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# The role of service business models in the manufacturing of transition economies

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**Abstract.** The use of service in the manufacturing sector is growing in the last decade. Moreover, there are developed and implemented many service business models across the world. Prior studies investigated the role of service business models in the manufacturing sector of developed countries; however, the role of service business models in transition economies (e.g., Serbia) is neglected. This research provides an overview of the use of service business models in the manufacturing sector of the Republic of Serbia from the dataset of 240 manufacturing firms from the European Manufacturing Survey conducted in 2018. Furthermore, results show a positive impact of service business models on the manufacturing firm's performance.

**Keywords:** Product-Service Systems, Service Business Models, Firm performance.

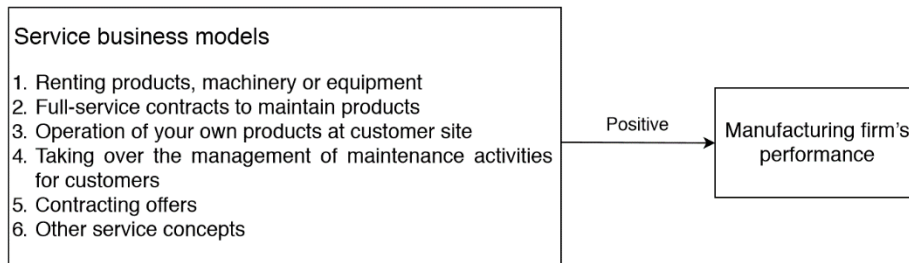
## 1 Introduction

Servitization presents a connection between goods, service, and adding value for customers [1]. Throughout history, the idea of Product-Service Systems (PSS) was developed by the servitization process in manufacturing [2] [3]. PSS represents a system of connectedness between products and services, which is developed for increasing customer satisfaction [4]. Moreover, there are many studies, which investigate the service business model in the manufacturing sector of developed countries [5], [6], but this field is neglected in transition economies (e.g., Serbia) [7], [8]. On the other perspective, the Gross Domestic Product (GDP) of the top four economies (i.e., United States of America, China, Japan, Germany) in the world is conducted by services [9]. Also, the manufacturing sector of Serbia had a major share in the GDP creation for 2018, with 14.5% [10]. Unfortunately, the share of service in the GDP of the Republic of Serbia is around 50%, which is 20% under average value in countries from the European Union [9]. Consequently, there is a real need for observation of service business models in the manufacturing sector of Serbia, from both perspectives – theory and practice. The purpose of this paper is to investigate the role of service in the manufacturing sector of developing countries. Moreover, this study provides useful information on which service business models could increase firm performance. With this knowledge,

manufacturing firms from developing countries could improve their position on the market and increase its competitiveness. Research is based on a Serbian dataset from the European Manufacturing Survey (EMS) with a sample of 240 manufacturing firms. Based on the gap in the literature of developing countries, the following research question is proposed:

- RQ: The deployment of service business models will positively affect a firm's performance in the manufacturing sector of the Republic of Serbia?

Figure 1 depicts the proposed research framework based on the theoretical background and research question.



**Fig. 1.** Research framework

## 2 Literature review

Previous research demonstrated the growing importance of services in the manufacturing sector [2]. Furthermore, studies presented that service business models in manufacturing are developed and mature than in the last decade [3]. PSS business models "refers to the logic of how a firm does business" with the services in the manufacturing sector [11]. A prior study introduced three levels of use of PSS in manufacturing firms: product-oriented, use oriented, and result-oriented [12]. Moreover, these orientations provide an in-depth understanding of their service business models [12]. Customer segmentation and relationships are shown as the key activities in the services business model [13]. Accordingly, authors investigate service business models of *operation of products at customer site / for the customer* and *taking over the management of maintenance activities for the customer to guarantee availability or costs*. Advanced contracts about services offer could increase revenue from service offers [14]. Therefore, the authors introduce the *full-service contracts with a defined scope to maintain products* and *contracting offers (e.g. supply of operating resources such as electricity)*. The service business models which provide *service concepts based on firm performance* are presented as one of the main capabilities for service innovation [15]. Pay per use are service business models that are employed in many firms such as Rolls-Royce Holdings [14]. In order to investigate pay per use services in developing countries authors *introduce renting products, machinery or equipment* as the service business model. Based

on the presented literature, EMS consortium [16] considers a list of service business models in manufacturing sectors shown in Figure 1.

Furthermore, previous research presented that service business models have a different impact on firm performance, according to the use of product innovations [5]. Manufacturing firms with product innovations have a positive long-term effect on firm performance, but without product innovations, they have only short-term positive effects [5]. Additionally, prior research presented that services supporting the clients' actions have a positive and significant relationship with profit growth [17]. Besides, investments in relationships with stakeholders directly contribute to firms' performances and indirectly to firms' value [18]. It could be argued that service business models could construct a positive relationship with customers and long-term positive effects on firm value. On the other hand, the literature presents that service business models do not generate positive effects on firm performance in any case [19]. This occurrence is called the "servitization paradox" [20]. Moreover, Cambridge Service Alliance gives an overview of 75 manufacturing firms from developed countries, which bankrupt with servitization activities [21].

Nevertheless, novel studies show that digital services business models could improve the current situation with the servitization paradox [22]. Moreover, the use of digital services based on Big Data Analysis, Cloud Computing, and Artificial Intelligence are often used in manufacturing firms of developed countries [23]. Unlike from studies from developed countries, previous research from transition economies (e.g., Serbia) measure only the impact of product-related services and digital services on firm performance [24] [8], [25]. However, the role of service-business models in the manufacturing sector of the Republic of Serbia is neglected [25].

### 3 Methodology

Data for this empirical research are collected through European Manufacturing Survey (EMS) with the dataset from the Serbian manufacturing sector (NACE Rev. 2 codes from 10 to 33) from 2018. The EMS is coordinated by the Fraunhofer Institute for Systems and Innovation Research from Germany [16]. The analytical dataset includes 240 observations of manufacturing firms from the Republic of Serbia.

For data visualization and influence between manufacturing sectors, Social Network Analysis (SNA) method is used. SNA is the method of extracting useful information from social structures based on graph theory [26], [27]. Moreover, many studies apply this method in a different type of manufacturing research, such as Industry 4.0 [28], cloud manufacturing [29], logistics [30], collaborative manufacturing [31]. The industry sectors are presented with red circles according to NACE Rev 2.2 classification. While authors labeled service business models with a combination of letters and numbers ranging from BM1 to BM6 according to the research model and they are presented with blue squares in Figure 2. Furthermore, to analyze the impact of service business models on a manufacturing firm's performance, the authors used linear regression. According to previous research [5], [17], authors employed share of revenue from services as the dependent variable. Moreover, early studies present financial parameters as the

measurement for firm performance [32]–[34]. Furthermore, Eggert [32] introduce a share of revenue as the ratio for firm performance. Table 1 depicts the sample distribution according to the industry sector.

**Table 1.** Classification of manufacturing sectors according to share on the total sample.

NACE Rev. 2	Manufacturing industry	Share on total sample (%)
25	Manufacture of fabricated metal products, except machinery and equipment	16.7
10	Manufacture of food products	14.4
22	Manufacture of rubber and plastic products	8.6
28	Manufacture of machinery and equipment n.e.c.	8.6
27	Manufacture of electrical equipment	6.9
14	Manufacture of wearing apparel	6.3
	Other	38.5

## 4 Results and Discussion

Table 2 presents the linear regression model used to test the research question.

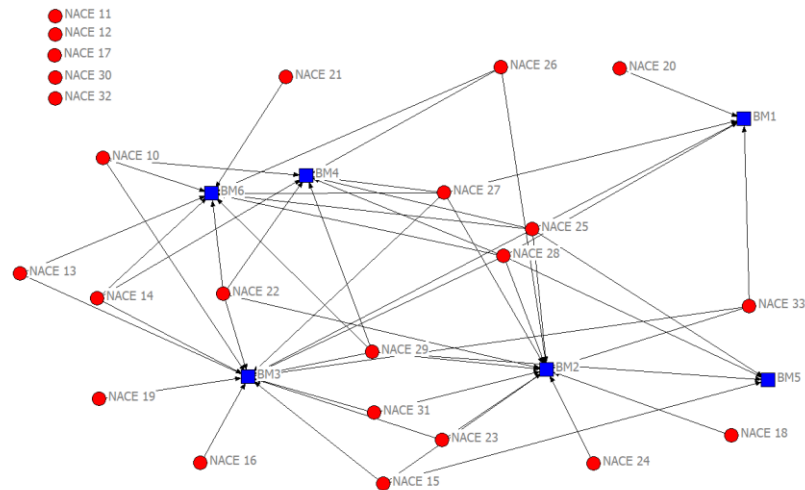
**Table 2.** Results of the impact of service business model on performance

Service business models	Model parameters
Renting products, machinery or equipment	0.049
Full-service contracts to maintain products	0.175*
Operating of your products at the customer site	0.279***
Taking over the management of maintenance activities for customer	0.078
Contracting offers	0.111
Other service concepts	0.154
R	0.461
R <sup>2</sup>	0.213
Sig.	0.001

Note: \*\*\* $p < 0.001$ , \* $p < 0.05$

In the regression model that tests the research question the overall model was significant,  $R^2 = .248$ ,  $F = 3.163$ ,  $p < .001$ . Furthermore, results shown that only service business models of *Full-service contracts with a defined scope to maintain products* and *Operation of products at customer site / for the customer* have a positive and significant impact on the share of revenue. As a major finding, our research indicates a significant role in the service business model in the manufacturing sector of the Republic of Serbia.

Additionally, Figure 2 presents a network between manufacturing sectors according to the use of service business models.



**Fig. 2.** Graph illustrating social network between manufacturing firms and service business models

Figure 2 shows the results of eigenvector-centrality between manufacturing firms in the two-mode networks. Moreover, eigenvector-centrality shows that:

- (1) Manufacture of fabricated metal products, except machinery and equipment,
- (2) Manufacture of machinery and equipment n.e.c.,
- (3) Manufacture of electrical equipment,
- (4) Manufacture of motor vehicles, trailers, and semi-trailers
- (5) Manufacture of rubber and plastic products

have the highest relationship between the manufacturing sector of the Republic of Serbia in the use of service business models. Furthermore, the network shows that the *Operation of your own products at customer site / for the customer (e.g., pay on production)* and *Full-service contracts with a defined scope to maintain your products* are the most used service business models in the manufacturing sector of the Republic of Serbia. The results of the linear regression model are in line with results from SNA analysis. These findings may be useful for production managers. Moreover, this information could provide an in-depth understanding of the role of service business models in manufacturing firms. Thus, production managers can better shape their service business models according to other firms in their industry.

## 5 Conclusion

This research evaluates the use of service business models in the manufacturing sector of the Republic of Serbia. The empirical results indicate a significant and positive impact of service business models on manufacturing firm performance (share of revenue from services). Previous studies showed an overview of servitization in developed countries [35]. Nevertheless, studies presented in the last decade don't study servitization in developing countries [36]. Accordingly, this study provides findings on the example of developing countries. Furthermore, this overview contributes to the existing literature by showing the role of service business models in manufacturing firms in transition economies (e.g., Republic of Serbia). This study confirmed previous findings that presented a revenue model and relationship with the customers as one of the main components in service business models [6]. This study gives a novelty in servitization literature because the authors used a mixed-method approach with SNA and linear regression. Moreover, results show that the most used service business models provide the best effects on firm performance.

This research is limited only to the dataset from one manufacturing industry (i.e., Serbia). There are other transitional economies, which could employ service business models in their manufacturing firms that could be included in future research. Future research should take into consideration different service business models in measuring their impact on manufacturing firm performance. Furthermore, many manufacturing firms are evolving their digital service business models on product offerings so that these business models could be considered in future research.

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