and against potential configurations.

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