The Financial Benefits of Smart Service Provision in the Brazilian Manufacturing Sector

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1. Introduction

In connection with today's environment of strong competition and constantly developing technologies, manufacturing companies are forced to add services to their tangible products. This leads to a transformation from product-centric offering to product-service bundles or service-centric offering. For many companies and their customers, the offering of basic and intermediate services is no longer sufficient, so they focus on advanced services, including so-called smart services that use smart technology for their activities. A field survey of the business use of IoT technologies shows that most manufacturers use them to provide basic product-related services, such as time and material repairs and required warranty services (Paiola and Gebauer, 2020).

Given the advent of smart services and the digitalization era, it is expected that these services will generate a huge transformation in how manufacturers operate their business models and how they are able to capture financial value. Manufacturers consider financial benefits of smart services and seek ways to measure them. Therefore, the aim of the paper is to investigate if small and medium-sized manufacturers perceive the financial benefits of providing smart services, including the possible financial indicators.

This paper is organised as follows: The literature review introduces smart services provided by manufacturing companies and their potential benefits, with the focus on financial ones; the next chapter describes the research based on interviews with 10 respondents; the results chapter reveals the main findings of the research; the discussion presents the findings, the knowledge gap and possible research opportunities for future work, as well as its limitations; finally, the conclusion summarises the contributions and managerial implications of the research.

2. Literature Review

The business service offering of manufacturing firms' servitization provision is usually defined in literature as a continuum encompassing base, intermediate and advanced services (Baines & Lightfoot, 2013; Rabetino et al., 2017). Results centre on the effective supply of goods when it comes to base services, namely products and spare parts, and warranty contracts). Intermediate services are geared towards product conditions (Oliva & Kallenberg, 2003), e.g. maintenance contracts and agree- →

ments in addition to necessary repair services to restore or maintain product quality — e.g. operator training surveillance or cost-plus contracts (Kim et al., 2005). Advanced services encompass output-based services with the provision of capability stressed as importantly (e.g. risk and reward sharing contracts and customer support agreements) (Baines & Lightfoot, 2013). R&D services are a salient example of the latter category, where services (e.g. feasibility studies or product performance complications) with the aim of identifying potential performance enhancements are undertaken (Visnjic et al., 2018). This paper is focused on advanced services, namely smart services.

According to Dreyer et al. (2019) "smart services are individual, highly dynamic and quality-based service solutions that are suitable for the customer, implemented using field information and data analysis of technology, environment and social contexts, which leads to the co-creation of value between the customer and provider in all phases from strategic development to smart service improvement." Klein (2017) describes smart services as technologically mediated services that are delivered by the provider and accessed through a remote asset, and that exchange data through built-in control. Therefore, smart services provide a varied range of benefits for manufacturing companies and service providers, enabling the improvement of value creation and profitability, positioning them as possible leaders in the market. Smart services are associated with five main characteristics that explain their potential benefits for manufacturing, as pointed by Marquardt (2017):

1. Connection between the physical and the digital world.
2. Upgrade of value creation and economic efficiency.
3. Extension of products and services with a digital level.
4. Transformation of the product into a part of service.
5. Change from product-centric to customer-centric business models.

Point 2, mentioned above by Marquardt (2017), is seen as the main characteristic benefit gained from smart services in this paper. The starting point to create value from digitalization services are embedded in advanced services, operational services, and out-come based services, which enable firms to capture all its financial benefits (Visnjic et al., 2018). Thus, manufacturers may struggle with the deployment of digitalization, and capturing value from its investments, so it is evident that they should not only invest in technological improvement, but also invest in complementary capabilities, such as servitization, to generate a sustainable financial performance (Kohtamaki et al., 2020).

From this perspective, a strategic action towards service business growth often used by manufacturers to achieve their financial goals, relies on 'servitization'. The term was firstly introduced by Vandermerwe & Rada (1988), and represents a value generation process via the increasement of the services offered to customers, securing a competitive position in the value chain. Moreover, servitization is a shift from product to service orientation, manifested by integrated solutions, like customised products and advanced services (Windahl & Lakemond, 2010). Different studies highlight the challenges that manufacturers face in capitalising on the value capture of digital services that must be done through digital business models, such as digital servitization, which refers to the provision of digital services embedded in a physical product (Kohtamaki et al., 2020; Linde et al., 2020). Therefore, the key premise in digital servitization of manufacturing is to provide IT-enabled solutions to customers, mainly through planned integration of products and services (Paschou et al., 2017).

The literature suggests that IoT adoption enables businesses to offer additional services or features to an existing product or service. Thus, businesses can generate additional revenue from these services (Rachinger et al., 2018) and generate revenue more stably as long-term contracts replace

sales (Debey et al., 2017). It has been reported in the literature that the use of IoT in service delivery helps businesses reduce the resources used in service delivery, such as labour costs, as fault diagnosis can be performed remotely. Thus, companies can benefit from reduced operating costs (Hasselblatt et al., 2018). Smart services enable continuous feedback that is not limited to a specific time or place (Birch-Jensenová et al., 2020).

It is evident, accordingly, that by adopting strategic moves, given the recent digital scenario and by taking smart services into consideration, manufacturers will be able to offer more secure and stable services, and consequently incur on profitable revenue growth margins and save costs (Classen & Friedli, 2021). Customers' ever-expanding quality requirements and demand for innovations, makes it primordial for companies to increase their flexibility and reorientate their service offerings to secure their future in the competitive world market, especially during digital change (Marquardt, 2017).

Some studies have already tested the impact of smart services on manufacturing firm performance, e.g. return on sales and return on investments (Abou-Foul et al., 2021), return on assets and profit margin (Kharlamov and Parry, 2020), return on assets growth (Kohtamaki et al, 2020), total sales (Martin-Pena et al, 2019), share of revenue (Marjanovic et al., 2019), or revenue and profit margin evolution and revenues and share price evolution (Vendrel—Herrero et al., 2017). Thus, as Rakic et al. (2022) state, in studies of manufacturing firm performance, it is mostly a measurement of financial aspects. The metrics used here are similar to metrics that have been evaluated in empirical studies that have examined the impact of product-related services (such as installation, maintenance and repair, training, etc.) on manufacturing firm performance, such as share of revenue (Eggert et al, 2014, Marjanovic et al., 2020), return on sales (Moreno et al., 2020).

According to Lamprecht et al. (2022), 12 performance indicators were revealed and grouped into four core perspectives within the KPI set. Possible KPIs mentioned by Lamprecht et al. (2022) are e.g. Net promoter score, Conversion rate, Churn rate, IoT revenue, Registered users, Annual recurring revenue, Profitability.

Determining the benefits, especially the financial ones, still need some deeper research. Even if the manufacturers implement the same type of smart services, the benefits from them will be different for each of them and will be measured in different parameters depending on the business field, business model, management method and current stage of the life cycle. The benefit of smart services can therefore be measured and proven only in a specific company, by monitoring the development

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of the parameters that the given company wants to improve by implementing a smart service. Precisely because of this diversity of situations in individual companies, an effort was made to first get to know and understand this issue of financial benefits as much as possible and then try to find some intersection of perception of smart services by manufacturers.

The following research questions (RQ1–RQ3) were formulated to deepen understanding of smart services and their financial benefits, including possible KPIs, in small and medium manufacturing companies:

- RQ1: Which smart services in manufacturing do you provide to your customers and why?
- RQ2: Do you perceive the financial benefits of the smart services provided by manufacturing companies?
- RQ3: If you perceive the financial benefits of your smart services positively, how often do you evaluate these benefits and what financial metrics (KPIs) do you use?

3. Methodology

The field of digital servitization research, including the financial benefits of smart services, is still not sufficiently explored. Therefore, further research is needed to gain a deeper understanding of this area. Respondents in the research were electrotechnical SMEs, which already provide some smart services to their products. Manufacturers provide smart services to their products and their customers usually appreciate them because of their benefits. Also, manufacturers can perceive benefits gained from smart service provision, such as in time savings, travel cost savings, faster repair resolution, higher customer satisfaction, etc., but do they also expect any financial benefits, and if so, what are they?

The research firstly aimed to delve deeper into the problems of financial benefits gained from smart services and then, based on its results, to explore this area in further research. For this paper and its main aim, research was conducted among 10 SMEs manufacturing companies to propose a broader understanding concerning the perception of financial benefits during adoption of smart services by manufacturers.

3.1 Company selection and research setting

Electrical engineering companies are important representatives of the manufacturing industry and are subcontractors for many other branches of the economy. Additionally, the electrical industry is a global industry, meaning that many manufacturers may have customers worldwide, but on the other hand, competitors may also be global. Therefore, it is crucial to be constantly focused on research and development, innovate products, respond to customer demand, look for production savings and new trends in the field. One of the possibilities for manufacturers is the transformation from the offering of only tangible products to the offering of accompanying services, including services using digital technologies (smart services).

Due to the connection of products with digital technologies, electrotechnical companies were chosen for the research, where some manufacturers are already trying to provide accompanying services using smart technologies. Their customers usually appreciate the benefits of the provision of smart services.

To propose a broader understanding concerning the usage of smart services in Brazilian electrotechnical SMEs research was conducted among 10 companies from the sector. All respondents involved in the research were members of an electric association in Brazil and are associated with the Brazilian Electrical and Electronics Industry Association (Abinee). In total, 55 SMEs, who provided smart services according to their web pages, were initially contacted for the interview. They were informed about the topic, possible questions and were asked to confirm smart service provision. Ten of them agreed to be part of the interview process.

3.2 Data collection and analysis

Data was collected via structured phone interviews with mostly open-ended questions. Protection of the anonymity of the companies was crucial and encouraged openness around the topics, especially focused on financial benefits of smart services. The list of companies and their description is mentioned below in Table 1. The respondents were mainly product managers, directors, or managers in companies.

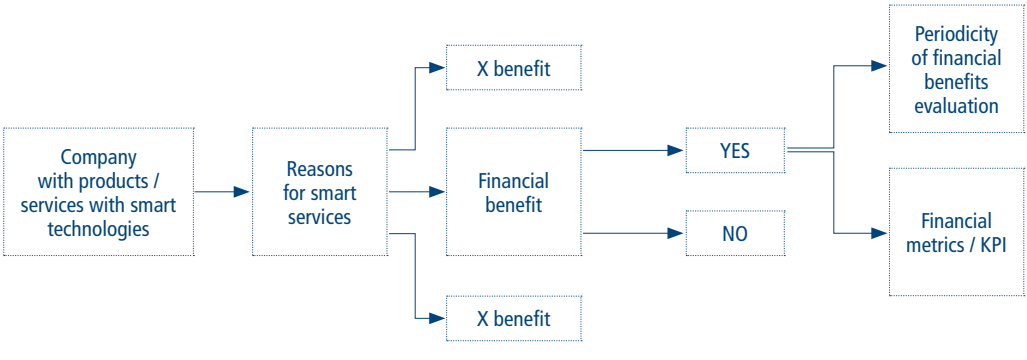
The research was based on phone calls and was carried out in March 2022. The length of interviews by phone call was 15–20 minutes. The interviews were mainly recorded and transcribed. The questions were mostly open-ended. Only for the question on perception of financial benefits was there an option to choose two predetermined answers — perception is positive or perception is negative. Furthermore, for the question on whether the financial benefits are evaluated by the respondents, there were only two options — yes or no. When it comes to the question related to the financial metrics (KPIs), it was not easy for all of them to answer it in an open-ended question. Some respondents were not entirely sure about the correct definition and use of the term "KPIs", so explanation was required. Also, the list of some possible KPIs, specifically KPIs that were mentioned in previous interviews that could be similar to their businesses, was offered to them. Evaluation of interviews could be quite sensitive to researchers' subjective explanations; some peer consultation was needed to avoid researcher bias and to ensure greater objectivity in the study.

The following aspects were asked during the interviews: the kind of provided products embedded with smart services and performed technologies, smart services provided, the specific reasons for providing smart services, the perception of financial benefits, periodicity of financial benefits and used financial metrics/Key Performance Indicators (KPIs).

The following Figure 1 shows the steps of the research process. The premise was to reach small and medium-sized manufacturers that provide products and services with smart services. The first question was about finding out the reasons why they provide smart services. Next, the aim was to find out if smart service provision also brings them financial benefits. This was followed by a question that asked those respondents who indicated that smart services bring them financial benefits, how often they measure these benefits and what financial metrics/KPIs they use. "X benefit" mentioned in Figure 1 means another type of benefit, which companies could have from smart service provision.

Brief descriptions of respondents involved in the research, including their location and type of respondents, can be found in Table 1.

Figure 1 » *Steps of the research process*



Source: Authors

Table 1 » *Respondents from electrotechnical companies and their locations*

Company name	Type of respondent	Company location
Company 1	Product Manager	Porto Alegre (Rio Grande do Sul – RS)
Company 2	Manager	São Paulo (São Paulo – SP)
Company 3	Product Manager	Contagem (Minas Gerais – MG)
Company 4	Executive Director	Canoas (Rio Grande do Sul – RS)
Company 5	Director	São Paulo (São Paulo – SP)
Company 6	Director	Taquara (Rio Grande do Sul – RS)
Company 7	Director	São José dos Campos (São Paulo – SP)
Company 8	Partner	Belo Horizonte (Minas Gerais – MG)
Company 9	Director	Campo Mourão (Paraná – PR)
Online	Manager	Itaquaquecetuba (São Paulo – SP)

Source: Authors

Table 2 » *Products provided embedded with smart services and technologies performed*

Company	Products provided embedded with smart services	Performed technologies
Company 1	Services based on telemetry solutions for remote monitoring and controlling of electronic devices	Internet of Things, Cloud Computing, 4G systems
Company 2	Smart security systems, alarms and detection sensors, facial recognition, and biometric recognition	Internet of Things, Big Data, Radio Frequency Identification
Company 3	Smart Uninterruptible Power Supplies (UPS)	Internet of Things
Company 4	Smart security systems, alarms and detection sensors	Internet of Things, Big Data, micro processing technologies
Company 5	Data acquisition systems, data intensive modelling, digital servo controllers, sensors, software	Internet of Things, Cloud Computing and Big Data
Company 6	Cellular intercoms, cellular interfaces, gateways, recorders, remote concierge products.	Internet of Things, Cloud Computing
Company 7	Smart identification sensors and detectors for power controlling	Internet of Things, 4G systems
Company 8	Smart electricity concession equipment	Internet of Things, Cloud Computing and Big Data
Company 9	Smart monitoring, control and management products, ATM machines, optical sensors, biometric and data reading systems	Internet of Things
Company 10	Smart electricity concession equipment	Internet of Things, Big Data

Source: Authors

Table 3 » *Reasons for smart service provision for Brazilian electrotechnical companies*

Company	Reasons for providing smart services
Company 1	Keep updated with market trends to fulfil the company's offering availability for new smart goods; ability to meet individual customer demands.
Company 2	Keep updated with market trends; provide innovative products; progressive improvements and replicate solutions.
Company 3	Provide innovative products; increase product agility.
Company 4	Ability to offer customer's individual needs towards smart products.
Company 5	Keep updated with market trends; provide innovative products; meet customer's individual needs; progressive improvements and replicable solutions; reduce associated risks and costs.
Company 6	Keep updated with market trends; ability to offer customer's individual needs; product innovation; reduce associated risks and costs; social-environmental practices.
Company 7	IoT-based solutions were considered aligned with their expertise, which proved to be an interesting investment from a business perspective.
Company 8	Ability to offer customer's individual needs towards smart products.
Company 9	Keep updated with market trends; promote progressive improvements and replicable solutions
Company 10	Provide innovative products; increase product agility; reduce associated risks and costs.

Source: Authors

4. Results

It is safe to say that in all cases companies participating in the research (see Table 1 and Table 2) have been implementing smart services into their offerings, for different specificities and purposes. The most provided smart services were the following ones: remote monitoring and controlling of devices, remote diagnostics, data-driven equipment, predictive and preventive software solutions. Furthermore, all selected companies claimed that smart service provision was enabled by the massive performance of digital disruptive technologies, such as the Internet of Things (IoT), cloud computing, Big Data and even 4G systems. The characterization of products provided embedded with smart services and performed technologies are mentioned in Table 2.

Subsequently, all the respondents agreed on the importance of smart service provision for their products. The reasons for providing smart services were selected from the interview transcripts and are listed in Table 3.

The most mentioned reasons (the number in the brackets shows the number of respondents who mentioned some reason) for smart service provision according to the respondents of the research are the following:

- Keep updated with market trends (5×)
- Ability to meet individual customer demands (5×)
- Provide innovative products (5×)
- Progressive improvements and replicate solutions (3×)
- Reduce associated risks and costs (3×)
- Increase product agility (2×)

Manufacturers participating in the research perceive the benefits of providing smart services in a variety of areas. Respondents see market influence and the desire to continuously update their products according to market demands as a very important aspect of provision, but also the impor- →

Table 4 » *Perception of financial benefits*

Company	Perception of financial benefits	Specification
Company 1	Positive	The company value has risen in 2021 compared to 2020.
Company 2	Did not respond	—
Company 3	Positive	Smart services enabled an increase in sales and profit margins.
Company 4	Positive	The company's market share has risen from 3% in 2020 to 5% in 2021.
Company 5	Positive	Substantial sales increase and production line expansion.
Company 6	Positive	Smart services enabled increasement in sales and profit margins, deepening the company's market penetration.
Company 7	Positive	Increase of revenue and reduced time between fault identification and correction.
Company 8	Negative	No financial benefits were highlighted so far due to smart service implementation.
Company 9	Positive	Perception of increase of company value over the last 4 years and 10% growth of company value in 2021 compared to 2011.
Company 10	Negative	No financial benefits were highlighted so far due to smart service implementation.

Source: Authors

Table 5 » *Evaluation of financial benefits, their periodicity and financial metrics/KPIs performed for Brazilian electrotechnical companies*

Company	Are the financial benefits evaluated?	Periodicity	Financial metrics/KPIs used
Company 1	Yes	Monthly basis	Sales growth and net revenue
Company 2	—	—	—
Company 3	Yes	Monthly basis	Sales growth and net revenue
Company 4	Yes	18-month control[1]	Sales growth and net revenue
Company 5	Yes	Monthly basis	Net revenue
Company 6	Yes	Monthly basis	Sales growth, net revenue, and net profit margin
Company 7	Yes	Monthly basis	Net revenue
Company 8	No	—	—
Company 9	Yes	Monthly basis	Sales growth and net profit margin
Company 10	No	—	—

Source: Authors

[1] *According to Company 4, the financial benefits of smart services are evaluated through the metrics used to evaluate each of the offered products embedded with smart services. Thereby, this evaluation is performed for a period of 18 months, if a product is not able to provide a net revenue that compensates its costs, then its production ceases and the product in question is discarded from the company's offerings.*

tance of meeting the needs of their customers. Another area of reason for smart service provision is the product, in terms of increasing its innovativeness, progressive improvements, replicate solutions and increase product agility. Also, the desire to reduce risks and costs is one of the reasons mentioned. One respondent even mentioned the importance of addressing social-environmental practices.

Moreover, this research also investigated whether the electrotechnical SMEs were perceiving financial gains from the provision of smart services or not. Financial benefits were perceived by 7 respondents, while 2 respondents did not perceive any substantial financial gains and 1 manager did not respond to this question. Table 4 summarises the perception of financial benefits of all of the case companies, as well as a brief specification note of what these gains consisted of.

The most frequently perceived financial benefits of providing smart services in industry by respondents are in the areas of sales increase (3 respondents), profit margin increase (2 respondents), market share increase (2 respondents), and increase of company value (2 respondents). Some respondents mentioned a specific increase, such as market share, over a specific period. Beyond the direct financial benefits, benefits were perceived in the areas of production line expansion and reduction of time between fault identification and its correction.

The final topic addressed in this research concerned the evaluation of the financial benefits perceived by respondents, the frequency of evaluation of these benefits and the specification of the financial indicators/KPIs used. As a result, 7 companies evaluated their financial benefits from smart service provision, while 2 companies did not evaluate them. One company did not respond, because it is not able to release, or to discuss information concerning its financial situation. The results of this step of the research are presented in Table 5.

The periodicity mentioned in Table 5 shows that 6 manufacturers that perceive financial benefits from the smart services provided track their benefits monthly.

The interviews revealed that the most used financial metrics/KPIs according to respondents from Brazilian electrotechnical SMEs are listed below:

- Net revenue (6×)
- Sales growth (5×)
- Net profit margin (2×)

Respondents evaluate the financial benefits of smart service provision through different financial metrics/KPIs. Manufacturers determine specific variables and parameters that are important for managing their financial goals and results. Accordingly, the used metrics depend on their smart service offerings and on the current situation that the company is facing. The most mentioned financial metrics/KPIs are net revenue (6 respondents) and sales growth (5 respondents).

5. Discussion

The aim of the research was to cover the knowledge gap in perception of financial benefits of smart service offering, including the possible KPIs. Therefore, research questions (RQ1–RQ3) were set to identify the areas of need. The results of the research according to the given questions were presented in the previous chapter. This chapter builds on their findings and deepens and discusses them. The findings from 10 telephone interviews with representatives of Brazilian electrical companies revealed some interesting information regarding the benefits of smart service offering.

The most mentioned reasons for smart service provision according to the respondents are mentioned in Table 3. As the interviews revealed, respondents gave various reasons for providing smart services. Clear reasons for providing smart services that relate to financial benefits can be seen in three companies, in the form of risk and cost reduction. Three respondents who mentioned risk and cost reduction also mentioned other benefits from the smart services provision. They are →

likely to be very aware of the importance of the services to them as well as to their customers and thus the complexity of the services. The results are in line with Lakkisto (2020), who reported four categories of benefits of smart services to customers, namely: traffic management benefits, risk mitigation and image improvement.

However, it can be said that other reasons for providing smart services also can have their own impacts on the financial benefits as well, e. g. ability to meet individual customer demands, innovative product provision or progressive improvement and replicate solutions. These benefits can appear later, more slowly or indirectly, but they are also important for manufacturers and their customers. As stated by Kohtamaki et al. (2020) the rise of digitalisation needs to be supported in parallel by servitization and targeting services that lead to the financial benefits of digitalization (e.g. data acquisition, analysis, and implementation).

The financial benefits are mostly perceived by Brazilian electrical companies in terms of increased sales, profit margin, market share and company value. Some companies clearly perceived financial benefits from providing smart services, but they did not indicate the overall growth trajectory of their individual smart services-enabled product offerings. Respondents mentioned how the provision of smart services affected the overall company value after implementation of customer services to their portfolio (as reported in Table 4).

The periodicity of smart service provision is measured monthly by six respondents (see Table 5), which may indicate interest in tracking benefits for a variety of reasons. The reasons may be different, both in terms of determining the effectiveness of smart services or their returns, but also in terms of interest from customers. Often it is thanks to well-chosen financial metrics that it can be immediately seen how the company is doing, although it doesn't have to be just through smart services.

Company representatives were very quick to respond to a query about the regularity of identifying the benefits of smart services. As many said, they assess their financial benefits monthly, which seems to be very common. This may be due to the fact that a large part of their products is closely related to smart technologies. Most of the companies interviewed prefer to offer smart services, mainly because they consider them as a space to develop their opportunities. These newly exploited opportunities can provide them with new sources of revenue and cost reduction. As Rakic et al. (2022) mentioned, the impact of digital servitization is more significant with the higher technology intensity level of the industry sector. Also, data-based services based on Big Data analysis have the highest impact on manufacturing firm performance in all categories of technology intensity. Also, when product-related services are combined with digital solutions they register the highest financial performance according to the technology intensity of the firm (Rakic et al., 2022).

During interviews, respondents were very open to sharing how smart services have strengthened their position in the electrical market by providing new products with unique technological specifications. They reported that these services bring them significant financial benefits. This could be the reason why they are evaluated at such a fast pace, e.g. once a month, which allows them to understand and correct any errors in time and avoid further risks.

The respondents used net revenue and sales growth as the most financial metrics/KPIs for measuring smart service provision. The KPIs may vary from company to company. It's important to choose KPIs that fit the company's situation and help it move where it wants to go. First, Lamprecht et al. (2022) found 35 possible KPIs for steering the IoT business in product companies from their exploratory study. Then they used an in-depth study that showed them 12 performance indicators, where profitability and annual revenue were also mentioned.

It should be noted here that during the interviews with Brazilian manufacturers, it was sometimes not easy to get information immediately. When respondents were asked about the metrics,

it was not easy for all of them to answer it. Some of them were a little bit confused about the term "financial metric/KPIs", so some explanation was needed. Sometimes even some possible KPIs had to be mentioned and then respondents naturally agreed or disagreed. This certain ignorance of the terms is illustrated by the difference between the results in Table 4 and Table 5 for some respondents. Table 4 shows more benefits from the smart services provided compared to the financial metrics/KPIs in Table 5, which are not always fully relevant to the benefits listed.

The limitations of the research include the smaller sample of respondents. It would also be preferable to choose face-to-face interviews or online meetings for the convenience of the respondents. It would have been beneficial to provide a small manual to respondents prior to the scheduled interview, informing them of the possible metrics and briefly explaining them. This could help better orient respondents to the issue.

Possible research opportunities for future work are in more detailed research answering questions about the problems of collecting information and results from the measuring of financial metrics used for smart service provision, including the topics related to the frequency and exact reasons for their monitoring. The research did not focus on specifying the reasons for such frequent monitoring of benefits. This could be the subject of further research.

6. Conclusion

The main contribution of the paper is to find out how current manufacturing companies perceive the financial benefits from smart service provision. The research conducted by Brazilian electrotechnical companies focused on types of provided smart services and possible financial benefits from smart service provision. This part also revealed the periodicity of smart service evaluation and possible financial metrics (KPIs).

An interesting finding was the frequency and regularity of identifying benefits from the provision of smart services to manufacturers. The reason can probably be their focus, where they are strongly oriented towards smart technologies, and working with data is an integral part of them. This finding is consistent with Rakic et al. (2022), when product-related services are combined with digital solutions, then make the highest financial performance according to the technology intensity of the firm. The findings from the research could confirm that the degree of incorporation of smart technologies can also influence the implementation of other technological innovations in enterprises. Technological innovations may also include the provision of smart services, including regular evaluation of their benefits.

The benefits are clearly perceived by respondents, but some additionally noted that the implementation of smart services may raise concerns about securing their investment in these new products with smart services in the future. As Kohtamaki et al. (2020) noted, manufacturing companies may have difficulty adopting digitalization and extracting value from their investments. Therefore, it is necessary to constantly consider the costs of providing smart services and evaluate their benefits, including in the area of financial benefits, e.g. by setting appropriate KPIs and measuring them. As Lamprecht et al. (2022) suggested, it is better to change KPIs over time and make them simple, at least initially. A recommendation for manufacturers is to think carefully and set KPIs that are relevant to the individual situation of each manufacturer. Furthermore, to keep track of what is important to the manufacturer and what they want to move and develop further in. These insights could help managers to improve their focus on smart service provision. →

REFERENCES

[1] ABOU-FOUL, M., RUIZ-ALBA, J. L., SOARES, A. The impact of digitalization and servitization on the financial performance of a firm: an empirical analysis. *Production Planning & Control*, 2021, 32(12), 975–989.

[2] AMIT, R., ZOTT, Ch.: Value creation in e-business. *Strategic management journal*, 2001, 22(6–7), 493–520.

[3] BAINES, T., LIGHTFOOT, H.: *Made to serve. What it takes for a Manufacturer to Compete*. 2013.

[4] BIRCH-JENSEN, Andrea; GREMYR, Ida; HALLDÓRSSON, Árni. Digitally connected services: Improvements through customer-initiated feedback. *European Management Journal*, 2020, 38(5), 814–825.

[5] CHESBROUGH, H., LETTL, Ch., RITTER, T.: Value creation and value capture in open innovation. *Journal of Product Innovation Management*, 2018, 35(6), 930–938.

[6] CLASSEN, M., FRIEDLI, T.: 'It's not like we can charge for everything': revenue models to capture value from smart services in Pacific Asia. *Asia Pacific Business Review*, 2021, 27(3), 405–430.

[7] DREYER, S., OLIVOTTI, D., LEBEK, B., BREITNER, M.: Focusing the customer through smart services: a literature review. *Electronic Markets*, 2019, 29(1), 55–78.

[8] DUBEY, R., et al.: Explaining the impact of reconfigurable manufacturing systems on environmental performance: The role of top management and organisational culture. *Journal of cleaner production*, 2017, 141, 56–66.

[9] EGGERT, A., et al.: Revenue and profit implications of industrial service strategies. *Journal of Service Research*, 2014, 17(1), 23–39.

[10] HASSELBLATT, M., et al. Modeling manufacturer's capabilities for the Internet of Things. *Journal of Business & Industrial Marketing*, 2018, 33(6), 822–836.

[11] KIM, D., CAVUSGIL, S. T., CALANTONE, R. J.: The role of information technology in supply-chain relationships: does partner criticality matter? *Journal of Business & Industrial Marketing*, 2005, 20(4/5), 169–178.

[12] KHARLAMOV, A. A., et al.: Limited evidence for servitization in UK Publishing: an empirical analysis. *International journal of business environment*, 2020, 11(3), 336–346.

[13] KLEIN, M. M.: *Design rules for smart services: overcoming barriers with rational heuristics*. 2017. PhD Thesis. Universität St. Gallen.

[14] KOHTAMÄKI, M., et al.: The relationship between digitalization and servitization: The role of servitization in capturing the financial potential of digitalization. *Technological Forecasting and Social Change*, 2020, 151, 1–9.

[15] LAKKISTO, P.: *Customer-centric business model for remote monitoring services*. 2020. Master's Thesis.

[16] LAMPRECHT, C., et al.: A KPI Set for Steering the IoT Business in Product Companies: Product companies can use the key performance indicators set presented here to manage their Internet of Things business effectively and avoid three pivotal measurement traps. *Research-Technology Management*, 2022, 65(2), 53–63.

[17] LINDE, L., FRISHAMMAR, J., PARIDA, V.: Revenue models for digital servitization: a value capture framework for designing, developing, and scaling digital services. *IEEE Transactions on Engineering Management*, 2021, 70(1), 82–97.

[18] LINDE, L., et al.: Evaluation of digital business model opportunities: a framework for avoiding digitalization traps. *Research-Technology Management*, 2020, 64(1), 43–53.

[19] MARJANOVIC, U., RAKIC, S., LALIC, B.: Digital servitization: the next "big thing" in manufacturing

industries. In: *IFIP international conference on advances in production management systems*. Springer, Cham, 2019. 510–517.
[20] MARJANOVIC, U., et al. Servitization in manufacturing: role of antecedents and firm characteristics. *International Journal of Industrial Engineering and Management*, 2020, 10(2), 133–144. http://doi.org/10.24867/IJIEM-2020-2-259
[21] MARQUARDT, K.: Smart services–characteristics, challenges, opportunities and business models. In: *Proceedings of the International Conference on Business Excellence*, 2017, 789–801.
[22] MARTÍN-PEÑA, M.-L., SÁNCHEZ-LÓPEZ, J.-M., DÍAZ-GARRIDO, E.: Servitization and digitalization in manufacturing: the influence on firm performance. *Journal of Business & Industrial Marketing*, 2019, 35(3), 564–574.
[23] MORENO, R., MARQUES, L., ARKADER, R.: Servitization impact on performance moderated by country development. *Benchmarking: An International Journal*, 2020, 27(1), 302–318.
[24] OLIVA, R., KALLENBERG, R.: Managing the transition from products to services. *International journal of service industry management*, 2003, 14(2), 160–172.
[25] OVANS, A.: What is a business model? *Harvard business review*. [online] 2015. Retrieved from: https://hbr.org/2015/01/what-is-a-business-model.
[26] PAIOLA, M., GEBAUR, H.: Internet of things technologies, digital servitization and business model innovation in BtoB manufacturing firms. *Industrial Marketing Management*, 2020, 89, 245–264.
[27] PASCHOU, T., et al.: The digital servitization of manufacturing: a literature review and research agenda. In: *27th RESER Conference Bilbao*, 2017, 1–20.
[28] RABETINO, R., KOHTAMÄKI, M., GEBAUER, H.: Strategy map of servitization. *International Journal of Production Economics*, 2017, 192, 144–156.
[29] RACHINGER, M., et al.: Digitalization and its influence on business model innovation. *Journal of Manufacturing Technology Management*, 2018, 30(8), 1143–1160.
[30] RAKIC, S., et al.: Digital Servitization and Firm Performance: Technology Intensity Approach. *Engineering Economics*, 2022, 33(4), 398–413.
[31] VANDERMERWE, S., RADA, J.: Servitization of business: adding value by adding services. *European management journal*, 1988, 6(4), 314–324.
[32] VENDRELL-HERRERO, F., et al.: Servitization, digitalization and supply chain interdependency. *Industrial Marketing Management*, 2017, 60, 69–81.
[33] VISNJIC, I., NEELY, A., JOVANOVIC, M.: The path to outcome delivery: Interplay of service market strategy and open business models. *Technovation*, 2018, 72, 46–59.
[34] WINDAHL, Ch., LAKEMOND, N.: Integrated solutions from a service-centered perspective: Applicability and limitations in the capital goods industry. *Industrial marketing management*, 2010, 39(8), 1278–1290.

ABSTRACT

Manufacturers are increasingly focusing not only on their product offering, but also on services. They want to create customer value and protect their competitive edge in the marketplace. The transition process from product-to-service-centric logic is referred to as servitization. Despite a large and growing body of academic literature, there are still some gaps in research in the field of financial benefits. The aim of the paper is to study if small and medium-sized manufacturers perceive the financial benefits of providing smart services. The research was carried out with the respondents from small and medium-sized companies that are representatives of the electrical industry.

KEYWORDS
Smart Services; Manufacturing Sector; Benefits of Smart Services; Financial Metrics / KPI

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