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Determining the KPIs of the German engineering industry based on the evaluation of contemporary business models

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Abstract
This study determines the correlation between industry-specific success patterns of the German engineering industry and the business models applied within. In order to identify this correlation, the following objectives are addressed within the framework of this paper: (1) identification and description of business models used by the German engineering industry; (2) analysis of industry-specific success patterns of the German engineering industry by the usage of Key Performance Indicators (KPIs); and (3) determination of correlation between the KPIs and the effectiveness of the business models of the German engineering industry These objectives are mainly achieved by literature research and expert surveys. The findings highlight the KPIs (overall 41) that are relevant for the respective business models. This enables a better understanding of the interrelationships of the business model, in order to derive relevant conclusions. The paper contributes to the literature as it advances this field of research in Germany, and it is one of the first studies to examine the relationship between business models and industry-specific success patterns with relevant KPIs.

Keywords
KPIs, business model, business model evaluation, the German engineering industry, industry-specific success patterns.

Introduction

Most of the great success stories of companies are not so much based on one new ingenious product, but their success can be traced back to their innovative business model1 (Gassmann, Frankenberg, & Csik, 2017, p. 5). The companies' business model has not only changed traditional markets and redefined customer needs but it has also turned the way companies do business upside down (Ulrich & Fibitz, 2017, p. 32). For example, Amazon became the largest bookseller in the world despite the lack of experience in the distribution of books and without its own retail shop (Palumbo, 2019). Tesla has also established a seemingly unassailable lead over the competition by vertically integrating its supply chain of key components, such as charging stations, batteries, AI (Artificial Intelligence) chips or the operating system software, instead of sourcing them out to external suppliers (Montgomery, 2019).

The business models are becoming the basis for discussion of new challenges in business

[1] The term business model is explained in more detail in section 1. Until then, the business model can be understood as a simplified representation of the holistic business activity.

practice. The need for discussion stems from the growing changes in the competitive environment, in terms of continuously blurring borders between industry and companies (Zimmermann, 2013). These changes are caused, among other things, by shorter product life cycles and the faster diffusion of technologies and thus demand an extension of the resource- and market-oriented approach of strategic management (Zimmermann, 2013). According to Jansen and Mast (2014, p. 29), these changes often trigger crises and emergency situations at companies, which make it necessary to change or adjust their own business models. Numerous studies and analyses focus on business models in the context of innovation and the necessity for companies to permanently adapt their own business model to internal and external industry impulses in order to ensure long-term competitiveness (Zollenkop, 2006; Ulrich & Fibitz, 2017; Becker, Ulrich, & Stradtmann, 2018). In this context, corporate strategy is understood as the link between the current and the targeted business model (Becker, Ulrich, & Stradtmann, 2018, p. 14). Questions regarding the implementation, life cycle and success requirements of business models are discussed at various points, but usually assume an adaption or adjustment of the underlying business model in the form of innovations (Zollenkop, 2006; Becker, Ulrich, & Stradtmann, 2018; Born, 2018; Schallmo, 2018).

In contrast, the area of business model evaluation criteria is considered one of the least mature research areas (Pateli & Giaglis, 2003, p. 343; Horsti, 2007, p. 3). The common evaluation methods can be defined using qualitative criteria, which usually build on existing frameworks. These frameworks address specific questions about individual elements of a business model or quantitative criteria, which are based on the earnings of the company in the context of interaction with customers and suppliers (Heim & Linden, 2012). Whether the applied business model is ideally executed within the underlying industry or shows any potential for adaptation could not be found in the literature. In fact, Zollenkop (2006, pp. 17-18) states that there are no existing correlations between industry structural characteristics and business models in terms of relevance and success. Although a company's ability to deal with environmental requirements resulting from customers' needs or technology trends, it is considered a cornerstone for the effective use of business models (Born, 2018; Heim & Linden, 2012). Usually, the analysis of the environment or stakeholders is company-specific and helps the company to break down the overall market into manageable segments. There are proven methods of environmental analysis in the corporate context, such as Michael E. Porter's microeconomic analysis[2] or the macroeconomic PESTLE (Political, Economic, Social, Technological, Legal and Environmental) Analysis[3]. However, the general industry-specific factors or patterns for success[4] and their impact on business models are hardly considered, even though the applied business models are placed in the corporate context and adapted to the stakeholders within the industry (e.g. customers, suppliers, competitors) (Leshchenko & Ermolovskaya, 2019). For example, the demand for flexibility of construction companies is a prerequisite that every successful supplier of construction equipment must meet. Conversely, this leads to the conclusion that a short delivery time for construction equipment is the foundation for being successful within this industry, which results in an industry-specific success factor. According to a survey conducted by McKinsey & Company (2016, p. 38), shorter delivery time is only one among the 10 most important success factors of the of construction equipment industry.

The purpose of this paper is to address the described research gap, by identifying industry-specific success patterns and linking them to the business models applied within the German engineering industry.

Therefore, the main goal of this study could be formulated as follows:
Correlation of differently relevant KPIs, derived from industry-specific success patterns, to Germany's engineering industry's business models in order to evaluate these.

The focus within this paper is on commonly used business models within the observed

[2] Five-force model according to Porter, M. E. (1980). Competitive strategy. Techniques for analyzing industries and competitors (52. printing). New York: Free Press.

[3] The PESTLE Analysis is a modification of the ETPS or STEP analysis by Francis J. Aguilar (1967) and stands for Political, Economical, Social, Technological, Legal and Environmental factors.

[4] The term industry-specific success factor is explained in more detail in Section 1. Until then, these can be understood as a simplified description of factors that can be influenced and that have a lasting and longer-term positive influence on the success of a company.

industry, as the German engineering industry is suitable for this study due to its century-long history and its archetypal business models (McKinsey & Company and VDMA, 2016).

The remaining sections of this paper are as follows: First, we specify and describe business models used by the German engineering industry, based on a literature research and an expert survey (section 2). Secondly, we analyse industry-specific success patterns of the engineering industry of Germany by the usage of Key Performance Indicators (KPIs) based on literature research. These analyses are built on the understanding of business models in general and within the German engineering industry, business model evaluation, and industry-specific success patterns, which are briefly discussed in the theoretical background part (section 1). Finally, we will identify the correlation between the determined performance indicators and the underlying business models using an expert survey (section 3). The paper concludes with the summary and discussion of the main findings, and provides an outlook of potential research ideas.

1. Theoretical background

1.1. Business models

Osterwalder, Pigneur and Tucci (2005, p. 4) identified the initial usage of the term "business model" in an academic article in 1957, which was then further recognized through the Internet in the 1990s. During the 1970s, this term was mainly used to describe the result of business modelling in the field of business informatics, which basically captured certain information in the context of the company in order to be able to display the business processes (Zollenkop, 2006, p. 27). Through the expansion of the new economy, this term was redefined as a strategic perspective (Heim & Linden, 2012, p. 5). This renewed idea was particularly relevant in the field of start-ups, where the way of thinking in business models terms became increasingly popular, since it allowed to differentiate themselves from the competition and to create business plans as demanded by the venture capital companies (Zollenkop, 2006, pp. 29-30).

There is no uniform understanding of a business model, even though it has been the focus of closer examination for years, of strategic and management topics such as corporate performance, value creation, and innovation management (Zott, Amit, & Massa, 2011; Osterwalder, Pigneur, & Tucci, 2005). Heim and Linden (2012, p. 4) observed that in many cases the definition is not specified within the literature, because these authors regard it as self-explanatory, which leads to varied interpretations. When authors explain the term, the perspectives vary greatly from each other. Some authors refer specifically to the way a company operates, while others use it to simplify the complexity of business to an understandable dimension (Osterwalder, Pigneur, & Tucci, 2005, p. 3). The fact that the authors conduct their research mainly isolated (Zott, Amit, & Massa, 2011, p. 1034) and not based on one another (Osterwalder, Pigneur, & Tucci, 2005, p. 22) enhances the different perceptions. According to Bornemann (2010, p. 17), the focus of a study is the main reason that the definitions do not only differ from each other, but also sometimes even contradict each other. This different perception is further increased by the usage of the same term to address a wide variety of topics such as e-business, value creation, innovation management (Zott, Amit, & Massa, 2011, p. 1034) or to describe a company's strategy (Magretta, 2002, p. 91). Another factor for the different perspectives is the varying views of people in business and technology (Osterwalder, Pigneur, & Tucci, 2005, p. 1). Bornemann (2010, p. 18) claims that the general lack of research in this area as another important factor. This idea is supported by Chesbrough and Rosebloom (2002, p. 533). They identified the lack of focus of business models as the reason for minimal scientific interest.

As a result of a minimal uniform understanding of business models, the literature has numerous comparisons of the different business model definitions, concepts and intensive studies (Zott, Amit, & Massa, 2011, pp. 1034-1036; Schallmo, 2018, pp. 14-16; Pateli & Giaglis, 2004, p. 305; Morris, Schindehutte, & Allen, 2005, p. 728).

For the concept of business models within this paper, we will use the definition identified by Gassmann, Frankenberg and Csik (2017) – the St. Gallen Business Model Navigator. It is the result of an analysis of 250 business models in different countries, in which 55 patterns were identified, that were used as the basis for business model innovation. Gassmann et al. determined via the evaluation phase of their model that 90% of all new business models are based on a recombination of existing elements and designs. Due to the simple and holistic design of the

model, which facilitates the description of business models in general, it is a helpful tool to describe and compare the business models to be investigated in the further course of the analysis. Despite its simplified structure, the model succeeds in making the business model concrete and tangible by focusing on the following four dimensions: target customer, value proposition, value chain and revenue model (Figure 1).

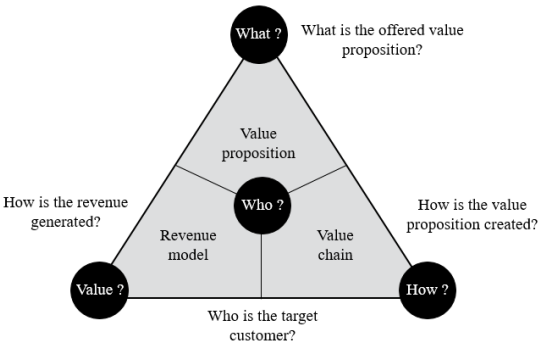

Figure 1 The "magic triangle" with the four dimensions of a business model
Source: Designed based on Gassmann, Frankenberg, & Csik, 2017

These dimensions allow the customer (Who?) to be placed at the centre, as customers are the cores of every business model. The second dimension (What?) describes the value proposition offered by the company, which can be products as well as services. In order to create and deliver the value proposition, a company has to manage multiple processes and activities within their available resources, skills and internal value chain. All these attributes present the third dimension (How?). Lastly, the revenue model of the business model with all related costs and the underlying revenue mechanism is summarized in the fourth dimension (Value?).

1.2. Business models of the German engineering industry

Since the business models of the German engineering industry are quite traditional, there is a moderate number of literature sources to consider. These business models mainly focus on improving technologies and quality. They are also customer-centric with a high degree of individualization (Demont & Paulus-Rohmer, 2017, p. 104). Demont and Paulus-Rohmer (2017, p. 105) describe these business models with generic terms by using the dimensions of customer segment, value proposition (e.g. problem solving or product/service), revenue creation, value creation (e.g. key activity, competence, partner) and boundary conditions (e.g. legal requirements). A combination of products and services represent their main value proposition (Dr. Wieselhuber & Partner GmbH & Fraunhofer-IPA, 2015, p. 22), which addresses very diverse customer segments ranging from automotive manufacturers to food producers (Demont & Paulus-Rohmer, 2017, p. 105).

Demont and Paulus-Rohmer (2017, p. 106) identify service offering expansions and the associated development of new business models through digitization, as a logical consequence of falling profits from the traditional equipment business. Due to the context of the 4th Industrial Revolution[5], the business models within this industry draw the attention of different considerations. For example, Gerl (2020, p. 2) justifies the necessity of implementing smart service[6] business models in this industry, with the opportunity to generate additional sources of income and competitive advantages through differentiation and the increase of customer loyalty. Brauckmann (2015, p. 7) moves a step further by stating that the need for networking systems is essential in order to meet the customer's constantly changing demands. This is illustrated by the fact that production factors such as labour, inputs and materials, are no longer sufficient to describe the entire value chain, since the underlying networks are dynamic and can no longer be managed by traditional measures (e.g. sales, turnover, profit).

Voigt, Arnold, Kiel and Müller (2019) have found that some dimensions of the existing business models of the involved companies have already changed due to the influence of digitization. Frequently observed changes include their value proposition, key resources and activities, and their customer relationships. In the future, the establishment of a consistent aftersales service model will be increasingly important to successfully implement Industry 4.0 business models (Dr. Wieselhuber & Partner GmbH & Fraunhofer-IPA, 2015, p. 47). Here, the emphasis is on the creation of a corresponding value

[5] The 4th industrial revolution strongly focuses on automation, the interconnectivity of machines and the digitalization of production equipment based on real-time data (also known simply as Industry 4.0).

[6] There is no uniform definition of the term smart service. However, Gerl (2020, pp. 14-16) describes the term as a service that is based on data and creates added value by digitizing processes.

proposition, which is achieved through the combination of open hardware and software. Their provision will presumably be shaped by services platforms, which form the underlying infrastructure use to deliver these to the customer.

1.3. Business model evaluation

In this section, quantitative and qualitative evaluation methods of business models are analysed. The qualitative methods can be considered as direct evaluation methods, as these usually address components of the underlying business model directly. The quantitative methods can be considered indirect, because these mainly consider the success of the company and the related business model usually indirectly as a conclusion.

As mentioned above, the field of business model evaluation is minimally researched (Osterwalder, Pigneur, & Tucci, 2005, p. 8). This fact is supported by the statement: "A 'strong' business model can be managed badly and fail, just as much as a 'weak' business model may succeed because of strong management and implementation skills" (Osterwalder, Pigneur, & Tucci, 2005, p. 8). In other words, a business model itself may not be as important as its execution. However, the literature is addressing this gap in determining the value of the business model versus its execution. Various approaches to business model evaluation can be found in the literature, mostly applying qualitative and quantitative criteria. Heim and Linden (2012) describe these criteria either by qualitative elements, which are directly related to the business model, or by quantitative factors, which consider financial aspects in the business context. Pateli and Giaglis (2003, p. 310) share a similar view, as they identify the retrospective analysis as the focal point of business model evaluation with multiple possible objectives, such as the opportunity to uncover and evaluate potential business model innovations with quantitative and qualitative elements.

1.3.1. Qualitative evaluation methods

In the context of qualitative evaluation methods, Osterwalder and Pigneur (2011, pp. 220-227) assess a business model by rating the nine components of the underlying business model canvas[7], using a SWOT-analysis including a scoring matrix. Zott and Amit (2010) use four design themes, NICE (Novelty, Lock-In, Complementarities and Efficiency) to describe the success criteria for business models as the main value creation driver. Bornemann (2010) also carries out the evaluation of business models by using the 4 business model design themes according to Zott and Amit (2007, Amit & Zott, 2001), each of which is defined by 9 to 15 indicators, together with indicators for environmental influences (uncertainty and competition intensity) as well as corporate success. For this purpose, Bornemann weighs the significance of the individual indicators to identify quantitative relationships between them. The environmental influences are considered on the success of the company, before the influence of the respective business model design is determined.

Horsti (2007) discusses an evaluation tool for e-business, which uses two different types of success factors (the prerequisites of success and the measures of success). The latter are further categorized into seven components of the e-business model (e.g. customer, competitors, resources) and rated with a factor. Horsti (2007, p. 43) describes the tool as a prioritized checklist for a specific business model including the most important issues, which also enables the comparison of different business models. Afuah and Tucci (2003) also use qualitative criteria as they define "component attribute measures" (e.g. positioning, value, activities) to evaluate a business model, by using subjective benchmark questions related to the measures and rank them from high or low.

Schallmo (2018) proposes to evaluate a business model by examining the expected profitability of the business model prototypes depending on different scenarios. For this purpose, critical success factors (time, costs, quality and flexibility) are adapted to the respective business model, their interdependency is determined, and finally different scenarios are derived which describe possible future outcomes. Bouwman, De Vos and Haaker (2008) use their STOF business model (Service domain, Technology domain, Organization domain and Finance domain) as the foundation in terms of designing and evaluating a business model. Firstly, critical success factors (e.g. defined target group, quality of product, value proposition)

[7] The nine components of the business model canvas are: customer segments, value proposition, customer relationship, channels, key activities, key resources, key partners, cost structure and revenue streams (Osterwalder & Pigneur, 2011).

within each domain are identified, while they influence the value for the desired customer and the involved network that includes all actors, which interact and create joint value. Then a relationship is generated between critical success factors and critical design issues (important design variables of a business model) to identify a possible influence. As a consequence, critical design issues may be addressed to consciously influence the success factors.

The literature reviewed here supports the statement that the methods of a business model's qualitative evaluation are often based on a previously developed concept and address specific questions regarding its individual components (Heim & Linden, 2012, p. 15).

1.3.2. Quantitative evaluation methods

Afuah and Tucci (2003) define two quantitative criteria, profitability measures (e.g. earnings, cash flow) and profitability predictor measures (e.g. margins, market share), which consider the success of the company for business model evaluation. Another opportunity to evaluate a business model is addressed by Osterwalder et al. (2005, p. 14) and Born (2018, p. 16), as a balance scorecard[8] is suggested to improve relevant financial, operational and organizational measures of the related company. Schallmo (2018, p. 241) also discusses financial key figures (Subic, Vasiljevic, & Andrei, 2010) in the corporate context as an opportunity for a quantitative evaluation.

A similar approach is the e³-value model (ontology) of Gordijn and Akkermans (2003), which visualizes with the help of Use Case Maps[9] the network of the exchange relationship of all involved actors of the considered business model. Based on the displayed network, all possible expenses and revenues of each actor as well as the value objective, which is handed over between them, is calculated and leads to the profitability of each actor.

Other authors, such as Sandrock (2006) and Grasl (2009) use the simulation method system dynamics[10] to evaluate business models. Sandrock (2006) applies the method to evaluate the suitability of the business model of an e-learning provider and to identify model-induced recommendations for action, which can be used to align the strategy of the company. For this purpose, various variables and constants that describe the business model and its influencing parameters are defined before the simulation is applied. Then the model structure and relevant behaviour are validated to confirm the correctness of the assumptions and correlations. Grasl (2009) has a similar approach, as he declares the recommendations, which are derived by questions and scenarios concerning the related business model, as the main goal of business model analysis. The method engineering metamodel[11] is used to design the architecture and behaviour of business models. The architecture defines how suitable relevant individual components are for respective business model as well as their relationship to each other. Behaviour, on the other hand, defines how the components interact and how their value develops over time. The simulation method system dynamics provides valuable information about future events and the resulting measures of the analysed business models. However, they neglect a current state evaluation of the business model, since they focus on future developments that assume their analysed business model is effective. Thus, it is not possible to identify unused potentials of the business model.

Usually, the quantitative evaluation analysis indirectly evaluates the underlying business model since the actual evaluation is based on financial key figures of the associated company. An additional consideration is that the quantitative evaluation method could be very limited, because it mainly focuses on difficult to measure financial indicators (Pateli & Giaglis, 2004, p. 310).

1.3.3. Conclusions for the evaluation methods

As discussed in the previous section, various qualitative and quantitative methods have been identified in the literature for business model evaluation. Despite the differences identified, all methods have one thing in common: the effectiveness of the business model is evaluated. This means they evaluate how well the business

[8] The balance scorecard is a set of performance measures with different perspectives (customer, internal, innovation and financial) which provides a clear view on the company's business and helps to focus on the most critical indicator of the present and future performance (Kaplan & Norton, 1992).

[9] The term Use Case Maps is discussed in detail by Buhr (1998).

[10] System dynamics (initially called industrial dynamics) was developed by Forrester (1968) and describes a simulation method for the analysis of complex, non-linear and dynamic systems.

[11] The business engineering model is discussed in detail by Österle and Winter (2003).

model copes with the expectations and influences in the corporate context. In other words, the effectiveness of the business model is evaluated in the business context. All examined methods assume a completely efficiently implemented business model that leaves no room for unused potential. There was no referenced literature addressing questions regarding the efficiency of implementation, control or further development of business models.

1.4. Industry-specific success factors

First, the idea of success factors will be addressed in this section in order to determine a suitable definition of the term industry-specific success factor. The first serious investigations in the field of success factor research can be dated back to the 1960s to 1970s (Becker & Ulrich, 2011, p. 84). Through the Profit Impact of Market Strategies (PIMS) research program, which was started in 1972 by the Marketing Science Institute of the Harvard Business School, success factor analysis has undergone a considerable development (Spelsberg, 2011). Capon, Farley and Hoenig (1990) analysed the success of companies in terms of financial performance using a meta-analysis based on empirical work. They examined, among other things, which central independent variables were used to explain the success of the company. In the process, they were able to identify differences between the various variables in terms of their probability, strength and influence on the company's success. In this context Nicolai and Kieser (2002, p. 580) describe success factors as influencing variables which are responsible for the success of the company and which are suitable for the derivation of a recommended strategy for the management. A similar description is provided by Boeing (2001, p. 10), who describes success factors as determinants that effectively influence the success of a company in the long term. These establish a competitive advantage and are regarded as valuable orientation in strategic corporate planning. In contrast, Daschmann's (1994, p. 1) formulation is more general, as only characteristics or structures that have a positive influence on the success of the company are named. In this context, the differences between critical[12] and strategic[13] success factors are also mentioned. These examples overall illustrate a general understanding of success factors within the literature.

Although different authors have conducted the research on success factors for decades, the results so far are inconclusive, as they are generally contradictory (Woywode, 2004; Nicolai & Kieser, 2002). As a possible reason, Woywode (2004) points to the focus of the investigations on only few central key variables in the company instead of large-scale surveys of the entire company context. This could also be related to the lack of investigation of factors that have a negative impact on the company's success (Capon, Farley, & Hoenig, 1990, p. 1158). Nicolai and Kieser (2002) identified methodologically demanding quantitative-empirical studies as the main contribution to elaborate success factors. One factor for the research's ineffectiveness may be the insufficient application of methodological standards. Examples of these shortcomings include the usage of unrepresentative samples, inappropriate statistical methods and the misinterpretation of the causal relationship of cross-sectional data (Nicolai & Kieser, 2002, p. 584). Additional common methodological shortcomings include the revealing of causal structures, conducting data collection and implementing data analysis (Spelsberg, 2011, p. 33). Another difficulty of success factor research is the different definitions of the success measure to determine the success of a company. These definitions include profit development, market share and return on investment or the return on equity (Woywode, 2004, p. 22). Daschmann (1994) identifies the confusing variety of influencing variables and conditions as the reason for the lack of systematization of the results in success factor analysis. On the one hand, industry-, company- and business area-specific success factors are mentioned. On the other hand, success factors in the context of performance, position, market and product are described.

It can be stated that there is a general understanding of the definition of success factors in the literature, which is adapted to this study. Furthermore, there is great disagreement regarding the results of the success factor analysis and the methodologies used. Proposals for investigations are described in various studies, for example by Nicolai and Kieser, as well as by

[12] Critical success factors have a higher weight than non-critical ones, which should lead to a reduction in the number of interrelationships within the scope of the study (Daschmann, 1994, p. 11).

[13] Strategic success factors describe dynamic influences that should have a lasting and long-term impact on the success of a company (Daschmann, 1994, p. 11).

Woywode. As a possible approach to identifying success factors on an empirical basis, Nicolai and Kieser (2002, p. 586) suggest that researchers must make assumptions on causal relationships based on an explicit or implicit theory. Woywode (2004, p. 41) proposes to combine quantitative and qualitative methods within the framework of success factor research, to overcome the limitations of the results regarding interpretability and applicability.

Based on the general understanding of success factors, the term industry-specific success factors describes factors which should secure the company's success in the long term and apply primarily to the examined industry. The current singular explanation for success factors is insufficient to explain success alone. Hence, the concept of success patterns represents success's complexity better, especially when viewed holistically.

2. The German engineering industry

The following section addresses the business model archetypes of the German engineering industry and their value chain (section 2.1). This analysis describes the basic features of the applied business models within the industry and thus forms the first step of their determination. The literature of the VDMA (Verband Deutscher Maschinen- und Anlagenbau – Mechanical Engineering Industry Association) is primarily used for research, as it is the largest network organization with around 3300 members with significant influence on the engineering industry in Germany and Europe. It represents the mutual economic, technical and scientific interests of this diverse industry (VDMA, 2020). Most of the underlying literature consists of surveys as well as quantitative data collection from companies of the German engineering industry. Figure 2 shows the linear steps of determining the business models and KPIs of the German engineering industry.

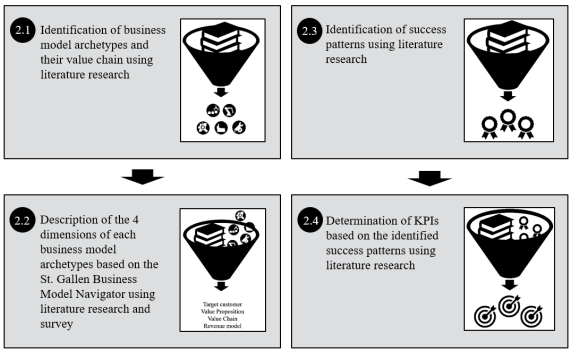

Figure 2 Methodology of the determination of the German engineering industry's business models and KPIs
Source: The authors

Section 2.2 outlines the identified business models utilizing the St. Gallen Business Model Navigator. These outlines are based on the results of section 2.1 and are determined using qualitative literature review. VDMA's literature is the basis for this analysis, as it focuses on the business models of the German engineering industry. The four dimensions of the business models of the German engineering industry are described by using St. Gallen Business Model Navigator's description of a business model and the results of the literature review. However, one of the dimensions, revenue model, could not be determined by literature research. As such, a quantitative survey was conducted with experts of the related industry. These experts are directly involved in the procurement or sales of components, machines, aftersales and software applications, and possess several years of professional experience in this field.

Subsequently, the success patterns of the engineering industry of Germany are determined (section 2.3) and analysed by the usage of KPIs (section 2.4). In order to identify the success patterns within the industry, an analysis of various quantitative studies on this subject is carried out. Finally, the KPIs are determined based on the identified success patterns using qualitative literature research.

2.1. Business model archetypes and their value chain

The business models of the present engineering industry are illustrated by the study of McKinsey & Company and the VDMA in 2016 (McKinsey & Company and VDMA, 2016). McKinsey & Company and the VDMA analyse the primary business models of 215 European companies (135 of them German) in a broad range of industry sectors (Table 1).

Table 1 Participants of the various industry sectors

Industry sector	Number of respondents by industry sector (multiple choice), n = 215
Power Transmission Engineering	41
Machine Tools and Manufacturing Systems	32
Food Processing and Packaging	28
Electrical Automation	23
Robotics + Automation	23
Large Industrial Plant Manufacturing	22
Construction Equip. and Building Mat. Machines	20
Engines and Systems	19
Process Plant and Equipment	17
Precision Tools	16
Plastics and Rubber Machinery	15
Printing & Paper Equipment and Supplies	15
Fluid Power	13
Agricultural Machinery	13
Materials Handling and Logistic Technology	13
Measuring and Testing Technology	13
Foundry Machinery	12
Security Systems	12
Pumps + Systems	12

Source: Designed based on McKinsey & Company and VDMA, 2016, p. 12

Five business model archetypes with their own distinct characteristics are defined (figure 3). These archetypes are based on the classification that a company earns more than 50% or 20% of their overall revenue within a particular part of the industrial value chain. Depending on the business model's focus and the industry sector affiliation, one archetype can include various business models. The variations are significantly influenced by the depth of the company's net value added and its own position within the entire value chain. In order to obtain reliable results within the framework of their study, McKinsey & Company and the VDMA cluster the different business models into the five groups, based on identified patterns. Although very few companies fit perfectly into the definition of an archetype, they can assign each company to an archetype.

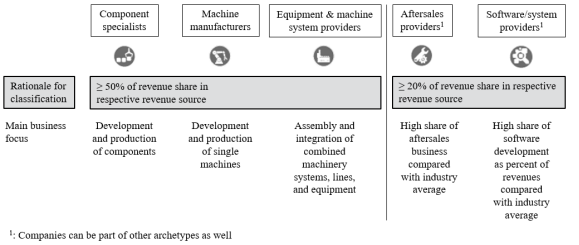

Figure 3 The 5 business archetypes across the European machinery industry
Source: Designed based on McKinsey & Company and VDMA, 2016, p. 17

According to McKinsey & Company and the VDMA (2016, p. 16) the net value added differs considerably between the different companies within the industry. Companies that develop and manufacture their products mainly from raw materials have a higher share of the value added (≥ 70 %) than companies that focus mainly on assembly and procurement of the necessary components externally (< 40 %). The value chain within the industry can be simplified by taking a closer look at the dynamics of the three following archetypes: components specialists, machine manufactures and equipment & machine system providers. They are closely interconnected through the industry's value chain. Figure 4 provides a simplified description of the value chain using representative suppliers of the related business model archetypes.

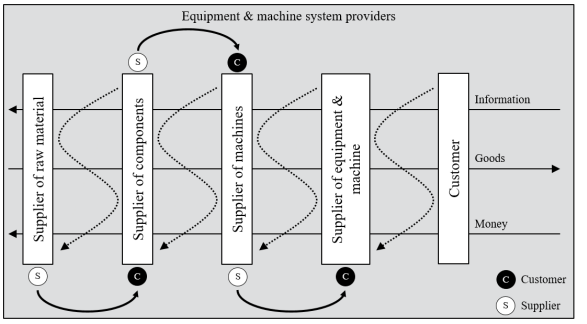

Figure 4 Simplified illustration of the value chain using the example of an equipment & machine system provider
Source: Designed based on IHK Nürnberg für Mittelfranken (ed.), 2014, p. 16

In this example, the company's internal order-to-payment process is not considered, but only the value creation of it within the industry sector. The value chain can be understood as a system of input flows (e.g. raw material), flows within the industry sector and output flows (e.g. customers). The flows within the industry sector can be described as a sequence of several order-to-payment processes that take place in upstream and

downstream companies (IHK Nürnberg für Mittelfranken (ed.), 2014, p. 16). The main actors of the simplified value chain are the suppliers of raw material, components, machines, equipment and machines as well as the customer. In the mutual business process, they exchange information and money for goods (see s-curve). Depending on the business relationship and direction, some companies switch the role as they act reciprocally as customers of an upstream partner and as suppliers of a downstream partner. It is not unusual that products do not only pass through the system in the form of a chain but are distributed to different actors in the form of a network (IHK Nürnberg für Mittelfranken (ed.), 2014, p. 17). Companies can thus act simultaneously as suppliers and customers of products and solutions. Due to the high complexity of products and services in this industry, the described distribution of products is essential in order to function as a holistic solution provider for the customers (IHK Nürnberg für Mittelfranken (ed.), 2014, p. 17).

As an example, the food processing and packing industry clearly illustrates (figure 5) the link of the different actors within its value chain. The figure shows the different industrial sectors within the various business model archetypes and their distribution of the products.

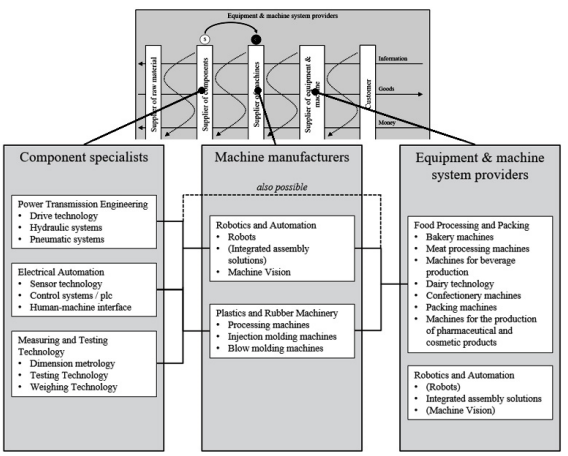

Figure 5 Representative illustration of the value chain, considering the various industrial sectors, exemplified by the food processing and packing industry

Source: Designed based on VDMA Antriebstechnik und Fluidtechnik (ed.), 2017; VDMA Mess- und Prüftechnik (ed.), 2019; VDMA Robotik + Automation (ed.), 2018; VDMA Fachverband Kunststoff und Gummima. (ed.), , 2019; VDMA Elektrische Automation (ed.), 2018; VDMA Future Business (ed.), 2020

Figure 5 shows common products of the different industry sectors (e.g. Power Transmission Engineering, Robotics and Automation, Food Processing and Packing) within their respective business model archetype, including components specialists, machine manufacturers, and equipment and machine system providers. In addition, the value creation within the industry is simply presented, as individual components and products are built upon one another. The components specialists produce their components (e.g. drives, sensors and testing technology) and deliver these to the machine manufacturers and in some cases also directly to the equipment & machine system providers. The machine manufacturers use their original equipment manufacturing (OEM) business to build machines (e.g. robots and process machines) based on the received components. Then, these manufacturers deliver the machines to the equipment suppliers. The machines are then used together with the components specialists' products to manufacture their integrated production solutions. This example illustrates that holistic solutions can only be realized by the linkage of different products (e.g. drives, sensors and testing technology, robots, process machines, etc.).

According to McKinsey & Company and the VDMA (2016), it is not uncommon for companies to be active in aftersales and/or as a software provider in addition to their main archetype business (e.g. components specialists, machine manufacturers and equipment & machine providers). Some companies use the sale of their original equipment as a catalyst to subsequently offer the profitable service business. Other companies offer their service business in addition to the equipment business, but only at the customer's request and not as the primary business.

The result and conclusion of the aforementioned study is similar to the archetypes study by McKinsey & Company in 2018 (Altmeier, Bauer, Becker, & Simon, 2019). They analysed 146 companies in Europe in the field of machinery and industrial automation sector. Altmeier et al. (2019) cluster the business models of market participants with similar patterns into 3 business model archetypes (1. OEM (Original Equipment Manufacturer) and system integrator; 2. Supplier; and 3. Software, platform, and application provider). Each archetype has its own characteristics and corresponding subcategories. In this context, they combine the OEMs with the system integrators within one cluster and do not consider the aftersales as a separate business

model, as it is included in each of the 3 archetypes. Altmeier et al. (2019) distinguish OEMs and system integrators not based on their position within the value chain but based on standard machines (such as robots or milling machines) with limited customer-specific adaptions and customer-specific production equipment among the suppliers, who produce and deliver components either directly to the OEMs and system integrators for integration or into the independent aftermarket. The archetype of the software, platform, and application providers is pretty much the same as the software/system providers of the first study from McKinsey & Company and the VDMA (2016). Altmeier et al. (2019) also point out that very few players fit perfectly into the definition of one archetype but can be assigned to an archetype or its subcategory, which is a comparable statement to the first study.

2.2. Description of the four dimensions of the five business model archetypes

As aforementioned, there are 5 business model archetypes (figure 3), which are a cluster of various business models of the companies within the industry. These archetypes have limited applicability within this context, therefore further analysis is required. In order to identify the correlation between "KPIs" (Section 2.3) and the individual elements of the business models, the business model archetypes must first be detailed (figure 6). For this purpose, a literature research was conducted using key questions. These questions are taken from the St. Gallen Business Model Navigator (Gassmann, Frankenberg, & Csik, 2017, pp. 29-30) and serve as a template for determining the 4 dimensions of a business model, such as target customer, value proposition, value chain and revenue model.

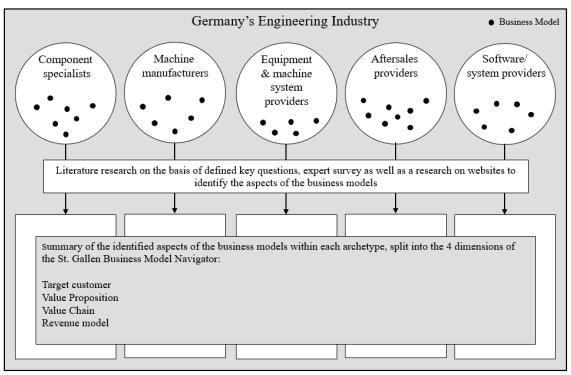

Figure 6 Procedure to identify the aspects of the clustered business models within the archetypes, using the St Gallen Business Model Navigator
Source: The authors

The dimensions include target customer, value proposition and value chain that are determined via literature research. As mentioned, the available literature has only limited data on the revenue model. Therefore, an additional expert survey and research on the websites of representative companies were conducted. The survey is conducted with internal and external experts from various sectors of the German engineering industry, such as electrical automation, machine tools and manufacturing systems, robotics + automation, and large industrial plant manufacturing using a questionnaire. The overview of the respondents by archetype, company size and industry sector are presented in table 2.

Table 2 Survey participants – Revenue model; Number of respondents by archetype, company size and industry sector

Number of respondents by archetype, company size, industry sector (multiple choice), n = 10 participants

Archetype	Component specialists	Machine manufacturer	Equipment & machine system providers	Aftersales providers		Software/ system providers
Resp.	7	5	6	10		9
Industry sector	**Robotics + Automation**	**Measuring Testing Technology +**	**Large industrial plant manufacturing**	**Machine tool and manufacturing systems**	**Electrical Automation**	**Power Transmission Engineering**
Resp.	5	4	5	1	2	3
Company size (employees)	**< 1.000**	**1.000 – 1.500**	**1.500 – 5.000**	**10.000 – 15.000**	**15.000 – 20.000**	**75.000 – 100.000**
Resp.	1	1	4	2	1	1

Source: The authors

Overall, ten experts were asked to answer the questionnaire and their feedback is reflected in the description of the revenue model in the related archetype. The questionnaire does not consider the revenue made by the company within each archetype. It evaluates which opportunities the experts have selling or purchasing products and services. Table 3 shows the number of respondents by archetype and revenue model.

Table 3 Number of respondents by archetype and revenue model

Number of respondents by archetype and revenue model (multiple choice), n = 10 participants

Archetype / Revenue model	Component specialists	Machine manufacturer	Equipment & machine system prov.	Aftersales providers	Software/ system providers
Selling	7	5	6	10	9
Leasing		4		3	
Renting	4	4		3	
Licensing	3	4		5	9
Pay-per-use	3	4			3
Subscription-based		4		1	5
Freemium					2
Interaction platforms and ecosystems	2				4

Source: The authors

The overview of the revenue models' description is presented in table 4.

Table 4 Description of the different revenue models

Selling (Rental purchase/Financing)	Retention of ownership of the product/service for a single payment (also possible in instalments). The landlord has granted the tenant the right to purchase the rented object by unilateral declaration within a certain period. Within this period, a constant monthly amount is usually paid.
Leasing	In leasing, services or products are rented to a certain extent, as leasing is a transfer of use for money on a temporary basis. The lessee is liable for the failure of the product and must carry out repairs and maintain the object himself.
Renting	Renting is similar to leasing, with the main difference, that the lessor is liable for the failure of the product and must carry out repairs and maintain the object (not the tenant).
Licensing	The owner of intellectual property (e.g. technology, process know-how) can grant licenses to other companies in exchange for royalties to allow them to use this property. A licensing model can also be used to limit the performance of components, machines or equipment.
Pay-per-use (Selling of uptime or output)	The use of a product or service is measured, and a fee is charged to customers each time they use the service or product. The user has no acquisition costs, no capital commitment and no running costs.
Subscription-based	Subscription business models are based on the idea of selling a product or service in order to receive monthly or annually recurring subscription revenues.
Freemium	Freemium is a business model in which the basic product is offered for free, while the full product and extensions are subject to a fee.
Interaction platforms and ecosystems	On interaction platforms, the supplier connects multiple parties and coordinates their interactions. On ecosystems, companies can facilitate the further development of products and applications based on their own product offering.

Source: The authors

The following sections include the four dimensions of each archetype (component specialists, machine manufacturers, equipment and machine system providers, aftersales providers, software/system providers), which are described based on the identified characteristics, such as literature research, website research and expert survey. The description of the respective dimension is not based on a single business model, but rather on a combination of characteristics of different business models of the examined industrial sectors.

2.2.1. Four dimensions of the business model archetype: Component specialists

This section presents the results of the research and the survey, which were used to determine the four dimensions of the component specialists' business model archetype. The development and manufacturing of components for industrial machines and equipment is the specialists' main business focus (McKinsey & Company and VDMA, 2016, p. 17). The underlying research is based on sources of the industrial sectors, which can be assigned to the components specialists' archetype.

Target customer

- The machine manufacturers (section 2.2.2) and the equipment and machine system providers (section 2.2.3) (McKinsey & Company and VDMA, 2016).
- OEMs with limited customer-specific adaptions and system integrators with customer-specific adaptions (Altmeier et al., 2019, p. 8).
- Strong focus on homeland markets with a production footprint linked to machine

manufacturers (McKinsey & Company and VDMA, 2016, p. 71).
- Additional industries such as automotive, shipbuilding and manufacturers of railway vehicles (VDMA Motoren und Systeme (ed.), 2019, p. 7).
- Key account management system for customer care is used in most cases, while focusing on premium segments (McKinsey & Company and VDMA, 2016).
- Offering customized and machine-specific parts at online information and ordering platforms (24/7) (McKinsey & Company and VDMA, 2016, p. 36).

Value proposition

- Innovative products and services with a distinctive customer orientation and product quality (McKinsey & Company and VDMA, 2016; VDMA Antriebstechnik und Fluidtechnik (ed.), 2017; VDMA Elektrische Automation (ed.), 2018).
- Customized solutions (McKinsey & Company and VDMA, 2016; IHK Nürnberg für Mittelfranken (ed.), 2014; CECIMO (ed.), 2011).
- Product range includes components from sectors such as drive technology, hydraulic and pneumatic systems, sensor technology, control systems, dimension metrology, internal combustion engines for industrial applications and precision tools such as cutting tools (VDMA Antriebstechnik und Fluidtechnik (ed.), 2017; VDMA Elektrische Automation (ed.), 2018; VDMA Mess- und Prüftechnik (ed.), 2019; VDMA Motoren und Systeme (ed.), 2019).
- Free services in the form of platforms and simulation tools (VDMA Antriebstechnik und Fluidtechnik (ed.), 2017, p. 15).
- Date and delivery reliability (IHK Nürnberg für Mittelfranken (ed.), 2014, p. 19).
- Compliance with the European regulation for health and safety (IHK Nürnberg für Mittelfranken (ed.), 2014).
- Availability of spare parts for durable machines over longer periods of time (IHK Nürnberg für Mittelfranken (ed.), 2014, p. 19).

Value chain

- Highly vertically integrated manufacturing process, which leads to a high share of net value added (McKinsey & Company and VDMA, 2016; Altmeier et al., 2019; IHK Nürnberg für Mittelfranken (ed.), 2014).
- Long-term partnership with their customers and focus on the development of their own components (CECIMO (ed.), 2011; VDMA Antriebstechnik und Fluidtechnik (ed.), 2017).

Revenue model

- Most common: sale of components.
- Additional: renting, licensing, and pay-per-use models.

2.2.2. Four dimensions of the business model archetype: Machine manufacturers

This section covers the four dimensions of the machine manufacturers' business model archetype. The manufacturers' main business focus, according to McKinsey & Company and the VDMA (2016, p. 17), is the development and manufacturing of single machines such as milling machines or mobile equipment for agricultural or constructional applications. This archetype also includes products that can be used directly by an integrator, such as robots, complete lasers with optics and beam guidance (e.g. for marking), complete process units and standalone tools (e.g. for labelling and dispensing applications). The underlying research is based on sources of the industrial sectors, which can be assigned to the archetype machine manufacturers.

Target customer

- Mainly high-priced products with limited diversification (McKinsey & Company and VDMA, 2016, p. 72).
- Equipment & machine system providers inside and outside the engineering industry (McKinsey & Company and VDMA, 2016).
- Customers vary greatly --> end-users or actors within their own supply chain (CECIMO (ed.), 2011).
- Industries such as automotive, aerospace and aeronautics industry, medical technology, shipbuilding, manufacturers of railway vehicles, manufacturers of power generation and distribution equipment, agricultural machinery and construction equipment (CECIMO (ed.),

2011; German Machine Tool Builders' Association (ed.), 2020; VDMA Landtechnik (ed.), 2020; McKinsey & Company, 2016).
- Rental and leasing companies (McKinsey & Company, 2016, p. 19).

Value proposition

- Innovative products and services with a distinctive customer orientation and a distinctive product quality (e.g. a high energy and resource efficiency) (German Machine Tool Builders' Association (ed.), 2020; VDMA Landtechnik (ed.), 2020; CECIMO (ed.), 2011).
- Differentiation of own products to differ from competition (CECIMO (ed.), 2011; McKinsey & Company, 2016).
- Close partnership with customers to develop new and better solutions (CECIMO (ed.), 2011; McKinsey & Company, 2016).
- Customer-oriented application solutions rather than standard machines (CECIMO (ed.), 2011, p. 22).
- Strong ability to respond to customer requirements and the flexibility to offer a wide range of solutions for their changing needs (CECIMO (ed.), 2011, p. 22).
- Intelligent solutions for fuel efficiency and CO2 reduction (VDMA Landtechnik (ed.), 2020; McKinsey & Company, 2016).
- Compliance with EU Directives regarding health and safety standards (CECIMO (ed.), 2011; VDMA Landtechnik (ed.), 2020; McKinsey & Company, 2016).

Value chain

- Medium depth of value added with lean manufacturing footprint and leverage supplier base, and a close linkage and cooperation with their suppliers (McKinsey & Company and VDMA, 2016; CECIMO (ed.), 2011).
- Outstanding operational excellence in operational scale and low-cost production and sourcing (McKinsey & Company and VDMA, 2016; CECIMO (ed.), 2011; McKinsey & Company, 2016).
- Outsourcing of less strategic components and activities and focusing on core competences in developing and manufacturing of the equipment (CECIMO (ed.), 2011, p. 17).

Revenue model

- Most common: financing options such as rental purchasing, financing, leasing and renting are frequently offered by the companies (McKinsey & Company, 2016), such as TRUMPF (TRUMPF Financial Services, 2020) or Heller (Gebr. Heller Maschinenfabrik GmbH, 2020a, 2020b), which are suppliers of machine tools.
- Pay-per-use models (HELLER4Use) (Gebr. Heller Maschinenfabrik GmbH, 2020a, 2020b).
- Pay according to the operating hours of the rented equipment (Liebherr-International Deutschland GmbH, 2020).
- Subscription model, pay-per-use and licensing model, which include billing according to operating hours or number of uses and the option of ordering certain machine functions on demand (Mücke, 2019). Heidelberger, one of the biggest suppliers of printing machines globally, offers a pay-per-use model. Within this model the customer gets all components required for printing, such as the press system, software, consumables and service. In this case, the customer pays exclusively for the price per printed sheet agreed with Heidelberger (Heidelberger Druckmaschinen AG, 2020).
- Performance-related offerings and contracts, which are used by construction equipment manufacturers in the form of selling of uptime or output (e.g. material moved) (McKinsey & Company, 2016, p. 46).
- Offering machinery in used condition (McKinsey & Company, 2016; Liebherr-International Deutschland GmbH, 2020; Gebr. Heller Maschinenfabrik GmbH, 2020a, 2020b).

2.2.3. Four dimensions of the business model archetype: Equipment and machine system providers

The four dimensions of the equipment & machine system provider business model archetype are determined in this section. Their main business focus is on the delivery of processing machinery equipment such as food and beverage, wood and textile. However, fully automated packaging lines, assembly lines and entire turnkey solutions such as power plants are also in their scope (McKinsey

& Company and VDMA, 2016, p. 17). The underlying research is based on sources of the industrial sectors, which can be assigned to the archetype machine manufacturers.

Target customer

- Focus only on one price segment and a few selected premium customer industries (McKinsey & Company and VDMA, 2016; McKinsey & Company and VDMA, 2014a, 2014b, 2014c, 2014d; VDMA Future Business (ed.), 2020).
- Customers come from the most diverse industries:

1. Metallurgical plants and rolling mills for the production and processing of steel, conventional (e.g. fossil-fuelled, gas, nuclear) and regenerative power plants, and plants for cement production (VDMA Large Industrial Plant Man. Group (ed.), 2020; PwC and VDMA (ed.), 2019).
2. Chemical plants, to produce plastics and fertilizers, and special chemicals, such as flame retardants, light stabilizers and food additives (PwC and VDMA (ed.), 2019, p. 20).
3. Pulp and paper plants, which produce graphic and hygiene paper (e.g. toilet and kitchen paper as well as tissues), and drinking water and sewage plants (VDMA Large Industrial Plant Man. Group (ed.), 2020).
4. Food and packaging machinery and textile machinery, with focus on food companies and manufacturer of pharmaceutical and cosmetic products (McKinsey & Company and VDMA, 2014a, 2014b, 2014c, 2014d; VDMA Future Business (ed.), 2020).

- Intelligent, economical and integrated assembly and production solutions, which manage complex production sequences and a multitude of technical processes (e.g. joining, forming, handling, measuring and testing) (McKinsey & Company and VDMA, 2014a, 2014b, 2014c, 2014d).

Value proposition

- Customer-orientation with distinctive quality tailored to individual customer requirements (McKinsey & Company and VDMA, 2016).
- Design and delivery of equipment in close cooperation with customers (VDMA Large Industrial Plant Man. Group (ed.), 2020).
- Innovative and high-performance customer-specific complete solutions (McKinsey & Company and VDMA, 2014a, 2014b, 2014c, 2014d).
- Qualitative and innovative large industrial plants with high productivity and energy efficiency, which aims to meet the environmental protection standards to significantly reduce their energy consumption and CO2 emissions (VDMA Large Industrial Plant Man. Group (ed.), 2020).
- Provision of low investment costs for short project processing times, as some customers focus on the operating costs of plants when making buying decisions (VDMA Large Industrial Plant Man. Group (ed.), 2020).

Value chain

- Highly horizontally integrated, with strong focus on technology while concentrating on assembly and integration of different machinery systems, lines, and equipment (McKinsey & Company and VDMA, 2016).
- Comprehensive technical process expertise, to handle the entire necessary project and risk management, with aspects such as planning, designing and engineering of the plant (VDMA Future Business (ed.), 2020).
- Management of the supply chain management, with aspects such as production and procurement of the machinery and the facilities, and their delivery, assembly and commissioning (VDMA Large Industrial Plant Man. Group (ed.), 2020).
- Focus on a lean manufacturing footprint and leverage supplier base, with close relationship with their suppliers in terms of cooperation (McKinsey & Company and VDMA, 2016).

Revenue Model

- Different financing packages for the customers, to allow them the option for long-term payments for their high investment costs (VDMA Large Industrial Plant Man. Group (ed.), 2020).

2.2.4. Four dimensions of the business model archetype: Aftersales providers

This section describes the four dimensions of the aftersales providers' business model archetype, based on the identified characteristics of the research and the results of the questionnaire. In this study, the sales share of companies is not considered, since these only describe the affiliation to an archetype. As such, component specialists, machine manufacturers, and equipment and machine system providers are considered because they all offer different levels of aftersales (McKinsey & Company and VDMA, 2016, p. 18). The underlying literature research is based on sources which were used for the dimension determination of the previous 3 archetypes (see section 2.2.1, 2.2.2 and 2.2.3).

Target customer

- The same customers as for the initial sale of components, machines or plants.

Value proposition

- Distinctly customer-centric with a close customer relationship (McKinsey & Company and VDMA, 2016; McKinsey & Company, 2016).
- Distinctive quality of products and service (McKinsey & Company and VDMA, 2016).
- Focus on spare and wear parts, repairs, maintenance and refurbishment, which usually lead to reduction of the life cycle costs of the machine. Retrofits are also offered, in order to increase the efficiency and availability, whereas modernization can lead to solutions for more climate and environmental protection (McKinsey & Company and VDMA, 2014a, 2014b, 2014c, 2014d; VDMA Large Industrial Plant Man. Group (ed.), 2020).
- Individual end-to-end solutions to support the customer in every phase of the product life cycle, from remote monitoring of operation, maintenance, repair to disposal (IHK Nürnberg für Mittelfranken (ed.), 2014, p. 25).
- Training for operating and maintenance personnel with different training levels (CECIMO (ed.), 2011).
- Online and 24/7 phone services to extend availability (McKinsey & Company and VDMA, 2014a, 2014b, 2014c, 2014d; IHK Nürnberg für Mittelfranken (ed.), 2014).

Value chain

- Extensive service network with qualified employees, optimized response time and spare parts logistics to provide optimum service to the customers (McKinsey & Company and VDMA, 2014a, 2014b, 2014c, 2014d).
- Partnerships with aftersales providers inside and outside the industry, and cooperation with specialized service providers or mobile service stations (McKinsey & Company and VDMA, 2014a, 2014b, 2014c, 2014d; VDMA Large Industrial Plant Man. Group (ed.), 2020).
- Aftersales and service offerings are often used as a differentiation feature against competitors (McKinsey & Company and VDMA, 2014a, 2014b, 2014c, 2014d).

Revenue model

- Most common: selling-based revenue model.
- Additional: leasing, rental, licensing and subscription-based revenue models.

2.2.5. Four dimensions of the business model archetype: Software and system providers

The following section covers the identified characteristics of the research and the results of the questionnaire regarding software and system providers of business model archetype. Similar to the description of aftersales providers, the component specialists, machine manufacturers, and equipment & machine system providers are considered because they all offer software (McKinsey & Company and VDMA, 2016, p. 18). The underlying literature research is based on sources, which were used for the dimension that determined the 3 archetypes before (see Sections 2.2.1, 2.2.2 and 2.2.3).

Target customer

- The same customers as for the initial sale of the components, machines or plants.

Value proposition

- Strong customer orientation (McKinsey & Company and VDMA, 2016).
- Focus on the homeland market with the attempt to cover all price segments

(McKinsey & Company and VDMA, 2016, p. 75).

- One way to create additional value is the collection and analysis of all sorts of machine-related data:

1. Maintenance manager that maps, manages and monitors the installed sensors of a user, and a tool which enables the visualization of measured values and parameters as well as their transfer into the condition monitoring, in order to improve the machine's availability and productivity (Smart Service Suite) (SICK AG, 2020).
2. Machine networking, fleet management and remote maintenance as well as software solutions for the optimized application of fertilizers and crop protection agents (CLAAS KGaA mbH, 2020).
3. Customized solutions for monitoring and maintenance as well as increasing the efficiency and profitability of systems and machines, innovative services such as drone inspections for visual inspections of plants and machines, and the analysis of the collected data (Thyssenkrupp Industrial Solutions AG, 2020).

Value chain

- Highly qualified workforce with digital skills, consisting of specialists such as IT managers, programmers and experts for artificial intelligence (VDMA Large Industrial Plant Man. Group (ed.), 2020, p. 19).
- Experts in software design, who develop app-like products and advanced analytics (McKinsey & Company and VDMA, 2016; Altmeier et al., 2019).
- Get to know the end customer better and tailor machines and solutions using collected data (McKinsey & Company, 2016, p. 48; Haziri, Chovancova, & Fetahu, 2019).
- Data is also used for increased performance, reduction of downtime, and optimization of maintenance, which leads to refining the machine design and functionality long-term (McKinsey & Company, 2016).
- Cooperation with software suppliers to increase the own level of digitization (McKinsey & Company and VDMA, 2016, p. 52).

Revenue model

- Most common: selling and licensing models
- Common: subscription-based model and interaction platforms and ecosystems
- Additional: pay-per-use and freemium models

2.3. Success patterns of the German engineering industry

The following section identifies success patterns of the German engineering industry characterized by recurring factors and behavioural patterns. These success patterns are indicators, which may help affected companies achieve sustainable profitable growth and competitiveness within this industry. The basis of this investigation includes the two success pattern analyses of Eisenhut and Lässig (2013), and McKinsey & Company and VDMA (2014).

2.3.1. Success patterns according to Eisenhut and Lässig (2013)

Eisenhut and Lässig (2013) analysed publicly available data of 50 different German engineering companies in order to identify recurring success patterns. Thereby, they realized that these patterns can be transferred to other companies and help them with a long-term presence on the market despite changing conditions. To be considered as a successful company – a champion – in their analysis, a company must be above the median in the three key financial dimensions: sales growth, EBIT margin, equity ratio - segment adjusted. Additionally, one of the three dimensions has to be in the first quartile, at a minimum. The analysed companies are from sectors such as materials handling and logistics technology, robotics, woodworking, printing & paper equipment and supplies, pulp and paper machinery, textile machines, packaging machines, machine tools, and manufacturing systems. Through Eisenhut and Lässig's (2013) analysis, they identified a total of 15 success patterns of champions, which they categorized into the three design fields: business model, value-added system and financial basis. Table 5 below provides an overview about the champions' five success patterns in the design field: business model. It explains the characteristics of the individual pattern within the champion's business model.

Table 5 Definition of the five success patterns of the design field: business model

Design field	Success Pattern	Definition
Business model	Company growth	The champion's growth is moderate and mostly organic. Based on the champion's market knowledge, products are developed specifically to address new markets and customers.
	Innovation leader	The champion has the innovation leadership in its niche, which ensures its product positioning.
	Product positioning	The competition in the niche is manageable and thus leads to a price determination by supply and not by demand. Building on this, tailor-made premium products can be sold at premium prices.
	Global market coverage with locally adapted structures	The champion operates with a few core locations and is supplemented by local presence for sales and service.
	Added value of production	The champion's production is focused at a few domestic locations with medium depth of value added.

Source: Designed based on Eisenhut & Lässig, 2013, pp. 42-48

Based on their analysis, Eisenhut and Lässig (2013, p. 48) conclude that the successful implementation of the five success patterns within the champion's business model plays a more decisive role for its success than its operational management. In other words, a dysfunctional business model does not lead to long-term success through operational management.

The next table shows the six identified success patterns of champions within the design field: value-added system. The value-added system consists mainly of functions and processes within the company.

Table 6 Definition of the six success patterns of the design field: value-added system

Design field	Success Pattern	Definition
Value-added system	Performance-oriented organization with continuous leadership	The champion's management usually has been with the company for years, in some cases decades. Consequently, they have a wealth of experience within the company and the industry. This continuity is significant, because it can lead to more trust on the market, with customers and with the own employees.
	Optimized R&D allocation	The champion controls all development activities on a long-term and continuous basis. Priorities and goals for future products are clearly defined and controlled for the long term. The champion pays attention to a balanced relationship between customer-specific and customer-neutral developments and invests a significant and stable share of sales to these developments.
	Integrated supplier network	The suppliers are intensively integrated in the value creation of the champion. This is reflected by the integration into the operative production process of the champion and the usage of the suppliers' expertise and skills for the champion's own innovation and development processes.
	Efficient processes in logistic and production	The champions' manufacturing is highly automated by means of efficient production and inventory planning. They have lean production lines with optimized lead times and processes, which lead to an optimized use of personnel.
	Intelligent sales management	Champions open new markets and businesses through a cross-functional interaction of marketing, product management and sales. For this purpose, target customers are identified, products are developed to series-production readiness and subsequently customers are visited. The champions provide optimum day-to-day support for their existing customers in terms of new machines and service. The champion consistently manages the order situation to ensure high transparency of all leads and potential orders. The order situation is the basis for measuring and controlling sales performance.
	After market services	The champion has a stable customer-supplier relationship throughout the life cycle of the machine. On this basis, service for spare parts, repairs and maintenance is offered.

Source: Designed based on Eisenhut & Lässig, 2013, pp. 48-56

The final design field – financial basis – consists of four success patterns and is presented in Table 7. These patterns mainly focus on financial aspects.

Table 7 Definition of the four success patterns of the design field: financial basis

Design field	Success Pattern	Definition
Financial basis	Liquidity management	Although the champion is result-oriented, cash flow is given considerable attention in the core functions of the company, such as accounting, controlling, sales and technical departments.
	Balance sheet structure	The champions use their long-term assets optimally, keep the share of outside capital as low as possible and use outside financing from suppliers and customers actively for their own business activities. They define exactly which and how many assets they really need.
	Investment strategy	The champion makes long-term, continuous investments in product

	focused on continuity	development and production technology, and coordinates these investments with the innovation cycles of the industry.
	Risk management	The champion operates a holistic risk management as a cross-sectional task in all important areas, such as product development and positioning, company growth, cash-management, and sales.

Source: Designed based on Eisenhut & Lässig, 2013, pp. 56-60

2.3.2 Success patterns according McKinsey & Company and VDMA (2014)

McKinsey & Company and VDMA (2014) used a different approach to identify the success patterns of the German engineering industry. 333 companies from all sectors of the engineering industry were examined and partly interviewed within the framework of a comprehensive survey. These companies represent all company-size classes as well as different ownership and management structures. The two evaluation criteria for the company's success are sales growth and the profitability of the company as measured by EBIT. A company is considered successful within their analysis, if its sales growth or profitability exceeds the respective industry averages in at least one of the two financial dimensions. Based on the industry averages of the two financial key figures, a total of 10 success patterns have been identified (Table 8), with diverse characteristics in sales growth and profitability.

Table 8 Definition of the 10 success patterns of the German engineering industry

Success Pattern	Definition
Company size in terms of sales	Companies of increasing size (sales) are gradually becoming more profitable through standardization and economies of scale. The economies of scale play a particularly important role on the cost side. Savings result from improved negotiating positions with suppliers as purchase quantity and the number of standardized parts increases.
Internationalization	Companies with international manufacturing have cost advantages over companies without and are therefore more profitable and grow faster. This is mainly shown by the proximity to the customers in connection with lower logistics costs as well as wage and salary structures. Local purchasing and on-site service also contribute to a better result.
Operational excellence	Companies with best values in all three key operating figures are more profitable and show higher sales growth. These operations figures include delivery reliability, the number of customer complaints, as indicators for process and product quality, and the ratio of selling and administrative expenses to sales, as an indicator of efficiency.
Stringency in the business model	Companies that focus on their core business perform better in terms of profitability and growth. They consistently focus their structures and processes on their core business. This stringency on their business model can manifest itself in different dimensions, such as in the offer, and also in processes. When accepting orders, clear lines are defined in order to allocate resources to the most promising projects.
Innovation capability	Companies which are innovation leaders within their branch are more profitable and show higher sales growth. Innovation often supports a clear brand positioning and thus differentiation from competitors. This allows a price premium and can lead to higher margins. Innovation takes place not only in products and technologies, but also in processes and applications.
Premium supplier	Premium providers grow faster and are more profitable than companies in the medium price segment. Premium providers usually charge a mark-up for additional services, such as particularly high quality, innovative solutions, customized solutions, short delivery times or a wide range of services.
Single machines/components business	Companies that sell single machines and components are more profitable than suppliers of complete solutions (which are usually individually tailored to the customer), but also grow more slowly than these. Due to economies of scale in research and development and efficiency advantages along the entire process chain, standardized companies are more profitable than individualized suppliers. It is easier for single machine and component manufacturers to achieve a high degree of standardization than solution providers, in order to reduce production and to save process costs. Single machine and component manufacturers may more readily focus on their core competencies. The most profitable solution providers modularize their offerings and value creation by standardizing their portfolio and internal processes.

Source: Designed based on McKinsey & Company and VDMA, 2014a, 2014b, 2014c, 2014d

2.4. Key performance indicators of the success patterns

In this section, KPIs are determined based on the success patterns described previously. This determination is implemented in different ways for the success patterns of Eisenhut and Lässig (2013), and McKinsey & Company and VDMA

(2014). Based on the success patterns of Eisenhut and Lässig (2013) in Tables 5 to 7, KPIs are identified in two steps. First, the success patterns are coded by the champions' characteristics in order to focus their description on specific core elements (Table 9). Then, a literature research is performed based on the identified characteristics to derive the KPIs.

In the case of the success patterns of McKinsey & Company and VDMA (2014) in table 8, the KPIs can be described directly. Since they initially identified the majority of the KPIs in their analysis, this serves as the foundation of their success patterns.

2.4.1. KPIs based on success patterns according to Eisenhut and Lässig (2013)

Table 9 shows the champions' characteristics, which represent Eisenhut and Lässig's (2013) coded success patterns.

Table 9 Success patterns according to Eisenhut and Lässig (2013) coded by the champions' characteristics

Success Pattern according Eisenhut and Lässig (2013)	Champions' characteristics
Company growth	▪ Moderate and mostly organic
Innovation leader	▪ Innovation leadership
Product positioning	▪ Premium prices
Global market coverage with locally adapted structures	▪ Few core locations ▪ Local presence for sales and service
Added value of production	▪ Medium depth of value added
Performance-oriented organization with continuous leadership	▪ Performance oriented organization ▪ Continuous leadership of management
Optimized R&D allocation	▪ Long-term and continuous development activities ▪ Balanced ratio between customer-specific and customer-neutral developments ▪ Significant and stable investments in development activities
Integrated supplier network	▪ Suppliers are intensively integrated in the value creation
Efficient processes in logistic and production	▪ Lean and efficient production and inventory planning
Intelligent sales management	▪ Cross-functional interaction of marketing, product management and sales for new markets and customers ▪ Optimum day-to-day support for existing customers
Aftermarket services	▪ Stable customer-supplier relationship throughout the life cycle of the machine
Liquidity management	▪ Cash flow attention in the core functions of the company
Balance sheet structure	▪ The share of outside capital as low as possible
Investment strategy focused on continuity	▪ Long-term, continuous investments in product development and production technology
Risk management	▪ Holistic risk management

Source: the authors

The champions' characteristics are used as the baseline for identifying KPIs. In the following section, a literature review is conducted to clarify the ambiguities of these characteristics and to identify the KPI's necessary details. At the end of this study, all results are summarized in Table 10.

Company growth

Company growth is determined by quantitative or qualitative methods, metrics and dimensions (e.g. sales, employees or others), measurement and calculation (e.g. absolute or relative) and the period under consideration (Schweiger, 2012, p. 35). Organic company growth refers to growth from the company's own resources and through internal value creation processes. The derived KPI considers the annual organic sales growth of the company, as sales is one of the most used company growth indicators (Delmar, 1997, p. 201).

Innovation leader

Innovation leadership refers to the fact that a company is a leader in its industry in the development and sales of innovative products or processes. Saunila (2017, pp. 3-4) identifies four types of corporate innovation performance measurements: inputs, process, outputs and outcomes. According to Janssen, Moeller and Schlaefke (2011, p. 112) output metrics relate to R&D activities and measure the number of submitted, pending and approved patents per year, the share of new products in the product range, the number of new products per Euro spent on R&D and the number of new products per employee in terms of R&D. Outcome metrics are related to the success in the market and measure revenue, profit, market share, and customer satisfaction of the new products (Janssen & Möller, 2011, p. 99). Absolute outcome metrics measure the revenue growth and market share growth based on new products. Relative outcome metrics measure sales of new products/R&D per employee or annual sales/R&D budget. Anthony (2013) highlights the Return on Innovation Investment (ROII) as a reasonable performance measure, as it evaluates a company's effectiveness in investing in new products. ROII is calculated by dividing the profit generated from the

innovation through the cumulative investment required to create it.

Product positioning

The success pattern product positioning is coded by premium prices. Hinterhuber and Liozu (2018, p. 301) describe premium pricing as a strategy, which results in prices that are high in relation to the price level of competitors and customers. In B2B, the pricing strategy focuses on the quantification of value, to shows that the price is below the customer's quantified value proposition. The derived KPI is premium price.

Global market coverage with locally adapted structures

A global market coverage with locally adapted structures is defined by few core locations with local presence for sales and service. This leads to a KPI, which measures the number of core sites as well as local sales and service sites.

Added value of production

The KPI for the medium depth of value added measures the level of the company's value added. A company's value added refers to the periodic value by which the company's output is added to the input received from other organizations to produce the output that is recognized as the company's total output (Känel, 2018, p. 132).

Performance-oriented organization with continuous leadership

Two KPIs are used to describe this success pattern. These include the measurement of the management's length of service and the performance of the company. Bausch, Buske and Hagemeier (2011, pp. 359-360) use accounting and finance figures to measure the internal and external performance of a company. In doing so, they refer to values related to the past. Here, the invested capital or assets must be compared with the earnings figures, which were generated by the invested capital or assets. Bausch et al. (2011, p. 373) highlight the Economic Value Added (EVA) method as a dominant key figure to measure the company's performance. EVA is usually used if the performance of an investment is measured on an annual basis. In this case, the EVA calculation answers the question of whether a project generates positive cash flows that exceed the return required by the investors (Gitman & Zutter, 2012, p. 400).

Optimized R&D allocation

The optimized R&D allocation success pattern is described using three KPIs. First, the annual R&D investment based on sales is determined in order to measure the company's significant and stable investments in development activities. The second KPI is the company's annual R&D activity costs. The main cost driver for a company's internal R&D activities is usually personnel and equipment costs, which can be measured by this KPI (Janssen et al. 2011, p. 111). Finally, the ratio between customer-specific and customer-neutral developments is measured through the cost allocation of each development.

Integrated supplier network

Continuous supplier evaluation as part of the company's supplier management is the key to ensure supplier quality and to enable cooperation (Janker, 2008). Janker (2008, pp. 87-96) classifies the following eight main criteria for supplier evaluation, which define the KPIs of this success pattern: quantity output, quality performance, logistics service, remuneration, service, information and communication services, innovation performance and environmental performance.

Efficient processes in logistic and production

Dombrowski and Mielke (2015, p. 19) describe a holistic production system, which is a company-specific version of a production system with elements of lean production. It is based on the Toyota Production System, as the origin of lean production. This system is described in VDI (Verein Deutscher Ingenieure) as a company-specific and methodical set of guidelines. The guidelines consist of the following eight design principles: avoidance of waste, continuous improvement process, standardization, zero-error principle, flow principle, pull principle, employee orientation and goal-oriented leadership and visual management. It also includes a wide range of possible methods for each design principle (Dombrowski & Mielke, 2015, p. 29).

Intelligent sales management

The four dimensions of sales excellence are strategy, organization, controlling and personnel (Pufahl, 2019). According to Pufahl (2019), a well-positioned organization is the key for positive business development, since employees are the most valuable capital of sales and the organizational framework is crucial for efficient

market cultivation. In addition to the KPIs sales, incoming orders and customer satisfaction, the contribution margin, sales volumes and customer lifetime value play a central role in sales controlling (Pufahl, 2019). The Customer Lifetime Value (CLV) is the contribution of a customer, measured as the cash flow generated by the latter during the entire business relationship (Pufahl, 2019).

Aftermarket service

The success of a company's after sales and service is measured by the share of aftersales in total sales KPI.

Liquidity management

Cash flow is the financial surplus of payments received in the course of a company's business operations over payments made in the same accounting period. It is used, among other things, to assess the earnings and, above all, the self-financing capacity of a company (Känel, 2018, p. 165). Monitoring and control of cash flow across all core functions of the company is the key to successful liquidity management. Cash flow synchronization is one key aspect in this context, highlighted by Arnold (2013, p. 523), as it describes the management of reducing the level of cash balances needed by scheduling the in- and outflows.

Balance sheet structure

A stable balance sheet structure is part of the solid foundation of a successful company (Eisenhut & Lässig, 2013, p. 58). This makes a company comparatively independent of external investors and enables decisions to be made that are primarily oriented towards the company's own interests. According to Eisenhut and Lässig (2013, pp. 58-59), the return on equity (ROE) is a key metric that can be used as a KPI for this purpose. Return on equity measures the income-generating return on the equity that is effective in the business operations of a company on average over one year (Känel, 2018, p. 147).

Investment strategy focused on continuity

Jacobs (2019, p. 51) describes investment strategy, which is aligned with the industry's innovation cycles, as a necessity for companies. By identifying new technologies at an early stage and the resulting newly developed products, companies ensure innovation success and competitiveness. Ansoff, Kipley, Lewis, Helm-Stevens and Ansoff (2019, pp. 131-134) address this need by the demand technology lifecycle. In this case, the product lifecycle is defined as a section of a superordinate technology lifecycle. The driving force of technology of this cycle illustrates that products lose their competitiveness; hence developments and innovations are unavoidable.

Fischer, Himme and Albers (2007) investigated the company's impact of the timing of the market entry based on the product lifecycle in the area of pharmaceutical product markets. They distinguish between the pioneer, the early follower and the late follower. The pioneer is the first to enter the market, closely followed by the early follower, but before the take-off of the product. The take-off is understood as the point in time of the first major increase in sales, when the market moves from the slowly growing launch phase to the growth phase. The late follower enters the market well after the take-off of the product. No clear correlation between the sequence of entry and the success of the different companies could be found within the study. Since the success of a company in the examined context refers to the sales of products, this success pattern is described based on the KPI revenue growth – based on new products.

Risk management

Risk management in a corporate context can be described as the systematic analysis, evaluation, treatment and control of corporate risks (Brauweiler, 2019, p. 1). From the company's point of view, alongside the business necessity of identifying and avoiding risks, there are also legal requirements and regulations that the company must comply with (e.g. EU law, German Stock Corporation Act) (Brauweiler, 2019, p. 5). Brauweiler (2019) proposes a risk management system on company level, which identifies each significant risk and defines the associated monitoring and control procedures. The basis is a suitable reporting system with regular and ad-hoc reports. Risks are systematically recorded, presented and prioritized (in terms of probability and impact). Risk control comprises all necessary activities to eliminate or minimize the identified risks.

Table 10 summarizes the identified KPIs, the champions' underlying characteristics and the initial success patterns.

Table 10 Success patterns according to Eisenhut and Lässig (2013) coded by the champions' characteristics and described by KPIs

Success Pattern according Eisenhut and Lässig (2013)	Champions' characteristics	KPIs
Company growth	▪ Moderate and mostly organic	▪ Annual organic sales growth
Innovation leader	▪ Innovation leadership	▪ Number of patents per year (submitted, pending and approved) ▪ Share of new products in the product range ▪ Number of new products per Euro spent on R&D ▪ Number of new products per R&D employee ▪ Revenue share of new products ▪ Profit share of new products ▪ Market share of new products ▪ Customer satisfaction of new products ▪ Revenue growth based on new products ▪ Market share growth based on new products ▪ Sales of new products per R&D employee ▪ Return on Innovation Investment (ROII)
Product positioning	▪ Premium prices	▪ Premium prices
Global market coverage with locally adapted structures	▪ Few core locations ▪ Local presence for sales and service	▪ Number of core sites as well as local sales and service sites
Added value of production	▪ Medium depth of value added	▪ Level of value added
Performance-oriented organization with continuous leadership	▪ Performance oriented organization ▪ Continuous leadership of management	▪ Length of service of the management ▪ Economic Value Added (EVA)
▪ Optimized R&D allocation	▪ Long-term and continuous development activities ▪ Balanced ratio between customer-specific and customer-neutral developments ▪ Significant and stable investments in development activities	▪ Annual R&D investment based on the company's sales ▪ Annual R&D activity costs ▪ Cost allocation of customer-specific and customer-neutral developments
▪ Integrated supplier network	▪ Suppliers are intensively integrated in the value creation	▪ Supplier qualification based on: ▪ Quantity output; ▪ Quality performance; ▪ Logistics service; ▪ Remuneration; ▪ Service; ▪ Information and communication services; ▪ Innovation performance; ▪ Environmental performance;
▪ Efficient processes in logistic and production	▪ Lean and efficient production and inventory planning	▪ Lean production (acc. VDI 2870)
▪ Intelligent sales management	▪ Cross-functional interaction of marketing, product management and sales for new markets and customers ▪ Optimum day-to-day support for their existing customers	▪ Sales ▪ Sales volume ▪ Incoming orders ▪ Customer satisfaction ▪ Contribution margin ▪ Customer lifetime value (CLV)
▪ Aftermarket services	▪ Stable customer-supplier relationship throughout the life cycle of the machine	▪ Share of aftersales in total sales
▪ Liquidity management	▪ Cash flow attention in the core functions of the company	▪ Cash flow
▪ Balance sheet structure	▪ The share of outside capital as low as possible	▪ Return on equity (ROE)
▪ Investment strategy focused on continuity	▪ Long-term, continuous investments in product development in coordination with the innovation cycles of the industry	▪ Revenue growth based on new products
▪ Risk management	▪ Holistic risk management	▪ Risk management system

Source: The authors

2.4.2. KPIs based on success patterns according McKinsey & Company and VDMA (2014)

As previously mentioned, McKinsey & Company and VDMA (2014) have identified the majority of their KPIs as the basis of their success patterns in the course of their analysis. Table 11 shows a summary and comparison of the individual patterns and their KPIs.

Table 11 Success patterns according to McKinsey & Company and VDMA (2014) described by KPIs

Success pattern according McKinsey & Company and VDMA (2014)	KPIs based on McKinsey & Company and VDMA (2014)
▪ Company size in terms of sales	▪ Company size in terms of sales
▪ Internationalization	▪ Share of sales outside Germany
▪ Operational excellence	▪ Delivery reliability ▪ Number of customer complaints ▪ Sales to sales and administrative

	expenses ratio (SAE)
▪ Stringency in the business model	▪ Share of core business in total sales
▪ Innovation capability	▪ Innovation leadership
▪ Premium supplier	▪ Premium prices
▪ Single machines/components	▪ Share of standardized products in total sales (in relation to individualized products)
▪ Aftersales/service	▪ Share of aftersales in total sales
▪ Industry affiliation	▪ Industry affiliation
▪ Ownership and management structure	▪ Type of company management

Source: The authors

Table 12 shows the consolidated KPIs and their success patterns according Eisenhut and Lässig (2013) of table 10, and McKinsey & Company and VDMA (2014) of table 11. The two success patterns, innovation capability and innovation leader, are combined, as their KPIs are similar. This also applies to the patterns: Premium supplier and Product positioning, Aftersales service and Aftermarket services, and company size in terms of sales and sales. Overall 41 different KPIs are identified and grouped into the dimensions: Company, Finance, R&D, Product, and Process and Functions.

Table 12 Consolidated KPIs and their success patterns, categorized into the dimensions: Company, Finance, R&D, Product, and Process and Functions.

	Success Pattern	KPIs
Company	▪ Industry affiliation	▪ Industry affiliation
	▪ Company size in terms of sales	▪ Company size in terms of sales
	▪ Ownership and management structure	▪ Type of company management
	▪ Performance-oriented organization with continuous leadership	▪ Length of service of the management
	▪ Global market coverage with locally adapted structures	▪ Number of core sites as well as local sales and service sites
Finance	▪ Company growth	▪ Annual organic sales growth
	▪ Intelligent sales management	▪ Sales volume ▪ Incoming orders ▪ Contribution margin
	▪ Liquidity management	▪ Cash flow
	▪ Performance-oriented organization with continuous leadership	▪ Economic Value Added (EVA)
	▪ Balance sheet structure	▪ Return on equity (ROE)
	▪ Internationalization	▪ Share of sales outside Germany
	▪ Aftermarket services	▪ Share of aftersales in total sales
	▪ Value-added strategy	▪ Level of value added
	▪ Operational excellence	▪ Sales to sales and administrative expenses ratio (SAE)
R&D	▪ Innovation leader	▪ Number of patents per year (submitted, pending and approved) ▪ Share of new products in the product range ▪ Number of new products per Euro spent on R&D ▪ Number of new products per R&D employee ▪ Sales of new products per R&D employee ▪ Revenue share of new products ▪ Profit share of new products ▪ Market share of new products ▪ Customer satisfaction of new products ▪ Revenue growth based on new products ▪ Market share growth based on new products ▪ Return on Innovation Investment (ROII)
	▪ Optimized R&D allocation	▪ Annual R&D investment based on the company's sales ▪ Annual R&D activity costs ▪ Cost allocation of customer-specific and customer-neutral developments
Product	▪ Product positioning	▪ Premium prices
	▪ Stringency in the business model	▪ Share of core business in total sales
	▪ Single machines/components	▪ Share of standardized products in total sales (in relation to individualized products)
Process and Functions	▪ Operational excellence	▪ Delivery reliability ▪ Number of customer complaints
	▪ Integrated supplier network	Supplier qualification based on supplier's: ▪ Quantity output; ▪ Quality performance; ▪ Logistics service; ▪ Remuneration; ▪ Service; ▪ Information and communication services; ▪ Innovation performance; ▪ Environmental performance;
	▪ Efficient processes in logistic and production	▪ Lean production (acc. VDI 2870)
	▪ Intelligent sales management	▪ Customer satisfaction ▪ Customer lifetime value (CLV)
	▪ Risk management	▪ Risk management system

Source: The authors

3. Correlation between business models and KPIs

In this section, a relationship is determined between the individual elements of the five business models' dimensions from section 2.2 and the consolidated KPIs from Table 12. Table 13 summarizes the description of the 41 determined KPIs

Table 13 Description of the 41 KPIs

KPIs		This KPI considers…
Company	Industry affiliation	…the company's average sector-dependent profitability as it differs from sector to sector in Germany's engineering industry.
	Company size in terms of sales	… the company's size in terms of sales, as companies tend to become more profitable with increasing size due to standardization and economies of scale.
	Type of company management	… the company's management type, such as family-run or employed management.
	Length of service of the management	… the continuous management of the company by length of its employment with the company.
	Number of core sites as well as local sales and service sites	… corporate structure, with global market coverage and locally adapted structures, defined by a few core locations and local presence for sales and service.
Finance	Annual organic sales growth	…the company's annual organic growth measured by its annual sales growth. The focus is exclusively on the company's own resources and internal value-added processes used for growth.
	Sales volume	…the total annual amount of the company's sold products.
	Incoming orders	…the total annual amount of incoming orders.
	Contribution margin	… contribution margin, as the difference between the revenue and the variable costs of a good, which remains to cover all other costs and as profit.
	Cash flow	… cash flow, as the financial surplus of payments received in the course of a company's business operations over payments made in the same accounting period.
Finance	Economic Value Added (EVA)	…EVA, used to measure the performance of the company. It calculates the period-related difference between the business profit generated by the capital employed and the costs of a company associated with the capital employed.
	Return on equity (ROE)	…ROE, measuring the income-generating return on the equity that is effective in the business operations of a company on average over one year.
	Share of sales outside Germany	…the share of sales in total sales generated outside Germany.
	Share of aftersales in total sales	…the share of service sales in total sales.
	Level of value added	…the level of the company's value added. A company's value added refers to the periodic value by which the company's output is added to the input received from other organizations to produce the output that is recognized as the company's total output.
	Sales to sales and administrative expenses ratio (SAE)	…the ratio that measures the selling and administrative cost intensity, as the selling and administrative costs are divided by the total sales.
R&D	Number of patents per year (submitted, pending and approved)	…the amount of submitted, pending and approved patents of a company per year.
	Share of new products in the product range	…the share of new products in the company's available product range on an annual basis.
	Number of new products per Euro spent on R&D	…the ratio between the number of new products per euro spent on R&D.
	Number of new products per R&D employee	…the ratio between the number of new products per R&D employee.
	Sales of new products per R&D employee	…the sales of R&D products per R&D employee.
	Revenue share of new products	…the revenue share of new products in the company's total revenue.
	Profit share of new products	…the profit share of new products in the company's total profit.
	Market share of new products	…the market share of new products in the designated product market.
	Customer satisfaction of new products	… customer satisfaction as the ratio between satisfied customers and total amount of customers of new products.
	Revenue growth based on new products	…the share of revenue growth from new products in the company's total revenue growth.
	Market share growth based on new products	…the share of market share growth from new products in the designated product market.
	Return on Innovation Investment (ROII)	… ROII, which evaluates a company's effectiveness in investing in new products. ROII is calculated by dividing the profit generated from the innovation through the cumulative investment required to create it.
	Annual R&D investment based on the company's sales	…the company's significant and stable annual investments in R&D activities based on the company's sales.
	Annual R&D activity costs	…the company's annual internal R&D activities (personnel and equipment costs).
	Cost allocation of customer-specific and customer-neutral developments	…the ratio between customer-specific and customer-neutral developments
Product	Premium prices	…the company's premium pricing strategy, which results in prices that are high in relation to the price level of competitors and customers
	Share of core business in total sales	…the share of core business and non-core business.
	Share of standardized products in total sales (in relation	…the share of standardized and individualized products.

	to individualized products)	
Process and Functions	Delivery reliability	… delivery reliability, measured by the ratio of the quantity of on-time and error-free deliveries divided by all deliveries.
	Number of customer complaints	…the amount of all customer complaints.
	Supplier qualification	…the company's continuous supplier qualification, which ensures the supplier's quality. The qualification is based on the eight following main criteria for supplier evaluation: quantity output, quality performance, logistics service, remuneration, service, information and communication services, innovation performance and environmental performance
	Lean production (acc. VDI 2870)	…a holistic production system, which is a company-specific version of a production system with elements of lean production. This system is described in VDI 2870 as a company-specific and methodical set of guidelines. The guideline consists of the following eight design principles: avoidance of waste, continuous improvement process, standardization, zero-error principle, flow principle, pull principle, employee orientation and goal-oriented leadership and visual management
	Customer satisfaction	… customer satisfaction as the ratio between satisfied customers and total amount of customers.
	Customer lifetime value (CLV)	…the contribution of a customer, measured as the cash flow generated by the customer during the entire business relationship, can be understood as Customer Lifetime Value (CLV).
	Risk management system	… holistic risk management in a corporate context, which systematically analyses, evaluates, treats and controls all corporate risks.

Source: The authors

This determination is established by a comprehensive quantitative expert survey, as the available literature has limited data, showing a correlation between these two factors. The data is collected by multiple-choice questions, which the experts answered subjectively. The selection of these experts in German engineering industry was based on their professional experience of over 5 years, and their respective function in their company's business model. The experts include roles such as such as Vice President Finance / Controlling, Head of Sales, Head of Order Processing, Vice President Business Development, Head of Aftersales and Chief Operating Officer.

The correlation is defined by the respective rating of the individual KPI. Each respondent assessed whether the KPI is very important, important or neutral for the business model's dimensions under consideration. A total of 10 experts from various sectors of German engineering industry, such as electrical automation, machine tools and manufacturing systems, robots + automation, and large industrial plant manufacturing participated in answering the questionnaire. Table 14 shows the overview of the number of respondents by business model archetype, company size and industry sector.

Table 14 Survey participants – Correlation of KPIs; Number of respondents by business model, company size and industry sector

Number of respondents by archetype, company size, industry sector (multiple choice), n = 10 participants

Business model	Component specialists	Machine manufacturers	Equipment & machine system prov.	Aftersales providers	Software/ system providers
Resp.	5	4	7	9	8
Industry sector	Robotics + Automation	Measuring + Testing Technology	Large industrial plant manufacturing	Electrical Automation	Power Transmission Engineering
Resp.	6	2	2	2	1
Company size (employees)	< 1.000	1.000 – 1.500	1.500 – 5.000	10.000 – 15.000	15.000 – 20.000	75.000 – 100.000
Resp.	1	1	4	1	1	2

Source: The authors

The output of the survey does not show a clear result for each KPI, as some have an identical rating in the different classes (e.g. neutral, important and very important). As a result, these KPIs do not have a clear correlation to the respective business model. However, to enable an assessment of the significance of the individual KPIs, the following evaluation logic was applied. For KPIs with identical ratings in different categories (e.g. neutral, important and very important), the category with the highest importance was used. For example, if the categories, important and very important have the same ranking, the underlying KPI is rated very

important. If, for example, the categories important and neutral have the same ranking, this KPI is rated as important. Following this logic, more KPIs tend to be categorizes as important or very important, but no ambiguous KPI is neglected.

Figure 7 shows the rating of the component specialists' KPIs based on the survey's results and application of the aforementioned evaluation logic. The respondents of this business model ranked 29 out of 41 KPIs as very important, 7 as important, and 5 as neutral. Within the company dimension, all KPIs are rated very important. All financial KPIs are regarded as very important, except for the two KPIs: cash flow, and share of aftersales in total sales. Cash flow is rated as important, whereas the share of aftersales in total sales is rated as neutral. The KPIs of the R&D dimension present a much more differentiated picture. Overall, 4 R&D KPIs are ranked neutral; these include number of patents, number of new products per R&D employee, sales per R&D employee, and annual R&D activity costs. The remaining KPIs can be separated into two groups. One group, which includes number of new products per Euro spent, revenue, profit and market share of new products, and cost allocation for developments is categorized as important. The second group is categorized as very important, which includes share of new products in product range, customer satisfaction of new products, revenue and market share growth of new products, ROII, and annual R&D investment is categorized as very important. The product dimension has only very important categorized KPIs, which is very similar for the dimension of process and functions. Besides CLV, which is ranked as important, all KPIs within this dimension are categorized as very important.

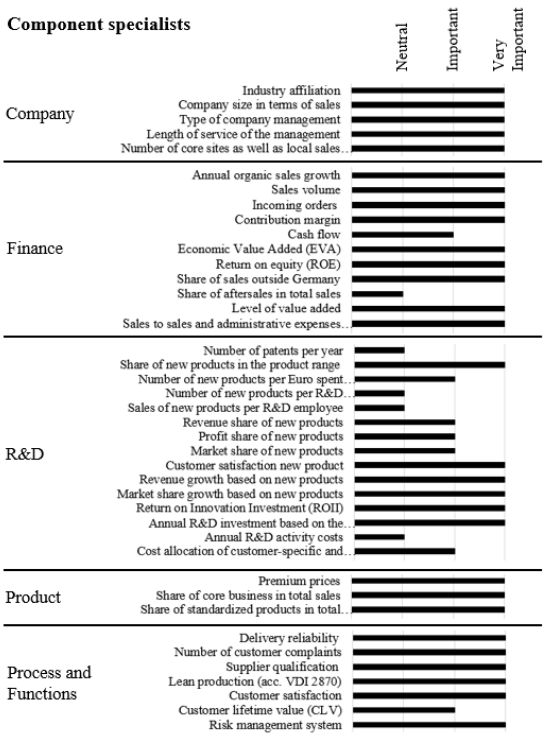

Figure 7 Rating of the component specialists' KPIs based on the survey
Source: The authors

Figure 8 presents the machine manufacturers' KPI rating with 23 categorized as very important, 10 as important, and 8 as neutral. All company's KPIs are categorized as very important, except the management type, which is ranked as neutral, and the industry affiliation, which is ranked as important. The financial KPIs' annual organic sales growth, and the SAE are categorized as neutral, whereas the contribution margin, and ROE are categorized as important. The remaining finance dimension's KPIs are categorized as very important. Within the R&D dimension, the KPIs' ratings are comparable to those of the component specialists' business model. The number of patents, the number of new products per Euro spent or R&D employee, the annual R&D activity costs, and the cost allocation of developments are regarded as neutral. In contrast, the KPIs, customer satisfaction of new products, revenue and market share growth of new products, and the ROI are categorized as very important. The remaining KPIs of the R&D dimension are categorized as important. The KPIs of the two dimensions, product, and process and functions, are categorized as very important. The premium prices KPI is declared as important.

Figure 9 summarizes the rating of the

equipment & machine system providers' KPIs. Overall, 22 of 41 KPIs are categorized as very important, 11 as important, and 8 as neutral. The respondents see the company size, and the management's service length as very important. In contrast, the number of core sites KPI is considered as neutral, and the KPIs management type and industry affiliation are categorized as important. The following finance dimension's four KPIs are clearly not categorized as very important. The ROE, the share of aftersales, and the SAE are considered as important. The level of value added KPI is regarded as neutral. The ratings of all KPIs within the R&D dimension are identical to those of the machine manufacturers' business model. However, the KPI annual R&D investment based on the company's sale is classified as very important. The two dimensions, product, and process and functions, include only premium prices and lean production, which are not regarded as very important. Premium prices KPI is considered as neutral, while lean production is ranked as important.

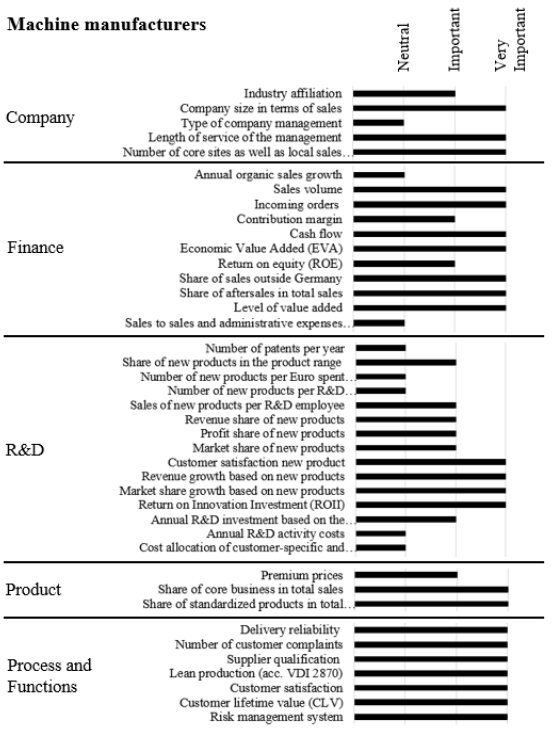

Figure 8 Rating of the machine manufacturers' KPIs based on the survey
Source: The authors

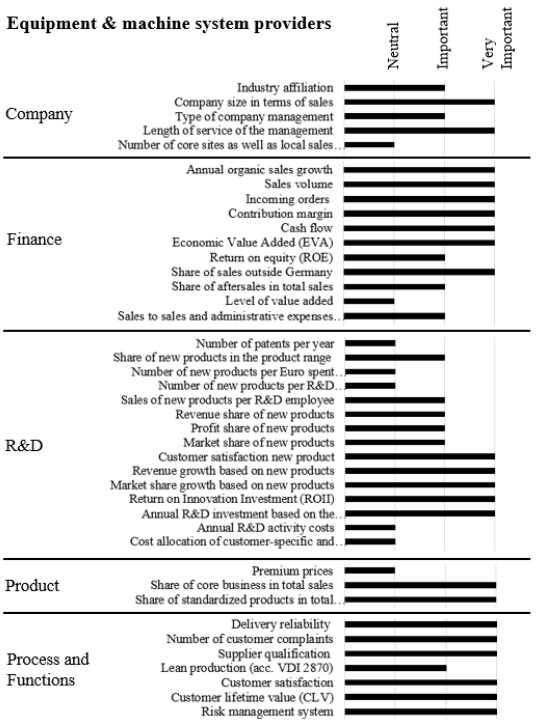

Figure 9 Rating of the equipment and machine system providers' KPIs based on the survey
Source: The authors

Figure 10 shows the respondents' evaluation for the correlation of the KPIs and the aftersales providers' business model. This evaluation consists of 40 KPIs, as the share of aftersales in total sales KPI is not considered. 21 of the 40 KPIs are rated as very important, 10 as important, and 9 as neutral. Two of the company's KPIs, industry affiliation and number of core sites, are categorized as very important. Three of the company's KPIs, company size, type of management and length of management service, are categorized as important. The financial KPIs are identical to the equipment & machine system providers' rating of the same dimension. The difference is that the share of aftersales in total sales is not considered. An examination of the result of the R&D dimension shows that almost half of the KPIs, 7 out of 15, are categorized as neutral. The remaining 8 KPIs can be separated into two groups, with each consisting of 4 KPIs. The first group consists of the important KPIs, such as share of new products in the product range, profit and market share of new products, and annual R&D investment based on the company's sales. The second group are customer satisfaction, revenue and market share growth based on new products, and ROII, which are similarly categorized as very important. Both dimensions' KPIs ratings, i.e. product and process

and functions are identical to those of the equipment & machine system providers' business model.

The software/system providers' KPI rating is shown in figure 11, with 24 KPIs positioned as very important, 11 as important, and 6 as neutral. The company dimension has only one categorized very important KPI – the length of the management service. Industry affiliation, company size, and management type KPIs are categorized as important, and number of core sites is categorized as neutral. All financial KPIs are categorized as very important, except the SAE, which is categorized as important. The respondents categorized 7 R&D KPIs as important. The number of patents, the number of new products per R&D employee, the annual R&D activity costs and the cost allocation of developments are categorized as neutral. In contrast, the share of new products in the product range, customer satisfaction, and revenue and market share growth based on new product are categorized as very important. Only the premium prices are not categorized as very important within the product dimension, as it is declared neutral. All KPIs of the dimension process and functions are categorized as very important.

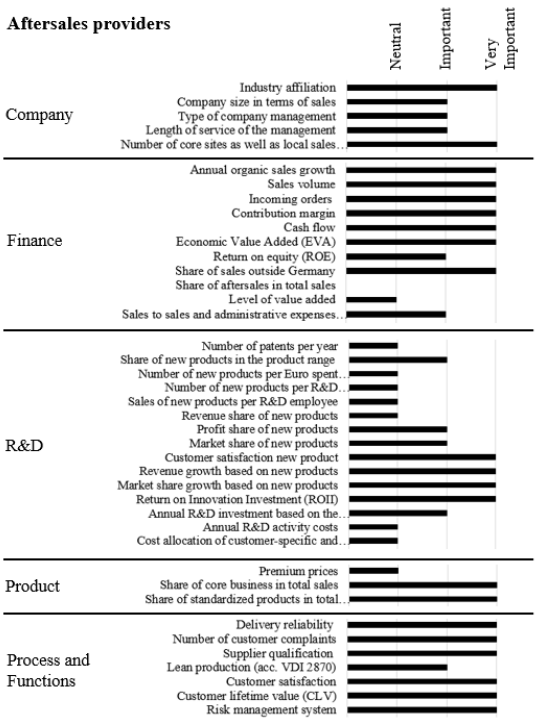

Figure 10 Rating of the aftersales providers' KPIs based on the survey
Source: The authors

Figure 11 Rating of the software/system providers' KPIs based on the survey
Source: The authors

In summary, more than half of the classifications of KPIs vary between the five business models. However, there are some KPIs that have the same ranking across all business models. The financial KPIs, sales, sales volume, incoming orders, EVA, and share of sales outside Germany are all categorized as very important. Within the R&D dimension, the number of patents per year, the number of new products per R&D employee, and the annual R&D activity costs are considered as neutral, whereas the customer satisfaction and the revenue and market share growth based on new products are regarded as very important. The profit and market share of new products are categorized as important. Furthermore, the KPIs share of core business, and share of standardized products of the dimension product are identical across all business models and are categorized as very important. Also, several KPIs of the process and functions dimension have identical rankings, such as delivery reliability, number of customer complaints, supplier qualification, customer satisfaction, and risk management, as they are classified as very important.

Conclusion

The investigation of the degree of correlation of differently relevant KPIs, derived from industry-specific success patterns to German engineering industry's business models was substantiated by a quantitative expert survey. These results are based on the business models of German engineering industry, which were identified via a qualitative literature research and expert surveys. Their underlying description was done using the St. Gallen Business Model Navigator's explanation of a business model, which includes four dimensions: target customer, value proposition, value chain, and revenue model. The analysis of industry-specific success patterns is based on the evaluation of various quantitative studies on this topic. As a further step, these patterns were described by KPIs, based on relevant literature analysis.

The findings highlight the KPIs that are relevant to the respective business model, which enable a better understanding of the interrelationships of the business model in order to derive potential conclusions. A total of 41 KPIs were identified with different relevance for the considered business models. These KPIs were categorized in the different dimensions, such as company, finance, R&D, product, and process and functions.

To strengthen the identified correlation between the KPIs and the business models, additional surveys should be conducted among industry experts. In order to evaluate the business models of the German engineering industry using the relevant KPIs, further research is required. Therefore, a model is necessary which would allow a comparison of company-specific KPIs values between different companies within the industry. In addition to the selection of the underlying data, it is also necessary to define the method in which the KPIs values of the companies are compared with each other. Furthermore, relevant methods are needed to incorporate the knowledge, gained from the benchmarking process with different companies, into the company's own strategy.

Another challenge is the validation of this methodology outside the German engineering industry. For this purpose, the identical method of the determination of business models, industry-specific KPIs and their correlation, could be used for another industry. Based on the described methodology for the evaluation of the business models of the German engineering industry, which has yet to be developed, these business models could then also be evaluated.SM

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Internationalization and globalization – concept, interpretation and communication

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Abstract
Today, globalization has completely determined our everyday life. However, due to COVID-19 virus pandemic, it has received unprecedented attention. There is a lively debate about whether it is useful, whether it is needed, and where it is headed. The situation is further complicated by the subordination of economic interests to populist politics. To understand today's globalization and its future, we need to examine its formation and development. It is important to understand what effects have influenced and what its influence was throughout history, whether positive or negative. After interpreting the past, we examine research and assumptions about the present and the future.

Keywords
the past, present and future of globalization, colonization, Trumpism, COVID-19, global civilization

Introduction

Globalization processes have been the main sources of growth in the world economy for years. During and after the 2009 crisis, many questions have been raised about the positive effects of globalization. Some believe that globalization means expanding the economy's ability to meet consumption and demand and increase prosperity of national economies. Globalization is much more than increasing trade and foreign direct investment. Internationalization of new inventions, technical innovations and growing cross-border services are part of the changes in globalization. Globalization is deepening and spreading, with more and more countries actively participating in the process, so that countries that do not wish to participate in these processes will be lagging behind economically and technologically. These changes affect not only the globalization of the economy, but also the globalization of culture, society and politics (Dreher, 2006). It is clear that it is a topic which is being researched and debated by many in the matters of how and in which meanings it is changing the world. To understand this, however, it is useful to review first how globalization has developed and what direction it is taking today.

Economic historians believe that the globalization adopted today was preceded by so-called International Business, i.e., international trade, back in ancient times! One of the prominent merchant nations of antiquity was that of the Phoenicians, who carried out extensive trade throughout the Mediterranean. It is interesting to note that the North and South American tribes also presumably engaged in extensive trade with each other, especially regarding the Aztec and Inca empires, but, unfortunately, historical finds uncovered are not sufficient to prove this yet. The formation of the already famous Silk Road, where there was regular trade between the Eastern and Western worlds, can also be traced back to antiquity.

However, the initial globalization became really spectacular in the Roman Empire. The first evidence of coordinated, supply-and-demand empire-level trade emerged from the time of the

Roman Empire. Several finds prove that imported fruits (such as dates, olives and figs) were consumed and there was a lively trade on land and waterways. (Hoffmann, 2011) Roman goods reached all parts of the empire, although initially its main purpose was to serve the army. They gladly traded with Asia, the Arab world, and the nations of the north when they were not at war with them. It is well observed how the Roman coin became a "world currency" and how the culture spread in parallel. After the age of conquests came to an end, Rome, after its strategy of subjugation, set itself the goal of unification. It was mandatory for the provinces to comply with Roman law and administrative expectations. As a result, the Mediterranean region was successfully brought together and connected. It is almost an accepted fact that this vigorous Romanization laid the foundations of the Western world and laid the foundations for the wealth of a few later countries.

Building on these foundations and taking advantage of technical advances, the merchants of Venice further developed their trade, and large trading houses also began to appear in Japan. Marco Polo was driven by curiosity and a desire to discover, to travel far from his homeland and map the hidden corners of the world, greatly helping his wealthy patrons by his subsequent expansion, for which trade and money were the primary motivations. In short, their goal was international business, although it was not called that. An important step in the history of globalization was the discovery and, of course, the colonization of America, as a result of which British trading houses networked the whole world. (Czakó, 2010) Many consider this period to be the real beginning of globalization, as it is clear, that the old colonial empires laid the foundations of today's globalized world economy. In the 1890s, Cecil Rhodes summarized the essence of colonization. "We need to find new lands from which we can easily obtain raw materials, while at the same time taking advantage of the cheap slave labour of the indigenous population of the colonies. The colonies also offer landfills for the surplus products produced in our factories." (Wayne, 2003) In addition to the English, of course, the Dutch, the Spanish, the French, the Portuguese, the Belgians and the Germans also took part in the conquest of new territories, the main reasons for which were the spread of religion and, of course, the acquisition of new markets with settled Europeans. Between the 18th and the 19th.centuries, unimaginable amounts of raw materials were brought out of South America in order to finance the Industrial Revolution. World trade began to grow at an unprecedented rate, as the mother countries brought raw materials from their colonies and actively traded with them. Slaves and gold from Africa, coffee, sugar, meat, gold and silver from South America, fur, wood and fish from Canada, and opium, tea and spices from Asia (London, 2013). They transported labour to the colonies, in the form of settlers and slaves, and backwards, packing their ships with raw materials that had already networked the whole world. This period is called the golden age of international trade in goods. However, the mother countries did not completely exploit their colonies, as they actively developed the infrastructure to extract even more raw materials. Cities, dams, railways and ports were built. The capital movement in the North-South direction was so huge that around the 1890s it exceeded that of the 1990s. At the beginning of the 20th century, exports accounted for a larger share of world production than at the very end of the century. (Wayne, 2003)

In the 19th century, the mindset of international business changed, and European companies emerged as investors in underdeveloped parts of the world. Capitalists realized that exploitation is unsustainable and that if they start to develop the economies of lagging regions, their investment can pay off in the long run. After World War II, world trade underwent a major change. (Blahó, Czakó, & Poór J. 2015) Private financial capital investments were replaced by the so-called FDI (foreign direct investment) of companies that had become international in the meantime. More and more mines were being opened in colonial or former colonial areas, crude oil extraction was being promoted in the Arab world, and existing plantation farming was being upgraded to an institutional level in South America. This was a huge change, because so far production had been based on violence, now money and economic interests became its driving forces. During this period, Anglo-American, Japanese, and Western European firms were strengthening and began to expand rapidly (Porter, 1990). Exports of goods and trade tied to a country or a nation were replaced by internal trade and movement of goods between parent companies and subsidiaries. During the 20th century, several colonial countries gained their independence, but their dependence remained, if not on the motherland, but on the

large corporations that supplied capital and technology. This dependence was been reinforced by the strong intertwining of the political bureaucracy and the companies driving the economy (Drucker, 1986).

The resurgence of globalization was caused by the development of information technology and, in particular, the spread of the Internet. It accelerated at an unprecedented rate, and the exchange of information is still accelerating today. Education is accelerating and reaching a better quality, which has a beneficial effect on development. Financial markets are intertwined, making any product or service available to everyone. Globalization is becoming deeper and more widespread as more and more countries are getting actively involved in the process. These changes affect not only the globalization of the economy, but also the globalization of culture, society and politics. Technical and technological globalization could thus become socio-economic and financial globalization. This process currently seems irreversible. Since the middle of the 20th century, global trade has increased more than a hundredfold. This whole technological advancement has at least as much of an impact on the world as the discovery of America in the 15-16th centuries, since new dimensions are emerging, the economy is expanding to new places, freight transport is being transformed, the movement of capital is accelerating and new things can be discovered, researched and learned from them.

1. Factors influencing globalization

The concept of globalization itself is not easy to define, let alone the forces behind it. It is a well-known and generally accepted view that globalization means a global economic system, the widespread use of the Internet, the free flow of ideas, information and cultural phenomena, and the supremacy of popular culture, in short, global unification. When a company leaves the country where it was established and starts operating in another country, it has already taken the first step towards internationalization. These activities typically remain within a region at first and then cover a whole continent, although later we can talk about large companies crossing several continents as well. (Poór, 2013) Many people even think that globalization means the standardization of products, that is, products and services are not tailored to the needs of the markets of the target countries but provide the same uniformly everywhere. (Bartlett & Beamish, 2011) There are also beliefs that globalization is a logical process, as companies with their presence in multiple countries can take advantage of and optimize production, sales, taxation, labour, etc. This gives them a competitive advantage over their competitors who do not take advantage of internationalization. In summary, globalization is the economic concentration of different countries, companies, leading to an increase in capital, the exchange of goods and services between countries, i.e. economic life, and the exchange of information and technology. In the case of a company, the driving force for internationalization is quite clear – to obtain new markets, raw materials, etc. In the case of globalization as a concept, it is no longer so obvious what it is driven by.

Technological development has been one of the most significant driving forces since the 1990s, including the explosive growth of the IT and telecommunications sectors. The exchange of and access to information has been accelerating at an unprecedented rate, which is a major contributor to economic growth. This development has led to the explosive expansion and growth of many industries around the world. Advanced technology and a modern communication network facilitate the availability of products and services, regardless of geographical location, let alone the exchange of knowledge and ideas (Petrov, Ćelić, Uzelac, & Drašković, 2020). Technological development is clearly leading to economic globalization.

Countries had previously restricted products and services from abroad through various tariffs, quotas and bans. This, of course, was a double-edged sword because other countries used similar instruments against other countries, making it difficult and restrictive for businesses to grow abroad (Holm & Sorensen 1995). Due to globalization and the constant demand for growth, these restrictive instruments have eased a great deal, in many cases completely disappearing, thus stimulating free trade and increasing the rate of economic growth. These processes have been strengthened and induced by the fact that, thanks to technical progress, consumers are able to gather information about more and more products and services, so the demand for them has developed and increased (Al-Rodhan, & Stoudmann, 2006). Solvent global demand has increased due to rising income and living standards and declining prices due to standardization, which has led many

companies to expand abroad or to meet global needs in cooperation with foreign players.

Increasing market competition is also a huge driver towards globalization, as increased competition in the domestic market is forcing organizations to become global. Thus, various companies are expanding into other countries to sell their products and services in order to increase their market share and increase their competitive advantage. Many market players have gained greater global market share through mergers and acquisitions, strategic alliances and joint ventures, for which global cooperation and information exchange, as well as the coordination of different (company) cultures, are essential.

Before the 19th century, international cash flows were greatly limited by geographical location. The Italian banks of the renaissance were the main financiers of trade and governments around the Mediterranean. Due to colonization, London and Amsterdam became key centres and their national currencies as well as capital investments were at the heart of international financial markets. As the industrial revolution spread from England, so did the importance of international capital. Later, several global financial institutions emerged, who were able to support international financial transactions and investments. Thanks to IT networks, these institutions have become interconnected over time and today's global financial market has developed, without which it would be impossible to finance internationalizing companies.

Due to lower capital flow constraints, the aforementioned FDI activity continues to grow, although FDI flows continued to decline in 2018, declining 13% to $ 1.3 trillion. This decline has been going on for 3 consecutive years and the main reason is the repatriation of capital exported abroad to the US. FDI flows to advanced economies, with their 27% decline themselves, have reached their lowest point since 2004. Cash flows to Europe have fallen to less than $ 200 billion, mainly due to the relocation of funds and the negative effects of significant changes in the UK. U.S. inflows fell 9% to $ 252 billion. Flows to developing countries remained stable, increasing by 2%. As a result of the abnormal decline in FDI in developed countries, the share of developing countries in global FDI rose to 54%, a record. Bartlett and Beamish (2011) state in their book that we can really talk about a real multinational company (MNE) since export-import activity is associated with higher levels of FDI and active management. In their view, because of these processes, foreign subsidiaries are fully integrated into the parent company and, as a result, trading companies in the age of colonization cannot be considered true multinationals.

2. The effects of globalization

Products are becoming more and more widely available in the global space, which means that global competition is becoming more and more widespread. However, competition does not stop with products and services, as the representatives of science and the most diverse theories (and even habits) have to "fight" with each other. Of course, competition between the latter tends to strengthen the players and together we can move "faster", invent new things, while in the product market the competition is against each other in most cases. The emergence and spread of the concept of multiculturalism, the acceptance (or even rejection) of cultural diversity can also be considered part of the globalization process. People began to travel regularly and farther and farther, boosting global tourism and channelling resources to poorer regions and countries. Thanks to advanced means of transport, there is hardly a place on earth that cannot be reached. Of course, this kind of mobility also brings with it the migration of labour and people, which, in addition to strengthening the economy, is increasingly accompanied by political and cultural problems. Pop culture, which is becoming world-wide, cartoons, games and other entertainment opportunities known by almost everyone, are changing our cultural habits (Rodrik, 2011). Based on these, it can be said that globalization in economic terms means both:

- the horizontal expansion of the world economy, the system connecting the economies of countries;
- the vertical deepening of the interdependencies of this organic system.

The integration of the socialist countries and, of course, China (and East Asia) into the world economy played a major role in accelerating horizontal expansion. This put an end to the rather long, decades-long isolation, individual and collective autarchy of this group of countries, which meant only marginal, indirect and inorganic relations with the capitalist world economy. In addition, the international flow and transnationalisation of capital play a key role in

the globalization of economic relations. No one can argue that when state barriers to free trade and free movement of capital are dismantled, the integration of globalization will always accelerate. Put simply, when trade is free, then globalization is faster.

Of course, globalization also has its downsides in addition to economic benefits. One of the most controversial negative effects is in the area of social welfare and security. These are commonly mentioned, among others:

- inequalities within the country and between nations, as well as increasing impoverishment;
- exclusion of poorer people and layers from technical and economic development;
- widespread unemployment
- disintegrating social safety net and the rising costs of its maintenance. Loss of much of the social rights that existed in the past, especially in socialist countries;
- the disintegration of the social safety net, the withering away of existing welfare institutions in developed countries and the increasing difficulties in maintaining them, the loss of much social rights in former "socialist" countries, the relegation of social (health and education) programs in developing countries;
- a marked decline in the ability of individual states to pursue independent, sovereign social policies;
- the increasing marketing and internationalization of welfare services, etc.

Terrorism is a significant problem in most developed countries. Thanks to globalization, people travel a lot. Some study abroad, start a business in another country, visit relatives, take a job in a foreign country and use health services. Many terrorists have come to foreign countries with a worker visa with the hidden purpose of carrying out a terrorist attack. This is a problem that is causing fear among citizens. Unfortunately, terrorists recruit young people, residents of the country, which generates fear, mistrust and tension within society.

Prior to globalization, skilled people were located in government sectors or in the private sector in order to earn higher incomes or set up their own businesses. It was relatively easy to get a job for those who graduated from college and obtained a degree. Having left a job, people usually quickly found a new one. Due to globalization, there are many active job seekers in the world and an unprecedented supply in the global job market. Employers take advantage of cheap labour, but in developing countries there is a labour shortage because richer societies absorb skilled labour. Even a small mistake can end in dismissal, as an employer can easily find a skilled worker who is willing to work for a smaller salary. Rapid price changes are also one of the negative effects of globalization. There are companies that set up companies in the Far East where they get cheap raw materials and labour. They reduce production costs and can sell their goods at low prices. No matter how the World Trade Organization tries to prevent large price differences, their efforts are not going to be very successful.

Thanks to globalization, there are job opportunities around the world. However, those who worked abroad had to leave their families and normal lives for years. As a result, couples divorced, remarried, and left behind children growing up in a truncated family. Some are unable to support their elderly parents because the money they earn from their work is not enough for everyone. Many elderly people die from illness and lack of financial and emotional support from their children. Globalization has increased the consumption of processed foods, planting plants with chemicals, and minimizing the duration of growth to maximize profits (Dreher, Gaston, & Martens, 2008; Deacon, 1999). For business benefits, animals, such as cows, are fed with chemicals in order to produce more milk or increase weight for those that are sold to the meat industry. Due to the increased consumption of food, chronic diseases are on the rise. The mortality rate is high.

Every community, society or nation has its values and beliefs, that is, its own culture. These are essential as they determine the acceptable behaviour of people in a given community. Elders or leaders make sure people behave morally straight (Pieterse, 1995). However, globalization is confusing different cultures. People have recently rethought the rules and customs of the community and become eccentric, rebellious against the previous habits. The nations of some developing countries accept Western culture and leave their own. As a result, the number of crimes, rape, divorce and domestic violence is increasing.

3. Globalization today

Interestingly, technological advances driven by globalization are, to some extent, also resulting in a slowdown in globalization today. In 2016, Adidas began production at a fully automated factory called SpeedFactory. Almost the entire manufacturing process, from development to delivery to stores, is performed by automated intelligent robots. Adidas simply called this development "reinventing manufacturing" and its undisguised goal is to "bring manufacturing home". It is also clear from the example of Adidas that industry 4.0, but most importantly robotics, has the opposite effect on globalization, as the more machines there are, the more automated the processes, the less human capital is needed, thus drastically reducing production costs. There is not so much need for foreign labour or to set up factories abroad, but it can also be produced domestically, and needs can be met by domestic suppliers. This process will also transform world trade, as there will be no need to transport raw materials, semi-finished and finished products across countries to reach the factory or the consumers. Local production will meet local needs, which will have a positive impact on nature as well. Production will return from developing countries to developed countries, which will in turn have a negative impact on underdeveloped economies.

Today, globalization is also being actively curbed by populist politicians. In South Korea, Mun Jain came to power with a promise to defeat big business, in Greece the extremist Syriza Party is proposing to cancel foreign debt, the EU has stepped up anti - immigration opposition in some countries, and US President Donald Trump wants to put his country in front of everyone. It is easy for politicians to blame globalization, among other things, for stagnant incomes, growing wealth disparities, and so in general, the poorer, but even increasingly middle-class, hopelessness. "If we can build, grow or produce something in the United States, we will do it here," Donald Trump emphasized in one of his speeches, and with his protectionist measures so far, he seems to be adhering to it. He has issued several decrees requiring U.S. government agencies to favour domestic products in their procurement, despite the fact, that in many cases this also means higher procurement prices. Such a decision, in addition to giving domestic companies a competitive advantage, negatively affects foreigners, whose home countries may, in response, make similar regulations. In addition, it may have a much greater impact by withdrawing from free trade agreements that are unfavourable to America. It has already withdrawn from the Pacific agreement, initiated a renegotiation of NAFTA (North American Free Trade Agreement), which is more favourable to the US, and even invalidated the transatlantic agreement launched by President Obama. To strengthen U.S. industry, it has imposed tariffs on imports of steel and aluminium, to the detriment of many EU countries, but because the economic power of the US is huge, it is difficult to make a real response. He has a difficult time, however, with the economically also powerful China and the "Customs War" which has been slowly running between the two countries for nearly two years, in which mutually protective tariffs are imposed on each other's products, thus limiting exports and imports.

However, the trade war between China and the United States goes much deeper than the various protective tariffs. Globalization will end in its current form and it will not be good at all in the long run. Throughout history, globalization has had successive waves of growth and decline. We can still be at the beginning of a wave of recessions because everything can be found to change the current status quo. Some argue that recent trends in politics, technology, and climate change point to the need for a new world order that focuses more on solutions at the local level, with stronger nation-states and a reformed international system. The G7 - the United States, Canada, Japan and the four largest economies in Europe - are no longer able to fully enforce their will at international summits, and in many cases do not even have a common position. The independence of central banks has been jeopardized and, in many cases serves political purposes. EU integration efforts are declining, Britain has exited the EU. This new kind of protectionism in the face of globalization will certainly help boost domestic industry in the short term, but it is not yet possible to predict how it will affect the competitiveness of different nations in the long term, as labour is much more expensive in developed countries than in developing countries, nor can it be said for sure that it would be better educated. Of course, the main goal of every politician is to protect the economy of his country, among other things, regardless of the long-term benefits of globalization. These directions will slow down

growth, the common exchange of information, the acquisition of knowledge and will once again plough deep ditches between different nations.

Looking ahead, however, there are also very positive forecasts. In her book The Future of Humanity, Zhouying Jin writes through an entire chapter on the future of global civilization. She believes that if we do not transform current supply chains and resource use, a catastrophic end result is to be expected and continued production and exploitation will cause irreparable damage to the biosphere. She believes that we need to shape our thinking in any way, because there is no need for infinitely growing GDP for prosperity, and organizational methods must adapt to the challenges of the modern age, even if we need to develop a new model of economic globalization and build a green economy. In order to achieve this kind of globalization, it is essential to encourage and combine development and openness. A good example of this is the "One Belt, One Road" strategy introduced by China, also mentioned by Zhouying Jin (2018), which aims to connect 94 cities in 53 countries. This initiative is still in its very early stages, but there are huge hopes for it: infrastructure development, mutual aid in finance, politics, science, culture and much more. China seems to have recognized that common development is the real key to success and is willing to share its successes and resources with regional countries for global development. They insist that if all economic actors are committed to peaceful cooperation, equality, tolerance, mutual learning and common goals, close communities of interest will emerge that will no longer pay attention to where the borders are, but development will be kept in mind. This kind of thinking and cooperation is necessary and inevitable for globalization to start moving in a healthy direction again. However, this will take a lot of time and will have to overcome many of the habits entrenched in generations that are still present in politics today. And of course as stated by in an article (Balan, et al., 2019), there is a huge difference between generation X, Y and Z. Each generation handles globalization differently.

3.1. Impact of the COVID-19 pandemic on globalization

During the last months, globalization seems to be historically significant again, as many are already talking about deglobalization instead. One of the Economist Intelligence Unit's (EIU) report mentions that COVID-19 brought with itself the regression of globalization and the global supply chain. Instead of globalized supply chains, regional supply chains started showing signs of development. It can be said that generally, this is not a new process, because globalization was already showing signs of slowing down, and the pandemic only sped this process up, because it pointed out to the leaders of international companies that it was worth it to diversify their supply chains. Ian Goldin, a professor of globalization and development at Oxford University highlighted in a radio interview with abc.net Late Night Live, that he sees two different possibilities:

- Signs of economic depression, with intensifying nationalist and protectionist tendencies similar to the 1918 period. Weakening international organizations and strengthening national interests.
- The best-case scenario is, however, that there will be an upswing similar to the post-1945 period, which will bring stronger international cooperation with common goals and directions for development.

According to him, the biggest question is who exactly will control these processes: "We should, or rather, we must be optimistic, but if we are honest, the current leadership of the White House is unsuitable for this. China is not being dealt a card in this sense, and as far as Europe is concerned, the United Kingdom cannot be a leading force either", he said. Global production chains can be fully understood if viewed from a point of economies of scale, cost optimization, and often untold tax optimization. However, this raises the problem that most products have multiple producers in a country far from the parent company itself. Low inventories and the aim of Just-in-Time production have only increased the vulnerability of the system. Thanks to the COVID-19 epidemic, these critical points have been damaged and many electronic items, and even pharmaceutical ingredients did not reach the assembly plants. This deficient state occurred rapidly and almost unmanageably, as a shock to both companies and whole economies. It is likely that we will not return to the pre-globalization period, but it is also certain that not all countries will start producing everything, because it is an impossible thing to do. It is much more likely that larger regions, such as the EU, USA and China with their associated economic areas will become

more independent production centres for some products and trade between these regions will decrease. In the future, no companies or even countries want to beg others in the future to get access to the raw materials required for production. It could be seen in the United States and other countries of the world even before the epidemic, that they began reducing the ratio of Chinese suppliers.

The memory of 2008 has faded away for a multitude of people and businesses already, and a whole new generation has grown up who had only experienced the previous economic crisis as teenagers. As a result, household debts have risen throughout the world once again. As a result of the epidemic, a whole branch of the service sector, tourism and hospitality was destroyed, literally overnight. A lot of people lost their jobs and their businesses which they had built over the years. A sure way to collapse is when high indebtedness is paired with low or disappearing cash-flow. In 2008, people retained their incomes, but their pay obligations increased, however, there was no current increase in household spending, they lost their incomes instead (Csáki, 2009). The speed of the process of how masses of people lost their livelihoods is unprecedented, and several micro, small and medium-sized enterprises have already filed for bankruptcy. Large corporations and banks have not yet filed for bankruptcy, but if that does happen, the crisis could deepen even further. After the crisis subsides and when recovery begins again, the willingness of the general population to take out loans will most likely decrease and a few people will not even be able to get them, so a slowdown is to be expected in several industries. Many will realize, for example, that they do not need to replace a 5-6-year old vehicle (this will apply to corporate fleets as well), so new car purchases will be delayed, which will have a negative impact on the automotive industry and its suppliers. As production decreases, it will be easier for companies to relocate their foreign factories, which will strengthen deglobalization. The same tendency is expected in tourism, as expensive foreign travel is not a necessity and thus its growth will be slow, which leads to the revival of tourism and cultural diversity. The slowdown in tourism will also have an impact on the real estate market, as owners will look to make up for the cash-flow shortfall from homes rented out on Airbnb and the likes by selling these properties, which will lead to stagnating or falling prices. The fall in real estate prices will affect the construction industry and so on. It is very clear that everything is interconnected, and the economy should be analysed as a whole, because a shutdown of one industry will have unpredictable effects on all other industries. COVID-19 has also pointed out very well that lots of countries have very poor health care, as many did not go to the doctor because they could not pay huge hospital bills that could exceed their total monthly household income. This logically increases the risk of infections, especially among the poorer social strata. In most parts of the world, there is not a unified system for sick leave, therefore many people go to work during illness, as they would lose their income if they were on sick leave. These serious issues were already on the agenda in the US before the outbreak, but it will likely receive even more emphasis now. A globalized, mutually responsible global healthcare system would be a good solution to avoid similar situations in the future, especially in light of the fact that prevention is always cheaper than reconstruction, albeit current processes are more in the direction of closure than globalization. One of the main characteristics of globalization was urbanization. In hopes of development and better opportunities, many people have moved to cities or their agglomerations in recent decades. Businesses could integrate easier into world trade in a metropolitan environment, than from an infrastructurally less developed region. The community experience, environmentally conscious public transportation and the rapidly growing sharing economy services have also become very popular in cities. Fear of the virus has completely reversed these processes because people feel more secure further away from others, not to mention that mandatory social distancing put in place by governments only further amplified this effect. The sudden introduction of home office has shown many that they can work just as well from home and they do not need to sit in traffic jams or use the crowded public transportation for hours. This had a positive effect on the IT sector, which experienced sudden, rapid growth, as with the right software, the activity and productivity of employees can be perfectly controlled in home office as well. Thanks to home office, former office spaces can be reduced by up to 30-40%, which means a further reduction in the concentration of population.

As an effect of COVID-19, banks, often under government pressure or subsidies, introduced

loans with an APR of around 0% for the corporate sector, but also even for the private sector. The limitless purchase of central bank bonds, which was previously considered impossible, has started, including the purchase of corporate bonds and shares. The current economic situation theoretically had to show companies, governments and families that the formation of reserves and self-sufficiency are both paramount and they should not be engaging in transactions with high leverage. It would be logical that once the economy recovers, many more people will build up savings, but unfortunately, this has not happened after the 2008 crisis either. To avoid huge expenditures, governments should finally admit that it is essential to raise the financial culture of the population, which should begin at school age. Whether there will be a change in this, we will only see in the upcoming years.

At the moment, it is difficult to predict how the events caused by COVID-19 will change the world, and how it will affect globalization. There are currently several conflicting theories and processes. Different economies, countries and households all handle the situation in different ways. The coming months and years will tell which strategy will be the example we should globally follow. Another question is whether this method will be the best for humanity in the long run.

4. Empirical survey

4.1. Research method

We conducted a descriptive research using questionnaires. The aim of the questionnaire was to find out how the working-age population sees globalization and how much they feel it affects their lives. Another aim was to find out how they think the COVID-19 virus will affect globalization. The Google-form questionnaire was posted in public online communities and was free for anyone to fill out, but no more than once. In the research, we would like to prove whether the respondents find globalization useful and whether it shows improvement.

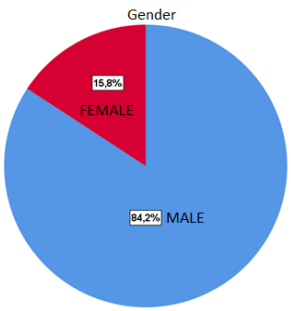
4.2. Empirical study, the samples and the variables

The questionnaire was completed by 186 people, of which 171 were fully completed, 95% between 28/03/2020 and 01/02/2020. The data collection and research examine how respondents think about globalization. As background data, we asked two demographic questions (gender and age) and the number of employees (size) of the company they work at. The sample set has 171 records, of which we recorded three factual variables and 6 opinion variables:

- Gender
- Age
- How many people work at your company?
- How much do you think globalization affects our everyday lives?
- How useful do you think globalization is?
- How much do you think globalization will affect the future?
- Where do you think globalization is heading?
- How much do you think the COVID-19 pandemic will affect globalization?
- In your opinion, which industries are most affected by globalization?

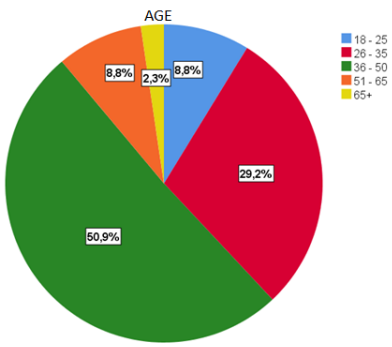
We recorded the opinions on a five-level Likert scale, except in the case of "Where do you think globalization is heading?", which only had two possible answers.

Descriptive statistics:



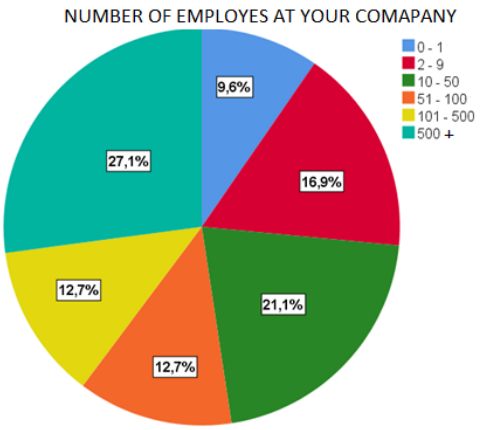
Graph 1

Source: The author



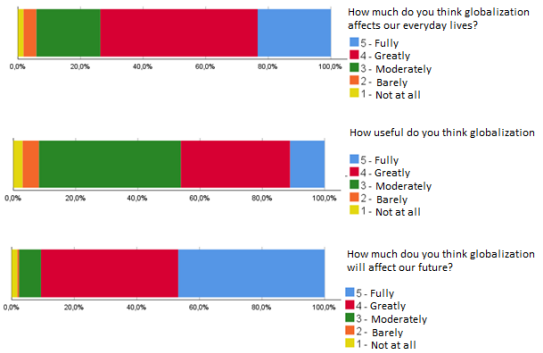
Graph 2

Source: The author



Graph 3

Source: The author



Graph 4

Source: The author

Multivariate analysis: We were interested in two research areas: possible relationships between opinion variables and relationships between opinion variables and background variables. Specifically:

- Is there a relationship between the answers about globalization?
- Are the answers influenced by the respondent's gender, age or size of their company?

We were looking for the answer to our question with Cronbach's alpha and rank correlation: the level of measurement and the variables indicate the possible use of correlation, but as Likert scales are "only" ordinal variables (not interval), "only" rank correlation can be calculated. Cronbach's alpha is a special type of "correlation calculation", as it calculates a relationship between one variable and all others. In the SPSS program, we could analyse rank correlation with Spearman's rank correlation coefficient. Both methods' results indicate that there is only a weak correlation between these variables: The value of Cronbach's alpha is only 0.321, and the highest of the item-total correlations is only 0.298 (the results of both can be between 0-1). The highest value (correlation coefficient) of rank correlation calculation is only 0.440, which is the relationship between the questions "How much do you think globalization affects our everyday lives?" and "How much do you think globalization will affect the future?"
The size of the company as a variable also only shows weak correlation, and only with 2 opinion variables; we measured this – as the size of the company is also at an ordinal level of measurement – with rank correlation, too.

The value of the coefficient:

- How much do you think globalization affects our everyday lives?: 0.237
- How much do you think globalization will affect the future?: 0.182
- Both correlations are significant ($p < 0.05$).

We analysed the correlation between age and attitudes with analysis of variance. According to the result, the only significant correlation is with "How much do you think globalization will affect the future?" ($F[3,167]=3.654$, $p = 0.014$). According to the result of the post-hoc analysis, only the age group of 51 and older differs significantly from the 26-35 ($p=0.021$) and the 36-50 ($p=0.009$) age groups.

84.2% of the respondents are male and 15.8% are female, 50.9% are between 36 and 50 years old and 29.2% are between 26 and 35 years old. By job, it can be said that they are roughly proportionally distributed by company size, but the proportion of respondents working for companies with more than 500 employees (27,1%) and between 10 and 50 employees (21.1%) is slightly higher than the others. Based on these values, it can be said that the studied population is sufficiently diverse.

50.9% of respondents thought that globalization has enough of an impact on their daily lives, 22.1% thought it had a full impact and 20.9% indicated that it had a moderate impact. A total of 4.3% gave little effect and 1.8% had no effect at all. Overall, 93.9% say globalization affects their life to some degree.

In terms of usefulness, 91.4% think that globalization is useful at some level (45.4% - Moderately useful, 35% - Quite useful, 11% -

Very useful). 5.5% think it is hardly useful and 3.1% think it is not useful at all. There is almost a consensus that the future will be at least moderately affected by globalization (47.2% - Fully, 42.9% - Quite, 7.4% - Medium, 0.6% - Barely and 1.8% Not affected at all). In light of this data to date, it is not surprising that 89% of those who took the test believe that globalization was on the rise. The question of the impact of COVID - 19 on globalization is much more colourful, with 5.6% very invigorating, 17.9% invigorating, 29% very restraining, 40.1% slightly restraining and 7.4% indicate the will not affect response. Based on the answers to the last question, 61.7% of respondents believe that globalization has the greatest impact on the economy. In addition, the number of responses received was 19.1% for IT and 9.3% for telecommunications.

Conclusion

The initial hypothesis that globalization is considered useful has been almost fully confirmed, as most of the literature and 91.4% of respondents consider globalization useful, of which 11% are very useful. Only 3.1% of the surveyed think that globalization is not helpful at all. The results of the survey seem to be in line with the generally accepted thesis that globalization, despite its downsides, is a useful thing and helps development.

A more interesting picture is shown by the fact that 89% of the participants thought that globalization was increasing, while recent research tended to show a stagnation of globalization, thanks to populist politicians gaining ground in more and more countries and putting national interests first. This trend was already observed before the emergence of the COVID - 19 virus, but already 69.1% of respondents believed that the emerging epidemic would at least slightly restrain globalization. An interesting finding from the survey is that 17.9% responded that COVID - 19 would intensify rather than slow down globalization.

There was no specific question on this, but the responses to the questionnaire show that most people have only a superficial knowledge of what globalization means and in what areas it has the greatest impact. The test also revealed that most people are only aware of the impact of globalization on the economy and IT. This is in line with the information heard in the mainstream media and they are not aware that globalization is now really a matter of promoting science, working together, acceptance and global development, which if slowed down or stomped, would also decelerate science and development and differentiate certain states by beating a wedge between them, which they will be able to overcome only after several generations.SM

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Expected effects of the revised exposure to banks Basel credit risk weighted assets standard

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Abstract
In 2017 Basel Committee on Banking Supervision (BCBS) published additional Basel III reforms for the calculation of the risk-weighted assets (RWA) as part of the capital adequacy calculation. The 2017 reforms should resolve shortcomings in the capital adequacy calculation from the pre-crisis period. Revised standardised approach for the credit risk should be valid as of January 2023. The new reforms are bringing numerous improvements particularly interesting for the bank strategic management. One of the especially important improvements of the 2017 Basel III RWA reforms is the new treatment of the exposures to banks. For the treatment of externally unrated exposure to banks, financial institutions can use Standardised Credit Risk Assessment Approach (SCRA). This topic is the most interesting and important for the banking sectors structured mostly with the externally unrated banks. This is more characteristic of the developing, transition economies than the developed economies. However, SCRA will also be very important for the developed economies' banking sectors and banks whose portfolios are dominated by externally rated bank exposures, but in the same time they have significant amount of the exposure to banks without external rating. This paper's focus is related to the expected effects of the implementation of SCRA on the unrated banks' exposure. The aim of the paper is to define those effects. The paper is analysing how worldwide implementation of SCRA will establish a more detailed RWA approach with enhanced risk sensitivity. The research has shown that externally unrated banks with strong and stable capital adequacy and other related parameters can have positive expectations from the implementation of SCRA.

Keywords
Banking, Basel III Standard, risk weighted assets, credit rating, strategic management

Introduction

Exposure to banks is one of the important elements (together with exposure to corporate, retail, sovereigns, etc.) of the total bank exposure, that are bases for the credit RWA (risk-weighted assets) calculation and capital adequacy calculation. As of Q4 2019, EU banks in the focus of the European Central Bank (ECB) Supervisory Banking Statistics (2021) had credit institutions' claims in the amount of EUR 1,186.7 billion or 5.3% of the total assets (1,230.4 billion or 5.1% as of Q3 2020). A similar situation can be seen in the developing countries. In the example of the Republic of Serbia, banks and other financial institutions' claims had a share of 5.2% in the total banking sector assets, as of Q4 2019 (National bank of Serbia [NBS], 2020b). Although, generally speaking, the amounts of the total corporate and retail loans are usually higher than the loans and advances to credit institutions, exposures to banks also require attention and analysis. It needs to be taken into account that exposure to banks can be generally more volatile in comparison to typical corporate and retail loans.

After the global economic crisis, BCBS (Basel Committee on Banking Supervision) published

Basel III standard in 2010-2011 with the main focus on capital (and liquidity) treatment and its revision. The reforms from 2017 (Basel Committee on Banking Supervision, 2017a, 2017b, 2021) should finish the job started in 2010-2011. The stated reforms are shaping capital and risk management that are among the most important components of the modern bank strategic management. Since the reforms from 2011 did not focus on RWA revision, the task of the reforms from 2017 is to improve RWA calculation, so that the capital adequacy reforms would be completed. Exposure to banks is revised with the 2017 reforms.

In the new framework (credit RWA standardised approach), banks can use two approaches: External Credit Risk Assessment Approach (ECRA) and SCRA (Standardised Credit Risk Assessment Approach). For the treatment of externally unrated exposure to banks, financial institutions can use SCRA. SCRA is the most interesting and important for the banking sectors dominated by externally unrated banks. This is mainly situation in the developing, transition countries. The paper is primarily focused on the stated situation. On the other hand, SCRA will also be very important for developed countries and banking sectors and banks in whose portfolios externally rated bank exposure has domination, but in the same time they have significant amount of exposure to banks without external rating.

This research has in focus effects expectations of the implementation of SCRA on the unrated exposure to banks. The aim of this research is to define those effects. The paper is analysing how implementation of SCRA will establish a more detailed RWA approach with enhanced risk sensitivity. Research takes into account big, developed banking sectors, banks and economies, but the main focus is on the small and developing banking sectors, banks and transition economies. Expectation for the Serbian banking sector is particularly analysed in the last part of the paper. The banking sector of the Republic of Serbia was the perfect example for our special case study. On the global scale, this is a relatively smaller and developing sector (with the domination of externally unrated exposure) and economy.

The goal is to outline the key elements of the new framework for exposure to banks, as well as to mark the most important challenges along the way of implementation. Additional research aim is to define the recommendations for the successful application of the new bank exposure standard, particularly SCRA. Taking into account the comprehensive analysis of exposure to banks (historical, current and future potentials), the expected achievements of the paper could be valuable for the financial institutions (in the Republic of Serbia, EU and non-EU countries, transition, economies etc.) and its risk and capital management. Additionally, related to the previously stated, potential benefits exist for other institutions and parties involved in financial development, stability and economic growth acceleration, as well as for the institutions involved in regulation and audit. More details about connection between economic growth and banking can be seen in a study by Milojević (2014). Some other interesting connections between finance and growth can be seen in the research of Moraru and Duhnea (2018), Šafár and Siničáková (2019), Šuliková, Siničáková and Štiblárová (2019) and Geršl, Jakubík, Konečný and Seidler (2013). Important related issues can be also seen in the research of Ciutacu, Chivu, and Iorgulescu (2009), Chivu, Ciutacu and Georgescu (2015) and Hadad (2018).

The recent scientific literature offers excellent research regarding contemporary banking capital and risk management standards (for example: Addo, Guegan & Hassani, 2018; Jacobs, 2018; Leo, Sharma & Maddulety, 2019; Lessmann, Baesens, Seow & Thomas, 2015; Laurent, Sestier & Thomas, 2016; Pop, Chicu & Răduțu, 2018; Mertzanis, 2019; Huser & Kok, 2019). However, this paper is innovative, i.e. it goes beyond existing literature and covers the topic of this paper in a unique, detailed and comprehensive way. It is solely, extensively and innovatively dedicated especially to one particular segment of capital and risk management that will be valid in the future period and very important for strategic bank management.

The key starting hypothesis of the research is the following: using worldwide experience, published papers and databases, perspectives of the new BCBS bank exposure framework implementation, particularly SCRA, can be defined. The second hypothesis of the research is that strong bank capital ratios will enable good starting position for the implementation of SCRA and its effects. The third hypothesis is that based on previous, recommendations for the thriving enforce of the new bank exposure standard can be defined, so that maximal effects could be achieved in the field of bank risk and capital

management, performance, control, financial stability strengthening and creating positive impulse for sustainable economic growth. After the conducted analysis, the stated hypostasis will be confirmed or rejected.

The methodology of this paper is characterized by the usage of the most relevant publicly available historical and present global experience, research results, analysis and databases during the research. The paper will take into account big, developed, as well as small and developing, banking sectors and banks from the transition economies. A special case study is related to the banking sector of the Republic of Serbia. The aim is to have adequate overview and analysis of the thesis, as well as conclusions in this paper. This is the reason to conduct the analysis of the actual bank exposure treatment, as well as planned improvements. Additionally, the plan is to define the recommendations for the successful application of the new standard. Related to the above stated issues, the following methods are especially: descriptive, inductive – deductive, analytical important – synthetic and comparative analysis.

For the research references and analysis results, the following can be highlighted as especially important:

- Various worldwide published scientific papers, research, and other documents relevant to the topic of this research. Among other, this research takes into account previous scientific articles and research of the authors of this paper.
- BCBS risk and capital management frameworks, analysis and recommendations that are crucial for bank exposure treatment and development during the past decades;
- Financial regulatory institutions and central banks, global analysis and published papers, research, documents and databases.

1. Current treatment of exposure to banks in the capital adequacy framework

During the past few years, in general, worldwide treatment of exposure to banks, as a part of credit RWA calculation, has not changed a lot. In fact, current worldwide treatment of exposure to banks is based on the Basel II capital adequacy framework. Although today worldwide capital adequacy treatment is based on Basel III, exposure to banks will be revised in 2023 with the implementation of the revised Basel III framework from 2017. Current Basel III capital adequacy framework (year 2011) was focused on the capital side revision, while the RWA changes can be seen in the 2017 revision.

Basel II framework – standardised approach – offered two options for credit RWA regarding exposure to banks. This segment of the paper will highlight crucial characteristics. The unrated bank exposure cannot receive a better risk weight (RW) than its sovereign exposure. Within the limits of possibility, all financial institutions from a specified state receive a RW one step below than the country's sovereign exposure. Still, 100% RW is assigned for bank exposure in countries with sovereigns rating BB+ to B- (rating scale of the external credit rating agencies: Standard & Poor's and Fitch) and on financial institutions in states without rating. Another possibility is related to the financial institutions' external credit estimation with institution exposure RW of 50%. The privileged, one step better RW is possible for 3 months or shorter primary term exposures, but not better than 20%. The above stated is not possible for financial institutions with 150% RW (BCBS, 2006).

Table 1 Risk weight table for bank exposures in the Basel II framework under Option 1 in the standardised approach

Country credit rating	AAA to AA–	A+ to A–	BBB+ to BBB–	BB+ to B–	Below B–	Without rating
RW - Option 1	20%	50%	100%	100%	150%	100%

Source: the authors, based on Basel Committee on Banking Supervision, 2006, p. 22.

Table 2 Risk weight table for bank exposures in the Basel II framework under Option 2 in the standardised approach

Bank credit rating	AAA to AA–	A+ to A–	BBB+ to BBB–	BB+ to B–	Below B–	Without rating
RW - Option 2	20%	50%	50%	100%	150%	50%
RW - Option 2: short-term exposure	20%	20%	20%	50%	150%	20%

Source: the authors, based on Basel Committee on Banking Supervision, 2006, p. 22.

The above presented BCBS solution for exposure to banks is in use worldwide. In the EU, the BCBS exposure to banks standard is implemented by the European Parliament and the Council of the European Union documents, like Capital Requirement Regulation (CRR) document from 2013 (The European Parliament and the

Council of the European Union, 2013). Similar solution can be seen in countries outside the EU. For example in the Republic of Serbia, there is the NBS Decision on Capital Adequacy of Banks from 2020c (update of the document from 2016, 2018 and 2019) with the similar solution.

Beside the presented standardised approach for the credit RWA, BCBS capital adequacy framework (starting from Basel II until now) and regulations of the countries following its framework also offers the internal rating based (IRB) method. Financial institutions that have permission from the regulatory bodies for the IRB method can use their own internally calculated risk parameters for the capital requirement. The stated parameters follow: the probability of default (PD), loss given default (LGD), exposure at default (EAD), and maturity. Regulatory bodies can require from the financial institutions to apply regulatory value instead of internal for one or more stated parameters (Basel Committee on Banking Supervision, 2006). IRB approach is offered in the foundation (FIRB) and advanced (AIRB) version, depending on which banks calculate for the regulatory CAR (capital adequacy ratio) on their own, only PD or all 4 stated components of the capital adequacy calculation.

2. Exposure to banks in the revised Basel III capital adequacy framework

BCBS published in 2017 additional RWA Basel III reforms as part of the capital adequacy calculation (Basel Committee on Banking Supervision, 2017a, 2017b). The first part of the reforms Basel III from 2011 was mainly focussed on capital treatment and liquidity risk (Ferreira, Jenkinson & Wilson, 2019; Milojević, 2016; Milojević & Redzepagic, 2020). The goal of the 2017 reforms is to complete reforms started in 2011. The Basel III 2017 reforms should resolve shortcomings in the capital adequacy calculation from the pre-crisis period. According to BCBS, the planned start of revised credit RWA standardised method is January 2022. On the other side, in 2020 BCBS has analysed worldwide situation and decided that the start of reforms will be prolonged until January 2023 (Basel Committee on Banking Supervision, 2020). The new reforms are bringing numerous improvements. One of the especially interesting improvements of the 2017 Basel III RWA revision is the new treatment of exposures to banks. They need to be incorporated in the banks' strategic management and planning.

Exposure to banks is one of the total RWA components. The change in the value of exposure to banks has direct impact on the change of the Basel III capital ratios, including today's most actual capital ratio: Common Equity Tier 1 (CET1) ratio, whose Basel III prescribed minimum is set at 4.5%.

$$\text{CET1 Ratio} = \frac{\text{CET1}}{\text{RWA}} \quad (1)$$

Like it was stated above, in the new framework (credit RWA standardised approach), banks can use two approaches: ECRA and SCRA.

In the ECRA, financial institutions will enforce the base RW to rated financial institutions claims in accordance with the following table (Basel Committee on Banking Supervision, 2017a, p. 8).

Table 3 Risk weight table for bank exposures in the Basel III Finalising reforms framework - External Credit Risk Assessment Approach

ECRA	AAA to AA–	A+ to A–	BBB+ to BBB–	BB+ to B–	Below B–	Without rating
Base RW	20%	30%	50%	100%	150%	20%
Short-term claims RW	20%	20%	20%	50%	150%	20%

Source: the authors, based on Basel Committee on Banking Supervision, 2017a, p. 8.

ECRA is valid for all claims to banks that are rated. Financial institutions operating in the states where is possible to apply external ratings for the RWA will enforce SCRA exclusively to financial institutions claims without rating (Basel Committee on Banking Supervision, 2017a, p. 8 and 9).

However, although the ECRA is bringing improvements in comparison to the current standard, the most significant changes are brought by SCRA. Due to this, SCRA is in the main focus of this research.

Financial institutions can use SCRA for the treatment of externally unrated exposure to banks. This topic is very interesting for the banking sectors dominated by externally unrated banks. This is the situation in countries like Serbia, Montenegro, Bosnia and Herzegovina, Macedonia, Albania and many other emerging markets and developing transition economies. The developed countries usually have more externally rated financial institutions in comparison to

typical developing countries and transition economies, especially if the focus is on ratings of the 3 world's most influential credit rating agencies (Standard & Poor's, Fitch and Moody's). However, the above stated SCRA will also be very important for banking sectors and banks whose portfolios is dominated by externally rated bank exposure, but in the same time they have significant amount of exposure to banks without external rating.

The SCRA prescribes that financial institutions must classify financial institutions claims into one of 3 categories: A, B and C and to enforce Table 4 RW.

Table 4 Risk weight table for bank exposures in the Basel III Finalising reforms framework - External Credit Risk Assessment Approach

Credit risk estimation of the bank	Class A	Class B	Class C
"Base" RW	40%	75%	150%
Short-term claims RW	20%	50%	150%

Source: the authors, based on: Basel Committee on Banking Supervision, 2017a, p. 9.

Within the SCRA, financial institutions claims that are not rated using 30% RW if the counterparty financial institution has a CET1 ratio of 14% or higher, Tier 1 leverage ratio of 5% or higher and has fulfilled all the Grade A requirements (Basel Committee on Banking Supervision, 2017a, p. 9).

Some of the major Grade A requirements are stated in the following sentences. It is valid for exposures to financial institutions that properly and promptly carry out obligations to counterparty institutions. A counterparty financial institution classified with "A" needs to be in accordance with the legislation demands including buffers specified in the new BCBS standard. In cases when minimum legislation obligations and new BCBS instructions are not satisfied, these claims will be classified in B or C (Basel Committee on Banking Supervision, 2017a, p. 9).

In the previous definitions there is a raised importance of high capital adequacy and its impact on lower RW. A grade A bank with high CET1 has the possibility to lower its RW to 30% (from the base 40%). For the RW of 30%, among others, banks also need high Tier 1 leverage ratio (LR).

$$LR = \frac{Tier\ I\ capital\ (CET\ 1 + addional\ Tier\ 1)}{On\ and\ off\ balance\ sheet\ exposures} \quad (2)$$

Banks will be additionally motivated to implement improved capital and risk management (Milojević, 2016; Milojević & Redzepagic, 2020).

As an illustration of the values of the currently most important capital management ratio, CET1 ratio value of the few European selected countries is presented here. The presented overview combines a few EU countries (their significant institutions at the highest level of consolidation) in the focus of the ECB Supervisory Banking Statistics and few developing countries banking sectors (represented here by Serbia and Croatia) All presented countries had average CET1 ratio on a country level as of Q4 2019 and Q2 2020, significantly higher than the Basel III minimum of 4.5%.

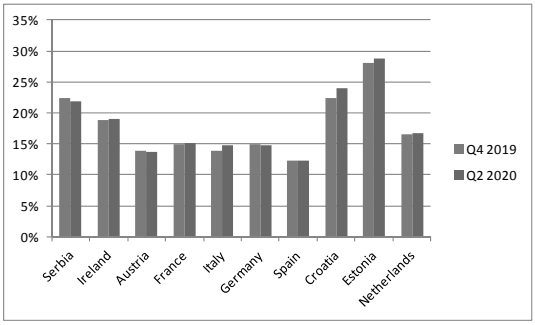

Figure 1 CET1 ratio of the few European countries as of Q4 2019 and Q2 2020

Source: the authors, based on European Central Bank, 2020a, 2020b; National bank of Serbia, 2020b; Croatian National Bank, 2019, 2020.

The interesting CET1 ratio variations between the selected European developed and developing countries can be seen in this comparison. High CET1 is one of the most important factors for the good starting position in the implementation of SCRA.

Some of the major Grade B requirements are stated in the following sentences. A counterparty financial institution is related with substantial credit risk, such as repayment potential. A Grade B financial institution needs to be aligned with the declared supervisory obligations (except the buffers). This does not include the financial institution's special minimum supervisory requirements requested by the regulatory body actions (like second Pillar). In case that this is not satisfied, classification C is valid for the financial institution's claims. Grade C is valid for the higher credit risk financial institution's claims, with non-performing, past due status (Basel Committee on Banking Supervision, 2017a, p. 9 and 10).

At the end of this chapter we would like to highlight major changes regarding internal approach for the exposure to banks. The Banks will continue to have the option of usage IRB approach, but with some changes and additional requirements. Regarding changed treatment of exposure to banks with IRB approach, what needs to be highlighted is that the reform from 2017 removes the option to use the AIRB approach for exposures to banks. This means that banks can use either standardised approach or FIRB to calculate exposure to banks within the credit RWA calculation.

3. Expected effects of the new treatment of exposure to banks

In this chapter the focus is on the authors' expectation regarding the effects of the new treatment of exposure to banks, so that we could define the conclusion regarding three starting hypotheses from the introductory chapter. Therefore, the focus is on the effects that SCRA can produce. The implementation of ECRA can also produce some changes in the credit RWA and CET1 ratio values. The changes of the CET1 ratios can also be expected from the IRB exposure to banking changes, since banks will not use any more AIRB for exposure to banks, so they will need to use either standardised or FIRB approach. The banks that had benefits from the internal estimation of LGD, EAD and maturity in the AIRB approach could now be faced with increased credit RWA and reduced CET1 ratio. However, the real big step forward in the exposure to banks is expected with the implementation of ECRA, which is focused on the externally unrated exposure to banks. The new treatment of SCRA with A, B, C grades, high sensitivity to CET1 ratio, Tier 1 leverage ratio and other improvements is a significant step in the improvement of capital and risk management. This improvement should be achieved with the more precise CET1 ratio which is expected from the implementation of 2017 reforms.

This enhanced risk sensitivity of the SCRA should be a big improvement in comparison to current treatment within the standardised approach, where for example A, B, C grades, high sensitivity to CET1 ratio and Tier 1 leverage ratio do not influence directly the RW of the externally unrated exposure to banks.

During the analysis of the expected effects of implementation of SCRA, we are specially taking into account which values of the capital and risk management ratios banks will have at the start of 2023 when implementation is planned based on the latest available information. Also the other performances of the financial institutions will be important for the grades A, B and C. Among the capital and risk management ratios especially important for the bank aim to have best possible (i.e. lowest possible) SCRA RW, need to be highlighted CET1 ratio and Tier 1 leverage ratio.

The banks that enters in 2023 with adequate and relatively high capital and risk management ratios, meets all A grade requirements, buffer requirements, including Pillar 2, SREP (supervisory review and evaluation process) and other regulatory and internal capital adequacy requirements (regardless is it directly required by the SCRA or not), meets or exceeds CET1 ratio 14% and a Tier 1 leverage ratio that meets or exceeds 5%, will be in a good position to have lowest possible SCRA RW of 30% (except the RW for short-term exposures, which can be lower, i.e. 20%).

The above mentioned banks aim to be aligned with all the requirements for the best possible SCRA RW, and can serve as an interesting benchmarking among banks.

Financial institutions can use SCRA for the treatment of externally unrated exposure to banks. This topic is very interesting for the banking sectors dominated by externally unrated banks in the exposure to banks. This is the situation in Serbia. The Serbian banking sector is the perfect example for our special case study. On the global scale, this is a relatively smaller and developing sector (with the domination of externally unrated exposure) and economy.

The above mentioned SCRA will also be very important for banking sectors and banks with portfolios characterised by predominant externally rated bank exposure, but at the same time they have significant amount of the exposure to banks without external rating. Taking this fact into account, for the research further quantitative analysis of the implementation of SCRA expected effects, data of banking sectors that has significant portion of unrated bank exposure could be a good source. This is the reason to conduct further quantitative analysis of the expected effects of implementation of SCRA, on the publicly available data of the Serbian banking sector.

During the past years, i.e. for more than 10 years, banking sector in Serbia has had strong and significant capital adequacy, which is higher than the prescribed regulatory limits. This was also the

situation during different economic conditions (including global economic crisis one decade ago), regulations (Basel II, III) and regulatory minimums in Serbia (12%, 8%).

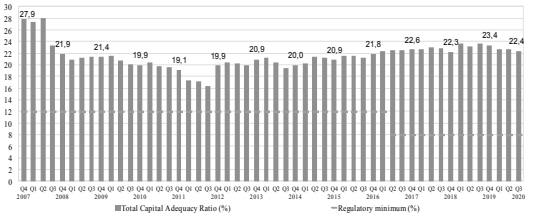

Figure 2 Total CAR of the banking sector in Serbia during the period 2007 - 2020

Source: the authors, based on National bank of Serbia, 2008a, 2008b, 2008c, 2009, 2019a, 2019b, 2020a, 2021.

The total capital adequacy ratio is presented on the graph above. Similar conclusions about strong capital adequacy in Republic of Serbia can be seen, during the CET1 ratio analysis, which has a shorter time series (starting with the implementation of Basel III in Serbia) in Serbia in comparison to Total CAR. During the whole presented period (Basel III period in Serbia), the CET1 ratio was significantly higher than the regulatory limit of 4.5%.

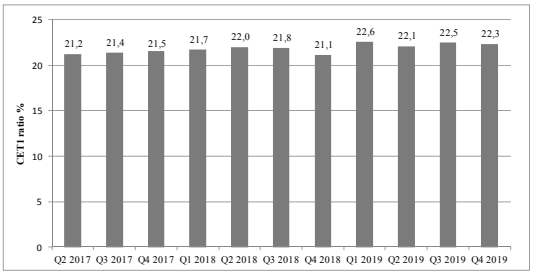

Figure 3 CET1 ratio of the banking sector in Serbia during period 2017 - 2019

Source: the authors, based on National bank of Serbia, 2020a.

To support the research hypothesis that the perspectives of the new BCBS SCRA bank exposure framework implementation can be defined, as well as to confirm previously stated opinion about traditional strong capital adequacy of the banking sector in Serbia, we will do a descriptive statistics analysis of CET1 ratio of the Serbian banking sector (its average values) for the period Q2 2017 – Q4 2019.

Table 5 Descriptive statistics of CET1 ratio of the banking sector in Serbia for the period Q2 2017 – Q4 2019

Indicators of descriptive statistics	CET1 ratio
Mean	21.83
Median	21.84
Standard Deviation	0.50
Kurtosis	-1.17
Skewness	-0.06
Minimum	21.07
Maximum	22.55
Number of observations	11

Source: the authors, based on data from National bank of Serbia, 2020a.

It can be concluded from the descriptive statistics (particularly mean, median, minimum, but also other stated indicators) for CET1 ratio that during this period banking sector in Serbia CET1 ratio stayed relatively stable and significantly higher than the regulatory minimum. The average CET1 ratio during this period was 21.83%. Basel III regulatory minimum was 4.5%, but banking sector in Serbia CET1 ratio stayed above the regulatory minimum even with its minimum in this period of 21.07%. Banking sector in Serbia CET1 ratio also stayed above the previously presented SCRA minimum for CET1 of 14%, so that the banks could achieve the lowest "base" RW. The presented high CET1 values are encouraging us that banks in Serbia have a high potential to achieve the best possible SCRA RW (with the assumption that the other grade A requirements are fulfilled).

Since the time series of the banking sector in Serbian CET1 ratio is relatively short (so we do not have significant number of observations), an additional descriptive statistics analysis for banking sector in Serbia was conducted, but now with Total CAR, since it has a much longer time series in Serbia, in comparison to CET1. Although we are aware that the capital in Total CAR is not the same like capital in CET1 ratio, what needs to be taken into account is the important positive characteristic of the capital in the banking sector in Serbia, stated in the following sentences. Namely, regulatory capital of the banking sector in Serbia is traditionally mostly formed from the highest quality capital, i.e. CET1 capital. As of Q4 2019, banking sector in Serbia Tier 1 capital accounts for 95.7% of the regulatory capital, while Tier 2 capital amounts to 4.3%. Almost the whole Tier 1 capital is Common Equity Tier 1 capital: 99.7%, while the Additional Tier 1 capital was 0.3% (National bank of Serbia, 2020b, p. 34). This is the reason to conduct further additional descriptive statistics analysis for the Serbian banking sector based on the Total CAR.

Table 6 Descriptive statistics of Total CAR of the banking sector in Serbia for the period Q4 2007 – Q3 2020

Indicators of descriptive statistics	Total CAR
Mean	21.53
Median	21.36

Standard Deviation	2.22
Kurtosis	2.49
Skewness	0.80
Minimum	16.40
Maximum	28.10
Number of observations	52

Source: the authors, based on data from: National bank of Serbia, 2008a, 2008b, 2008c, 2009, 2019a, 2019b, 2020a, 2021.

In this longer time series, there were 52 observations and numerous legislation changes (from: Basel II to Basel III framework, from International Accounting Standard 39 to International Financial Reporting Standards 9, etc.) in the capital adequacy treatment in Serbia. The characteristic of this time series is that it includes a period of the global financial crisis, period after this crisis and the first wave of coronavirus (Covid-19) disease. These factors increase the quality of presented time series. This is especially valuable taking into account that at this moment, when coronavirus disease is still strongly present worldwide, we cannot precisely predict its total effects on the global banking system in the forthcoming years. It can be seen from the descriptive statistics (mean, median, minimum and other) that during stated period the total CAR of the banking sector in Serbia stayed relatively strong, stable and significantly above the regulatory minimum. The average total CAR during this period was 21.53%. Total CAR regulatory minimum in Serbia was first 12% and then, defined to 8% with Basel III standard, but the total CAR of the banking sector in Serbia stayed above the regulatory minimum even with its minimum in this period of 16.40%. The conclusions based on the total CAR of the banking sector in Serbia are similar to the conclusions based on the CET1 ratio of the banking sector in Serbia. Namely, presented high total CAR values are also encouraging us that banks in Serbia have a high potential to achieve the best possible SCRA RW. Although, like stated before, in this moment we cannot precisely predict total effects of Covid-19 on the global banking system in the forthcoming years, the research has shown that the average CAR in Serbia stayed relatively high even during and after the global financial crisis that was active more than one decade ago. Additionally, BCBS has already reacted on the Covid-19 appearance with the prolongation of the Basel III reforms start to 2023, instead 2022 (Basel Committee on Banking Supervision, 2020). This BCBS's reaction, as well as previous experience with BCBS's decisions shows that it can be expected that the BCBS will continue to carefully analyse global situation in the forthcoming period (including Covid-19) and based on this it will decide when is the appropriate moment for start of the Basel III reforms (currently defined for 2023).

Previous conclusions regarding Serbian banking sector's expectations from SCRA, are additionally confirmed with the value of Tier 1 leverage ratio. On the presented Figure with Tier 1 leverage ratio of the banking sector in Serbia, we see that the values are significantly higher than the SCRA prescribed limit of 5% for the best RW treatment.

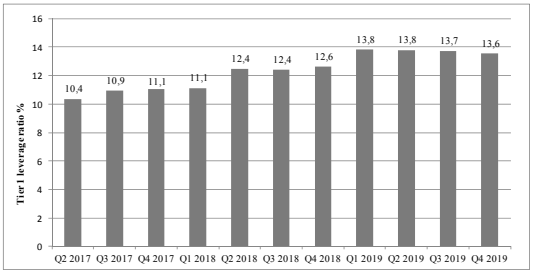

Figure 4 Tier 1 leverage ratio of the banking sector in Serbia during period 2017 - 2019

Source: the authors, based on: National bank of Serbia, 2020a.

The previously stated conclusions are also confirmed with Tier 1 leverage ratio descriptive statistics.

Table 7 Descriptive statistics of Tier 1 leverage ratio of the banking sector in Serbia for the period Q2 2017 – Q4 2019

Indicators of descriptive statistics	Tier 1 LR
Mean	12.35
Median	12.45
Standard Deviation	1.29
Kurtosis	-1.61
Skewness	-0.24
Minimum	10.37
Maximum	13.83
Number of observations	11

Source: the authors, based on data from: National bank of Serbia, 2020a.

Although the Tier 1 leverage ratio time series of the banking sector is relatively short, we see that this ratio in Serbia has stayed significantly above the SCRA stated level of 5%, even with its minimum in this period of 10.37%.

Based on all analyses presented in this chapter it can be concluded that externally unrated banks with strong and stable capital adequacy and other adequate parameters and ratios can have positive expectations from the implementation of SCRA that should be valid as of 2023. This confirms the first and second research hypotheses.

The paper has identified additional potential

for the positive effects if the banks achieve previously presented lowest possible SCRA RW. The stated is very important for the bank strategic management. This will be explained with the following hypothetical example that can be expected in 2023. This is very important information especially for the relatively smaller, developing, transition countries that often have the bank externally unrated exposure domination. The first bank in the paper's hypothetical example is a medium-sized international bank that has long term exposure to a second bank which is smaller and externally unrated, but it fulfils requirements for the lowest possible SCRA RW. There is a potential for the second bank to have lower cost of financing in comparison to a third bank (that would also receive loan from the first bank) with the following characteristics: also smaller and externally unrated bank but with higher SCRA RW due to lower CET1 ratio. In this example, the first bank, which calculates credit RWA based on the standardised approach, will have lower capital requirement based on the exposure to the second bank in comparison to exposure to the third bank. It is not guaranteed that the second bank can count on a lower interest rate in comparison to the third bank on the loans received from the first bank. However, there is potential for lower interest rate and cost of financing for the second bank, especially if we are analysing long-term exposures (for example refinancing lines which have a maturity of several years or longer). Based on the above, the second bank has a potential to offer lower interest rates to clients (corporate, retail, etc.) in comparison to the third bank. It can be expected that the first bank would be motivated to form this kind of different interest rate treatment, especially taking into account the importance of the cost of capital in today's international banking. Based on the previous, there is a potential for the capital allocation to banks with lower SCRA RW. If the general characteristic of one banking sector is low SCRA RW, then this could be positive for financing in this banking sector and economy. This can have positive impulse for performance improvement, efficiency and economic growth of the country in which characteristic of the banking sector is low SCRA RW for exposure to banks.

In accordance with the previous analysis, the recommendation to all banking sectors (especially those of the transition economies) for the successful start of usage of SCRA is related to the elements stated in the following sentences. The banks should continue to keep adequate capital and risk management ratios and improve it if possible and appropriate. The same stands for the related processes and system. If the values of their ratios are in accordance with the prescribed regulatory minimums, buffers, Pillar 2 (including SREP) requirement and other regulatory and internal capital adequacy requirements (regardless of whether it is directly required by the SCRA or not), they are on the good way to creating conditions for positive effects from the implementation of SCRA. All recommendations stated in the paper are confirm the third research hypothesis from the introductory chapter. The recommendations are also related to continuation of individual banks' careful planning of capital and risk management ratios and parameters, stress tests, different analyses and quantitative impact studies. It needs to be taken into account that an individual analysis which every bank can conduct on their own has the potential to be more precise, due to more available internal data on the particular bank level. This should induce that the banks are as ready as possible for the new regulations. There is a potential additional benefit for banks of using SCRA. Namely, SCRA can be useful in the banks' internal risk analysis and management, so not just for regulatory calculation. Banks can use SCRA as a kind of benchmark. They can use it for internal analysis, as an additional control tool or kind of additional validation for their rating models and analysis. For example, they can check what SCRA grade (A, B, C) externally rated banks would receive if they were analysed by the SCRA model. Banks can also try to compare SCRA grades with their internal rating for the same banks, etc. Based on previously stated, the recommendation for the banks would be that they should continue to analyse potential benefits on an individual level for the bank's internal risk and capital management of SCRA model. Banks should also continue to analyse the other options for treatment of exposure to banks, ECRA and IRB approach, so that they can see which approach is the best for them. The continuation of cooperation between all stakeholders in this process is also essential. Primarily, it should be a way to achieve maximal effects from the new regulations, in the field of bank risk and capital management, performance, control, financial stability strengthening and creating positive impulse for sustainable economic growth.

Conclusion

This paper has analysed the expected effects of the revised Basel III exposure to banks credit risk weighted assets standard that are due to be officially applied at the start of 2023 and incorporated in the banks' strategic management. All the major characteristics of the future, improved exposure to treatment of banks in the capital adequacy are presented. A comparison between existing solutions for the exposure to banks treatment, as part of the RWA calculation and planned revised solutions is performed in this study. Using the most relevant publicly available historical and present global experience, research results, analyses and databases during this research, the perspectives of the new BCBS bank exposure framework implementation have been defined.

In the scope of standardised credit RWA approach, for exposure to banks, ECRA can be used for externally rated exposure and SCRA for the unrated bank exposure. SCRA represents the most significant innovation in exposure to banks segment of RWA, although the ECRA improvements are also important. The changes of the capital adequacy ratios can be expected from the IRB exposure to banks changes, since banks will not use AIRB for exposure to banks anymore, so they will need to use either standardised or FIRB approach. The banks that had benefits from the internal estimation of AIRB credit RWA parameters now could be faced with increased credit RWA in the segment of exposure to banks. This would have an impact on capital adequacy reduction. However, the real big step forward in the exposure to banks is expected with the implementation of SCRA that is focused on externally unrated exposure to banks. The new SCRA approach with A, B, C grades, high sensitivity on CET1 ratio, Tier 1 leverage ratio and other improvements is a significant step in the capital and risk management progress. This improvement should be achieved with a more precise CET1 ratio (and other capital adequacy ratios) that is expected from the implementation of 2017 reforms.

The SCRA is very interesting for the banking sectors dominated by externally unrated banks in exposure to banks. In general, developed countries have much longer tradition with externally rated bank exposure in comparison to smaller, developing and transition countries that have usually faced externally rated exposure to banks later in comparison to developed countries. This was the reason to conduct a special case study and quantitative analysis regarding SCRA on the data of the banking sector in Serbia. The research has shown that relatively high capital adequacy, CET 1 ratio and Tier 1 leverage ratio in Serbia provide a good starting position on the way to achieving the best possible SCRA risk weight. SCRA will also be very important for banking sectors and banks whose portfolios are dominated externally rated bank exposure, but in the same time they have significant amount of exposure to banks without external rating. Based on the conducted analysis it was concluded that externally unrated banks with strong and stable capital adequacy and other adequate capital and risk parameters and ratios can have positive expectations from the implementation of SCRA that should come into force as of 2023.

The paper's recommendation for the successful start of usage of SCRA is that banks should continue to keep adequate capital and risk management ratios and improve them if possible and appropriate. The same stands for the related processes and system. If the values of their ratios are in accordance with the prescribed regulatory minimums, buffers, Pillar 2 (including SREP) requirement and other regulatory and internal capital adequacy requirements (regardless of whether it is directly required by the SCRA or not), they are on the good way to creating conditions for positive effects from the implementation of SCRA. The recommendations are also related to continuation of individual banks' careful planning of capital and risk management ratios and parameters, stress tests, different analysis and quantitative impact studies. SCRA can be useful in banks' internal risk analysis and management, i.e. not just for regulatory calculation. Banks can use SCRA as a kind of benchmark. Banks should also continue to analyse the other options for the exposure to banks treatment: ECRA and IRB approach, so that they can conclude which approach is the best for them. The continuation of cooperation between all stakeholders in this process is also essential. The above stated, should support establishing conditions for achieving maximal effects from the new regulation, on the micro and macro level.SM

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Job satisfaction and organizational citizenship behaviour of employees in companies in the Republic of Serbia

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Abstract
Organizational citizenship behaviour is a form of employees' behaviour where employees go beyond their formal duties required by job description. Despite the fact that this form of behaviour is not recognized or accepted by the reward system, employees are ready to put in an extra effort in order to achieve organizational goals. However, the readiness of employees to manifest this form of behaviour is not completely unconditional. Numerous empirical studies suggest that such behaviour can be encouraged by employees' job satisfaction, fulfilment of their psychological contract, perception of a high level of organizational justice in the company, support provided to them, etc. Having in mind the importance of this form of employees' behaviour, precisely from the point of view of employers, as well as the factors that influence it, this paper examines the impact of employees' job satisfaction on the level of their organizational citizenship behaviour on the example of the companies in Serbia. The paper starts with three hypotheses. The first and second hypotheses are that employees in companies in Serbia are satisfied with their jobs and that they demonstrate organizational citizenship behaviour. These assumptions were tested using the t-test. The third hypothesis is that employees' satisfaction with their job has a positive effect on their organizational citizenship behaviour. In order to test this hypothesis, methods of correlation and multiple regression analysis were used. The analysis is based on data obtained by primary research realized during 2019. In the research, 244 employees participated. The research showed that there is a positive relationship between respondents' job satisfaction and organizational citizenship behaviour, as well as the positive impact of job satisfaction on organizational citizenship behaviour of employees. This paper's contribution is twofold. First, it provides empirical data regarding the job satisfaction and organizational citizenship behaviour of employees in companies in Serbia. Second, it adds to the existing literature from this field by proposing strategies for increasing the employees' job satisfaction, which will lead to increasing the employees' willingness to manifest organizational citizenship behaviour.

Keywords
job satisfaction, organizational citizenship behaviour, employees, company

Introduction

Employees have always been an integral part of the work process, but their role and importance have changed over time. During the Industrial Revolution, they were seen only as a supplement to the means of work, while today they become "talent and dream investors" (Bartlett & Ghoshal, 2002). It is encouraging that today an increasing number of companies recognize the strategic role and importance of employees and see them as a source of competitive advantage.

A particularly valuable and important category of employees in companies are those employees who possess a high level of expertise, creativity and enthusiasm. Such employees are able to achieve extraordinary results in their work, even if they are not formally required to do so. This form of behaviour is known in the literature as *organizational citizenship behaviour*.

Research has showed that the manifestation of this form of employees' behaviour has several positive consequences in the working place. It was found that in companies where this form of employees' behaviour is present, the staff turnover rate is low, the company's resources are used rationally and organizational commitment and morale of employees are at a high level (Hemakumara, Khatibi, & Johar, 2018; Demirel, Elhusadi, & Alhasadi, 2018; Szabó, Slavić, & Berber, 2019) etc.

However, the manifestation of this form of employees' behaviour is not completely unconditional. It has been found that the readiness of employees to go beyond their formal duties is influenced by numerous factors. Some of them are fulfilling the psychological contracts of employees (Robinson, 1996; Sadiq, 2014; Milanović, Đokić, & Đorđević, 2018), perceptions of organizational justice (Niehoff & Moorman, 1993), perceived organizational support (Miao, 2011; Duffy & Lilly 2013; Jebeli & Etebarian, 2015), and many others.

One of the factors that could also be linked to organizational citizenship behaviour is job satisfaction. Previous research has showed that job satisfaction has a positive effect on organizational citizenship behaviour. However, it has also been found that organizational citizenship behaviour has a positive impact on job satisfaction, conversely (Intaraprasong, Dityen, & Krugkrunjit, 2012; Swaminathan & Jawahar, 2013) indicating that these phenomenons can reinforce each other.

Having in mind the above stated, the authors of the paper believe that job satisfaction of the employees in Serbian companies have a positive impact on their readiness to exhibit organizational citizenship behaviour. Therefore, the subject of the paper is studying the relationship between these phenomena with the hypothesis that job satisfaction of the employees in Serbian companies has a positive impact on their organizational citizenship behavior. The empirical research included 244 employees. The aim of the paper, is, first to find out the relationship between these job-related variables and second, to propose mechanisms and measures for increasing the employees' job satisfaction.

The paper is structured as follows. First, reviewing the literature on the concepts of job satisfaction and organizational citizenship behaviour is given. Second, hypotheses are developed and the research methodology is explained. Third, the obtained results are presented and discussed. Finally, at the end of the paper, an overview of the study's implications for human resource management and concluding considerations are presented.

1. Literature review

1.1. Job satisfaction

Job satisfaction is one of the most studied, but also one of the most controversial topics in human resource management (Givaki, Davoudi, Manzari, & Alipour Katigarie, 2017). The reason for that is that there is still no unique opinion on whether a satisfied worker is necessarily a productive worker. This further suggests that there are still reasons for new research in this area.

When it comes to defining this phenomenon, the time range of research on this topic, as well as the interest of many authors in it, have resulted in numerous explanations of what job satisfaction means. In the literature, however, the opinions of the most referenced authors in this field stand out. Thus, for example, Locke (1976) states that job satisfaction is a pleasant or positive emotional state that results from the evaluation of a job or the experience associated with it. Spector (1997), further, states that job satisfaction can be viewed either as a global feeling arising from doing a particular job or as a constellation of different attitudes about different aspects of work.

Mullins (2005) supports the view that job satisfaction is a multidimensional phenomenon that has different meanings for different people (Mullins, 2005 in Aziri, 2011; Ivanović-Đukić, Đorđević, & Lepojević, 2018), suggesting that what particular employee may be satisfied with is not necessarily the source of job satisfaction of other employees. This can be explained by the fact that different people have different needs and expectations from the job. In that sense, Adenuga (2015) states that job satisfaction reflects the level of compatibility between employees' expectations of the job and the rewards that the job provides.

It can be concluded from the above definitions of job satisfaction that the causes of job

satisfaction or dissatisfaction can be based on different grounds for different people.

An important topic regarding job satisfaction in the literature was investigating the causes of this phenomenon as well. Summarizing all the potential causes of this phenomenon, Riaz (2016) states that there are five dominant models of job satisfaction. Those models are: the model of the fulfilment of needs, the model of discrepancy in the level of realized expectations, the model of values, the model of equity and the model of genetic predisposition (Riaz, 2016). The essence of *the needs-fulfilment model* is that employees will be satisfied with the job to the extent that the job enables them to satisfy their needs. *The model of discrepancy in the level of realized expectations* is based on the premise that employees will be satisfied with the job if their expectations of the job are met, or if there is no mismatch in this regard. *The value model* is based on the belief that employees will be satisfied with the job if it allows them to achieve values that are important to them. *The equity model* is based on the attitude that employees will be satisfied with their job if they believe that the rewards in the company are fair, meaning that equal results are followed by equal rewards. Finally, *the model of genetic predisposition* is based on the belief that job satisfaction is partly a function of personal traits and genetic factors. In other words, this model is based on the attitude that stable individual differences are important in explaining differences in job satisfaction.

Despite the conceptual differences related to explaining the causes of job satisfaction, the authors agree that this phenomenon is related to many important phenomena in the working environment. In this regard, it was found that job satisfaction has a negative impact on the intention to leave the company (Wang & Zhang, 2010), positive effect on the quality of services provided to clients (Singh & Jain, 2013), positive effect on the commitment to the goals of the company (Kuzey, 2012; Latif, Ahmad, Qasim, Mushtaq, Ferdoos, & Naeem, 2013), etc.

One of the phenomena that job satisfaction is also associated with is the organizational citizenship behaviour of employees.

1.2. Organizational citizenship behaviour

The founder of the concept of organizational citizenship behaviour is Organ (1988). This author sees in organizational citizenship behaviour of employees a behaviour that is discretionary (voluntary) but which contributes to the more effective functioning of the organization, even though it is not directly and explicitly recognized by the reward system in the company. Because this form of employees' behaviour is not formally required of them, it is often referred to as behaviour that exceeds the role assigned to employees in the organization (Bienstock, DeMoranville, & Smith, 2003).

In the literature, it is almost common to look at the concept of organizational citizenship behaviour through its five dimensions: conscientiousness, altruism, civic virtues, sportsmanship, or "fair play", as well as courtesy. According to Organ (1988), *conscientiousness* reflects discretionary behaviour that is above the minimum required behaviour of the employee. *Altruism* refers to helping other team members in facing various organizational problems or tasks. *Civic virtues* reflect behaviour that demonstrates a willingness to participate responsibly in the life of the organization. *Sportsmanship* or *"fair play"* behaviour refers to the tolerance of employees towards others, as well as the willingness to accept changes in the organization even if they do not agree with them. Finally, *courtesy* reflects the care of employees for others or a willingness to help others (Organ, 1988).

Podsakoff, MacKenzie, Paine, and Bachrach (2000) have a very analytical approach when it comes to forms of organizational citizenship behaviour. Namely, they distinguish seven forms of this behaviour, such as assistance, "fair play" or sportsmanship, innovation, civic virtues, organizational commitment, self-satisfaction and individual growth.

Anderson and Gerbing (1988) stressed that the concept of organizational citizenship behaviour can be viewed as stratified, pointing out that organizational citizenship behaviour can be observed from two perspectives. Thus, they make a distinction between citizenship behaviour of employees that is directed towards individuals (organizational citizenship behaviour - individual) and citizenship behaviour that is directed towards the organization (organizational citizenship behaviour - organizational).

Since this concept, like the previous one, constantly attracts the attention of theorists, the views of its essence can also be found in more recent papers. Thus, Zeyada (2018) explains organizational citizenship behaviour as optional and voluntary employee's behaviour. Thiruvenkadam et al. (2017), further, state that

this form of behaviour does not have necessarily to be manifest by employees who achieve superior performance. For this form of behaviour to be demonstrate it is necessary that employees are ready to go "a step further", concerning what is formally required of them. In other words, this form of behaviour is characteristic of employees who are willing to invest more effort than the minimum that requires the satisfactory performance of their work (Thiruvenkadam, Yabesh, & Durairaj, 2017).

Organizational citizenship behaviour as the previously described phenomenon (job satisfaction), has also a significant impact in working place. For example, it was found that this form of behaviour has a positive impact on performance at the organizational level (Podsakoff et al., 2000). Some recent studies found that this form of employees' behaviour is negatively correlated with staff turnover, but, on the other side, has a positive impact on the rational use of the company's resources, organizational commitment, employees' morale, and overall organizational goals (Hemakumara et al., 2018; Demirel et al., 2018).

1.3. Hypothesis development

The relationship between phenomena such as job satisfaction and organizational citizenship behaviour has been researched by a vast number of authors. Consequently, there are a large number of empirical studies regarding this topic. In almost all of them it was found that there is a relationship between these phenomena, but in terms of the direction of influence, a unique conclusion cannot be given (Podsakoff, MacKenzie, & Hui, 1993). Namely, in some studies, it has been found that job satisfaction leads to the manifestation of organizational citizenship behaviour, and in others that job satisfaction results from organizational citizenship behaviour (Koys, 2001).

However, it seems that more studies have found that job satisfaction of employees leads to their exhibition of organizational citizenship behaviour. For example, it was found that job satisfaction and affective commitment of employees have a positive impact on organizational citizenship behaviour (Uludağ, Khan, & Güden, 2011). In some studies, for example, it was found that intrinsic and extrinsic factors of job satisfaction are good predictors of organizational citizenship behaviour (Mohammad, Habib, & Alias, 2011). A study by Huang, You and Tsai (2012) also found that peer satisfaction, as one aspect of job satisfaction, affects organizational citizenship behaviour significantly. The positive impact of job satisfaction on organizational citizenship behaviour has been found in many other studies as well (Schappe, 1998; Intaraprasong et al., 2012; Arif & Chohan, 2012; Günay, 2018).

Bearing in mind the above, the authors of the paper believe that situation regarding the relationship between employees' job satisfaction and organizational citizenship behaviour in the companies in Serbia is not different than in other countries, so the hypotheses that are going to be tested in this paper are as follows:

H1: Employees in companies in Serbia are satisfied with their jobs.

H2: Employees in companies in Serbia show organizational citizenship behaviour.

H3: Employees' satisfaction with aspects of their job in companies in Serbia has a positive effect on their organizational citizenship behaviour.

2. Research methodology

Procedure. These hypotheses were tested based on data from a sample of employees in Serbia. Employees were surveyed during 2019 in order to determine the level of their job satisfaction and organizational citizenship behaviour. 300 questionnaires were distributed to employees who agreed to participate in the survey. 244 employees completed it, giving a response rate of 81.33 per cent. There were no incomplete questionnaires, so all of them were included in the analysis. Students of the Faculty of Economics, University of Niš, who performed professional practice within regular student activities, distributed the questionnaires to employees. Employees from 33 companies participated in the research. Their structure is as follows: 14 micro, 10 small, 5 medium and 4 large companies. Regarding the activities of the companies whose employees were included in the research, a wide range thereof was determined.

Sample. Among the respondents, 45.9 per cent were men, while the percentage of women was 54.1. This indicates approximately equal participation of men and women. According to the age criterion, respondents under the age of 25 amounted to 9 per cent of the sample. The largest part, 47.1 per cent, were respondents of the ages between 26 and 40. Respondents of the ages between 41 and 55 amounted to 38.1 per cent, while 5.7 per cent were those with ages over 55.

When it comes to educational structure, the respondents predominantly had the fourth level of education, i.e., completed secondary school (36.1%) and the sixth level of education, i.e., completed college/university (27.0%) (Table 1).

Instruments. The first part of the questionnaire was designed to examine the demographic characteristics of respondents, while the second part of the questionnaire contained questions that sought to determine the level of their job satisfaction and organizational citizenship behaviour. Job satisfaction was measured by means of seven questions, where the respondents rated the degree of agreement with the listed statements on a five-point Likert scale from 1 – I completely disagree to 5 – I completely agree. The questionnaire used to measure job satisfaction was created by Fernandes and Awamleh (2006) in the expatriate job satisfaction survey, and was later used in many other studies. Each statement in the questionnaire represents one segment of the overall job satisfaction of the employee. An example of a job satisfaction statement is: "My opinion is respected at work." The reliability of the measuring scale expressed by the Cronbach's alpha indicator in the value of 0.864 was obtained by excluding the statement from the analysis: "In principle, I am satisfied/with this job."

Organizational citizenship behaviour was measured through eight questions using a five-point Likert scale, where 1 represented complete disagreement with the statement and 5 complete agreements with the statement. The questionnaire used in the survey was previously introduced by Sanders and Roefs (2002). An example of a statement for measuring organizational citizenship behaviour is: "Even when no one asks me, I try to help others not to make a mistake." The reliability of the measuring scale expressed by the Cronbach's alpha indicator in the value of 0.835 was obtained by excluding the statement from the analysis: "Regardless of changes in work, I will always try to do my job as well as possible."

Cronbach's alpha coefficients, as the most commonly used measure of scale reliability, show acceptable reliability (Field, 2018) and are comparable to the original measurement scales used in similar studies (Sanders & Roefs, 2002; Fernandes & Awamleh, 2006).

Data analysis. IBM SPSS program, version 26 was used for the analysis of the obtained data. First, the testing of data deviation from normality was performed. To test the proposed hypothesis, t-test, Pearson correlation and multiple linear regression were applied.

Table 1 Sample structure

	Frequency	Percentage (%)
Gender	**244**	**100**
Male	112	45.9
Female	132	54.1
Age	**244**	**100**
Up to 25 years	22	9.0
26-40 years	115	47.1
41-55 years	93	38.1
Over 55 years	14	5.7
Education (level)	**244**	**100**
II	1	0.4
III	16	6.6
IV	88	36.1
V	30	12.3
VI	66	27.0
VII	33	13.5
VIII	10	4.1

Source: the authors' calculation

According to Cohen (1992), if the Pearson correlation coefficient has a value of ± 0.10, it will represent a small effect, ± 0.30 a medium effect, and ± 0.50 a large effect. A threshold of $p < 0.05$ was taken for the level of statistical significance of the results.

Table 2 Minimum, maximum, mean and correlation between variables

Variable	Mean	St. Dev.	JS1	JS2	JS3	JS4	JS5	JS6	JS	OCB
My opinion is respected at work (JS1)	3,8852	,84324	1							
Most people in this company are satisfied with their job (JS2)	3,6557	1,10569	,333**	1						
I am satisfied with the recognition I receive for the job (JS3)	3,7910	,98620	,456**	,587**	1					
I am satisfied with my earnings having in mind the earnings for similar jobs in other companies (JS4)	3,7090	1,11912	,449**	,451**	,590**	1				
I am satisfied with the relationship between my boss and other employees (JS5)	3,9385	1,09258	,394**	,541***	,546**	,456**	1			
I am satisfied with the way my boss directs and organizes employees (JS6)	3,9918	1,11846	,462**	,567**	,521**	,527**	,808**	1		

Job Satisfaction (JS)	3,8286	,80910	,641**	,761**	,795**	,755**	,819**	,849**	(,864)	
Organizational Citizenship Behaviour (OCB)	3,8343	,76525	,441**	,367**	,399**	,402**	,370**	,347**	,497**	(,835)

Note: ** Correlation is significant at 0.01 level; the values of the Cronbach's alpha coefficient are presented in parentheses

Source: the authors' calculation

3. Results, analysis and discussion

Table 2 shows the mean, standard deviation and correlation coefficients between all variables that are the subject of analysis. The mean value of the variables job satisfaction and organizational citizenship behaviour is higher than 3 on the Likert scale from 1 to 5, which suggests that employees in Serbia are satisfied with the work they do and that they manifest organizational citizenship behaviour. A value of 3 is taken as the reference value since on the Likert scale it denotes a neutral attitude. All values less than 3 indicate a negative attitude towards job satisfaction and organizational citizenship behaviour, while values above 3 indicate a positive attitude towards the same phenomena.

Based on the data from Table 2, it can be concluded that the mean values of all responses that contribute to the overall job satisfaction are higher than three. The data also show that employees are the most satisfied with the relationship with the superiors (Mean = 3.9385, St.dev. = 1.09258) and their leadership style (Mean = 3.9918, St.dev. = 1.11846). The data from Table 2 further show that employees are the least satisfied with the earnings they receive in their company (Mean = 3.7090, St.dev. = 1.11912). Finally, Table 2 shows that the overall job satisfaction of employees in Serbia has an average value above 3, i.e., to be 3.8286 (St.dev. = 0.80910), indicating that employees are generally satisfied with the work they do.

When it comes to organizational citizenship behaviour, the data indicate that employees in companies in Serbia manifest this form of behaviour, bearing in mind that the average value of this variable is above 3 (Mean = 3.8342, St.dev. = 0.76525).

An important data from Table 2 is that the correlation coefficient is 0.497, which shows that there is a positive relationship between employee job satisfaction and organizational citizenship behaviour with a medium practical effect (Cohen, 1992).

In order to test the first and second hypotheses that employees in Serbia are satisfied with their jobs and manifest organizational citizenship behaviour, the t-test was applied (Table 3).

Table 3 T-test

	Test value = 3					
			Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
	t	df			Lower	Upper
Job satisfaction	15.996	243	.000	.82855	.7265	.9306
Organisational citizenship behaviour	17.030	243	.000	.83431	.7378	.9308

Source: the authors' calculation

The data in Table 3 present that the attitudes of the surveyed employees differ statistically significantly from the value 3, which, according to the used Likert scale, means a neutral attitude towards job satisfaction and organizational citizenship behaviour. In addition, the data show that respondents are satisfied with the work they do (t = 15.996, df = 243, p = 0.000) and that they demonstrate organizational citizenship behavior at work (t = 17.030, df = 243, p = 0.000). Based on the above, it can be concluded that hypotheses H1 and H2 have been confirmed.

Hypothesis 3 that satisfaction with job aspects of employees in companies in the Republic of Serbia has a positive effect on their organizational citizenship behaviour was tested by using multiple linear regression analysis, and the results are shown in Table 4.

Table 4 Multiple linear regression analysis

Dependent variable	Organizational citizenship behaviour
Constant	1.752
JS1 - My opinion is respected at work	.254***
JS2 - Most people in this company are satisfied with their job	.096
JS3 - I am satisfied with the recognition I receive for the job	.049

JS4 - I am satisfied with my earnings having in mind the earnings for similar jobs in other companies	.109*
JS5 - I am satisfied with the relationship between my boss and other employees	.118
JS6 - I am satisfied with the way my boss directs and organizes employees	-.078
R square	.286
Adjusted R2	.268
Change R2	.286***
F	15.853***

Note: ***p < 0.001, * p < 0.05
Source: the authors' calculation

The data listed in Table 4 indicate the existence of the impact of satisfaction with different aspects of the job on the organizational citizenship behaviour of employees in the Republic of Serbia (adjusted R2 = .268, F = 15.853, p <0.05), which indicates that hypothesis H3 was confirmed. Multiple linear regression analysis also shows that respondents' satisfaction with certain aspects of work explains 28.6% of the variability of their organizational citizenship behaviour. Given that the model is statistically significant (F (6.237) = 15.853, p <0.05), it can be used to estimate the influence of independents on the dependent variable, and the regression equation has the following form:

Organizational Citizenship Behavior = 1.752 + 0.254 (JS1) + 0.096 (JS2) + 0.049 (JS3) + 0.109 (JS4) + 0.118 (JS5) - 0.078 (JS6)
(1)

Non-standardized beta coefficients suggest that the influence of the first five independent variables is positive, while the sixth variable has a negative impact on the dependent variable – organizational citizenship behaviour. In addition, when employees' satisfaction with some aspect of job satisfaction increases, they are more likely to exhibit organizational citizenship behaviour and vice versa for the latter variable. However, in the mentioned regression equation, only in the first and fourth dimensions of job satisfaction, a statistically significant influence on organizational citizenship behaviour was detected, because only their regression coefficients were significant at the level of p <0.05. Therefore, satisfaction with respect for the employee's opinion and earnings are the main factors of job satisfaction that have an impact on the organizational citizenship behaviour of the employee. In addition, a higher regression coefficient in terms of satisfaction with respecting the employees' opinion indicates a stronger influence of this variable on organizational citizenship behaviour than the variable satisfaction with employee earnings.

The results of the study conducted by the authors of this paper are similar to the results found in other studies. Namely, a study conducted by Ilies, Lanajb, Pluutc and Gohd (2018) among employees in local government and one university showed that job satisfaction was a mediatory variable in the relationship between the fulfilment of intrapersonal and interpersonal needs and organizational citizenship behaviour. It was shown that the fulfilment of intrapersonal and interpersonal needs has a direct impact on job satisfaction, and that, then, job satisfaction as a mediator variable has a direct impact on organizational citizenship behaviour. In the research conducted by these authors, it was also found that job satisfaction explains 25 per cent of the variability in organizational citizenship behaviour ($\beta = 0.25$, $p = 0.008$), which is in line with the results of our research.

The results of our study are also in line with the results of Shafazawana, Yeh Ying, Zuliawati and Sukumaran (2016) who found a moderate positive correlation between job satisfaction and organizational citizenship behaviour ($r = 0.451$, $p < 0.01$). Linear regression analysis showed through the coefficient of determination that 26.9% of the variability in organizational citizenship behaviour of teachers in secondary schools can be explained by job satisfaction and organizational commitment. In the same study, it was found that job satisfaction had a statistically significant effect on organizational citizenship behaviour ($\beta = 0.299$, $p < 0.01$) (Shafazawana et al., 2016, p. 609).

Finally, Huang et al. (2012) investigated the impact of organizational climate, job satisfaction dimensions, and organizational commitment on three dimensions of organizational citizenship behaviour among nurses. Their results suggest that only the satisfaction with colleagues, as one of the five researched dimensions of job satisfaction, significantly affects the dimension of organizational citizenship behaviour, while in our research satisfaction with respect paid to employees' opinion and earnings are the main

factors influencing organizational citizenship behaviour.

4. Implications for human resource management

Since numerous empirical studies cited in the paper have shown that both job satisfaction and organizational citizenship behaviour of employees can be linked to several positive phenomena in the work environment, companies should take all measures in the field of human resource management to make a positive impact on both phenomena. At the same time, having in mind the nature of their relations, it can be expected that these phenomena will also have a positive influence on each other.

In the context of the empirical research conducted by the authors of this paper, as well as the proven hypotheses, there are several recommendations for managers in companies in the Republic of Serbia in order to increase employees' job satisfaction.

The first recommendation is related to the improvement of the reward system, which is a very powerful mechanism for increasing employee's job satisfaction (Tănăsescu & Leon, 2019). Namely, although the research showed that employees who were included in the survey are generally satisfied with their jobs, there is a place for increasing it through increasing the satisfaction with the rewarding system. Namely, in the study, it was found that the lowest average satisfaction ratings are expressed in this area. The survey showed that when it is about satisfaction with the recognition that employees receive for their work the average grade is 3.79, while when it comes to satisfaction with earnings compared to similar companies, the average grade of satisfaction is 3.70. Having in mind the previously stated, employees' job satisfaction can be increased by greater use of intangible forms of rewards (praise, recognition, etc.), as well as by striving to establish the highest possible level of external justice when it comes to paying. Otherwise, those employees who think they are worth more may leave companies.

However, organizational citizenship behaviour can be encouraged by mechanisms and measures other than those described above. Taking into consideration that the aforementioned studies have shown that this form of behaviour is influenced by the fulfilment of a psychological contract, the perception of organizational justice, as well as organizational support, therefore very useful mechanisms for stimulating organizational citizenship behaviour can be found in these areas. Thus, when it comes to a psychological contract, the employer must fulfil the given promises, because employees will be more satisfied with the relationship with him and more willing to engage in their workplace (Coyle-Shapiro & Kessler, 2000). Conversely, if employees feel that their expectations have been betrayed, that is, that the employer has not fulfilled the given promises, they will reduce their efforts only to the level defined by their role in the organization or will even reduce it below that level.

The organizational support that employees receive can also encourage them to go beyond their formal duties. Specifically, if employees believe that the organization values them and supports them, according to the theory of social exchange, it can be expected that employees will "reciprocate" by engaging in the execution of work tasks more than what is expected of them. In other words, perceived organizational support will lead to reciprocal additional engagement by employees where they will try to reciprocate with better performance in order to “repay” for the awards and support received. Such messages that the theory of social exchange sends have been confirmed in numerous empirical studies (Chiang & Hsieh, 2012; Cheung, 2013; Jovanović, 2019).

Finally, the space for stimulating employees to express the organizational citizenship behaviour to a greater extent is in the domain of organizational justice. This is because numerous studies have confirmed the positive link between the perception of justice in the organization and certain dimensions of organizational citizenship behaviour. Thus, Konovsky and Folger (1991) established a strong link between procedural fairness and employee's altruism. Based on the findings of their study, it can be concluded that if employees are satisfied with the decision-making process in the organization (and this is most often when they are involved in their decision-making), they are more willing to help other members of the organization when they face difficulties. The positive impact of organizational justice on organizational citizenship behaviour has been confirmed in several other studies (Karriker & Williams, 2009; Jafari & Bidarian, 2012).

Conclusion

The subject of the authors' research were employees in 33 companies operating in the

territory of Serbia. A total of 244 surveyed employees expressed the view that they were satisfied with the work they were doing and that they showed organizational citizenship behaviour. The analysis further showed that there is a positive relationship between respondents' job satisfaction and their organizational citizenship behaviour, but also the positive impact of job satisfaction on organizational citizenship behaviour. In addition, the research showed that 28.6% of the variability of the dependent variable could be explained by the variability of the independent variable, which in this case is job satisfaction, specifically its aspects. Also, respect for the employee's opinion and satisfaction with earnings are decisive factors for the manifestation of organizational citizenship behaviour of employees. The results of this research are consistent with the results of other studies in this field (Huang et al., 2012; Shafazawana et al., 2016; Ilies et al., 2018) so that the reliability of the results of the presented analysis is correct.

Following the obtained research results, the paper proposes certain mechanisms and measures that human resources managers can use to encourage employees in companies in Serbia to manifest organizational citizenship behaviour, whether they act directly on this form of behaviour, or by increasing job satisfaction.

However, this paper is not without limitations. They are primarily related to the size of the sample, as well as the fact that only employees in one part of Serbia were surveyed, mostly in the south-eastern part. Therefore, for the conclusions to be generalized, future research on this topic must be followed by an increase in the number of respondents. However, despite the obvious limitations of this research, it has some contributions. First, it provides empirical data on job satisfaction and organizational citizenship behaviour of employees in Serbia (the empirical studies in this area are quite rare). Second, it proposes set of measures to encourage organizational citizenship behaviour through increasing the employees' job satisfaction, which will simultaneously contribute to improvement of working conditions for employees.SM

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Does capital structure affect the differences in the financial performance of small enterprises?

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Abstract
Capital structure refers to the combination of debt and equity that the company uses to finance overall operations and growth. One of the most common problems of small enterprises is difficult access to various sources of financing, which is certainly reflected in their capital structure. Deciding on capital structure is one of the most important activities in the company, given that it significantly determines the performance of the company, but also the competitiveness and sustainability of the business. The aim of the study was to investigate whether there is a significant difference in financial performance between enterprises belonging to different leverage levels. Financial leverage was calculated by dividing total debts to total assets and based on leverage the companies are divided into 3 groups. Using ANOVA analysis, we found that the only difference in financial performance indicators was observed with NPM (but with a small effect size: eta square = 0.0470), whereas no statistically significant difference was observed between the groups in the ROE and ROA indicators.

Keywords
Capital structure, financial performance, leverage, small enterprises.

Introduction

"Capital structure is essentially concerned with how a firm finances its overall operations and progress by using different sources of funds" (Martinez, Scherger & Guercio, 2019, p. 106). Deciding on capital structure is one of the most important issues, given that capital structure largely determines the future performance of the company, and as Trif, Dutu & Tuleu (2019) state "Business performance is the primary goal of any type of firm, being a top priority for managers" (p. 292).

Capital structure decisions are very important for companies, because, in addition to affecting financial performance, it significantly contributes to a company's ability to adapt to a competitive and rapidly changing economic environment (Norvaisiene, 2012). This issue is especially important when it comes to small enterprises, given that many sources of financing are not available to small enterprises, primarily because of their risk, and that the capital structure of small enterprises differs significantly from the capital structure of large companies (Stoiljković & Marić, 2021).

The relationship between capital structure and company performance is explained by several theories and supported by empirical research from many countries. In this paper, the authors will try to analyse whether capital structure, measured by leverage level, determines the differences in the financial performance of small enterprises in the Autonomous Province of Vojvodina, Republic of Serbia.

The largest number of empirical studies on capital structure has been conducted in developed countries, where the most significant theories of capital structure have emerged. It is especially important to look at the results of research from developing countries, and to check whether companies with higher levels of leverage have better financial performance, which is mainly shown by the results of research conducted in developed countries.

1. Theoretical background and review of previous empirical research

In order for companies to achieve their goals, it is necessary to have certain resources that they can obtain from different sources. Sources of financing can be viewed from different aspects, such as time period, ownership and others. Sources of short term financing are those whose maturity is less than one year and most often include short-term loans and borrowings, payables, short-term securities issued, etc. Long-term sources of financing are those whose maturity is more than one year and are particularly significant in that they reflect the structure of capital and affect the long-term stability of financing (Erić, Beraha, Đuričin, Kecman & Jakšić, 2012). Equity involves the use of funds by the business owner while debt capital (borrowing) involves borrowing money from a bank or other lenders. Internal financing includes cash flows generated by the company's existing assets (Damodaran, Klajn & Popović, 2007). Internal sources of financing can be further differentiated into internal own sources (accumulated profit, depreciated capital, formation of reserves from profit) and internal other sources (formation of reserves for taxes, pensions or retention of amounts for fulfilment of some arrears). External financing includes cash flows generated outside the enterprise, from private sources or financial markets. External financing can be obtained by issuing new debt and equity securities or by issuing hybrids, and in accordance with the above, external sources of financing of the company can be classified into external own sources (equity, permanent deposits, equity of the owner, external reserves) and external sources which include all types of loans and other forms of engaging other people's assets (Damodaran et al., 2007). Also, with regard to external sources of financing there is a distinction between informal and formal sources. Informal sources mean funds raised from family, friends and so-called business angels, while formal sources include bank loans, leasing, trade loans and factoring.

"The structure of the sources of financing of the company indicates the security of the company from the aspect of financial independence" (Mirović, Mijić & Andrašić, 2018, p. 95). Although companies that finance their activities from predominantly their own sources of financing are characterized by high financial stability, these companies, by limiting the use of borrowed sources of financing, at the same time limit the possibility of increasing the return on invested capital and growth rates. However, it should be noted that in addition to greater potential for development and increasing profitability, the large use of borrowed sources of financing also causes greater financial risk (Norvaisiene, 2012).

Small businesses and entrepreneurs face significant problems in obtaining financing to start a business, as well as to finance business development (Jovin, 2016). According to Paunović & Novković (2003) the most common obstacles to the use of bank loans in small and medium-sized enterprises are: lack of adequate means of securing loans, lack of documentation on business venture and enterprise, lack of knowledge to present the project to creditors appropriately, orientation of lenders to financing large companies and, consequently, lack of a methodology for evaluating small projects, which makes the evaluation process expensive, especially in relation to small, individual loan amounts, while Michaelas, Chittenden & Poutziouris (1999) cite higher bankruptcy costs, lower marginal income tax rates and high-asymmetry information as reasons why small businesses have low debt levels.

Down (2010) states that small firms have limited access to long-term loans. Bastos & Nakamura (2009) note that since the internal funds of small enterprises are not sufficient to finance their growth, small enterprises must rely more on short-term debt, given that they are not in a position to acquire long-term debt, such as large companies can, because of their characteristics (based on quotation in Pacheco, 2016, p. 540). Mateev & Birundu (2013) state that larger companies have much higher leverage ratios compared to small companies.

Cassar (2004) states that it can be relatively more expensive for smaller firms to deal with the problem of information asymmetry, which leads

to capital constraints for small businesses or causes capital to be available at higher rates, which certainly discourages small businesses from using external financing. It can be concluded that small enterprises find it more difficult to access external sources of financing, especially when it comes to banks, which, due to the underdevelopment of the financial market in Serbia, are the dominant source of obtaining borrowed funds. A study conducted in Pakistan shows similar findings. Khan (2012) found that the costs of external sources of financing are much higher and difficult to obtain due to market inefficiency and information asymmetry, and that the analysed companies are largely financed by short-term debt, while only 9% of company assets are financed by long-term debt.

There are numerous theories of capital structure, among which, in addition to the basic and most famous Modigliani-Miller theory, Trade-off and Pecking order theory stand out. Trade-off theory (Kraus & Litzenberger, 1973) suggests that firms choose their capital structure by balancing the benefits and costs of debt. The main benefit of using debt refers to tax savings, while debt costs are mainly including bankruptcy costs. The optimum capital structure is achieved by a balance between tax savings based on debt and bankruptcy costs. Pecking order theory (Myers & Majluf, 1984) does not consider the optimal relationship between debt and equity, but points out that companies prioritize different sources of financing when composing their capital structure, so companies first decide on internal sources of financing, then resort to borrowing, while finally they decide to issue equity.

Also a very important theory, especially when the focus is on small businesses, is the Growth cycle (Berger & Udell, 1998). According to this theory, capital structure varies with firm size and age, so in the early stages, when companies are young or small, they are directed to financing from internal and mostly informal sources, commercial loans or through business angels, while companies that move to later stages of growth can access various external sources. As companies get older and larger, they will tend to use more external sources of capital (Berger & Udell, 1998). The authors conclude that different capital structures are optimal at different points in the cycle.

When it comes to empirical research that focuses on small enterprises, capital structure and its impact on enterprise performance, the research results are different. Analysing the decisions on the capital structure on a sample of small and medium-sized enterprises in Portugal, Sardo & Serrasqueiro (2017) came to results that are in line with the dynamic Trade-off theory, i.e. the analysed enterprises adjusted the ratio of short-term and long-term debt to respective target ratios. Deesomsak, Paudial & Pescetto (2004) analysed companies operating in the Asia-Pacific region and came to results that indicate that only in the case of Malaysia is there a significant and negative relationship between profitability and leverage. The results also show that when profits are high, Malaysian firms prefer to use internal sources of financing, which is in line with the predictions of the Pecking order theory. Results of study by Pacheco (2016) in Portuguese small and medium-sized enterprises are in favour of Pecking order theory. Observing the business life cycle of companies, La Rocca, La Rocca & Cariola (2011) came to interesting results which show that companies depending on the phase of their business life cycle define a different hierarchy of financial decision-making, so in the early stages, debt is the first choice and fundamental for business activities, which is contrary to the usual assumption, while in the maturity phase, firms rebalance the capital structure, relying more on internal sources, which is consistent with the Pecking order theory.

Mwangi & Birundu (2015) analysed enterprises in Kenya and came to the results which showed that there was no significant effect of capital structure on the financial performance of the analysed small and medium-sized enterprises. San & Heng (2011) conducted a study in Malaysia and found that, when it comes to small businesses, only earnings per share (EPS) have a significant relationship with capital structure. Specifically, a negative relationship was found between EPS and debt to capital ratio. A similar research was conducted by Abor (2007) on a sample of small and medium-sized enterprises in Ghana and South Africa. By and large, the results indicate that capital structure, particularly long-term and total debt ratios have a negative impact on company performance. When it comes to short-term debt as well as trade credits, a significant and negative relationship was established with the gross profit margin for both Ghana and South Africa, while looking at long-term debt, a significantly positive relationship with gross profit margin was identified, also for both countries. Capital structure shows a negative

relationship with return on assets in the case of Ghana, while when it comes to South Africa, the results are not so unambiguous. In South Africa, the results are different, so when it comes to the relationship of the observed measure of performance with short-term debt and trade credit, it is significantly positive, while when it comes to long-term debt and total debt, a significantly negative relationship with return on assets was identified. In the case of Tobin's Q, a statistically significant positive relationship was found with short-term debt and trade credit, while a significant negative relationship was found between observed performance measure and long-term debt, as well as between Tobin's Q and total debt ratio.

Expressing the capital structure of companies in Malaysia with indicators of short-term debt, long-term debt and total debt, Salim & Yadav (2012) came to results that are typical of developing countries, when it comes to the relationship of these indicators of capital structure with the performance of the enterprise. In most of the company's performance measures (return on assets, return on equity and earnings per share), a negative relationship was found with all analysed indicators of capital structure, while in the case of Tobin's Q, a significantly positive relationship was identified between this indicator and short term debt as well as long term debt. A significant study on a sample of companies from the Republic of Serbia was conducted by Dakić & Mijić (2020). The authors found, among other things, that debt ratio, as a measure of the extent of a company's leverage, has a significant negative impact on return on assets.

As most empirical research suggests, small enterprises need to be careful when composing their capital structure, especially when it comes to the use of debt, given that a decision on capital structure can affect a firm's performance. It was previously stated that deciding on capital structure is one of the most important activities in the company because in addition to the impact it has on the financial performance of the company, it greatly affects the competitiveness of the company and its survival in the market. Inadequate capital structure leads to high capital costs. High capital costs will cause constraints in investment activities, as not all investment alternatives will respond to increased requests for the expected return on investment. The reduced level of investment also limits the further growth of the company and adversely affects its competitiveness (Norvaisiene, 2012). Similarly, Abbasi, Wang & Abbasi (2017) point out that small and medium-sized enterprises, which rely excessively on debt financing, increase costs, which can cause financial difficulties for the company and lead the company to bankruptcy.

2. Methodology

The research sample consisted of 150 small enterprises operating in the Autonomous Province of Vojvodina, Republic of Serbia. The financial statements of the companies, available on the website of the Business Registers Agency, were used to obtain the necessary data. The research will address the following research question: Are there differences in the financial performance of companies belonging to different levels of leverage?

Financial performance was measured by ROE (return on equity), ROA (return on assets) and NPM (net profit margin). ROE was calculated by dividing net income by total equity, ROA was calculated by dividing net income by average total assets and NPM was calculated by dividing net income by sales.

Capital structure mainly includes long-term sources of financing (equity and long-term debt). Although long-term sources of financing are particularly important because they reflect the capital structure and affect the long-term financing stability, due to the willingness of companies to use short-term financing to finance long-term projects, the use of indicators that include only long-term debt could provide a misleading picture of a firm's risk in relation to financial debt (Damodaran, 2007). Therefore, in a large number of empirical studies, measures involving total debts are used to express capital structure (Abor, 2007; Dakić & Mijić, 2020; Khan, 2012; Salim & Yadav, 2012; San & Heng, 2011).

The use of indicators covering total debts is particularly important for studies conducted in developing countries, because companies from these countries have a very low share of long-term debt in the capital structure, which, according to Klapper, Sarria-Allende & Sulla (2002) "may be the result of the underdevelopment of the banking sector, poor collateral law and weak collateral registries" (p. 13). Stoiljković & Tomić (2020) found in the sample of small enterprises in Serbia that the indicator of long-term debt / total assets is 7.32%, while short-term debt / total assets is 34.38%. The authors also report that as many as a

third of the analysed enterprises do not have long-term debt.

Based on the above, the authors consider it justified to use total debt when expressing capital structure, so capital structure was measured by financial leverage, which was calculated by dividing total debts by total assets.

The aim of the study is to investigate whether there is a significant difference in financial performance between companies belonging to different leverage levels. The research assumption is: There is no significant difference in financial performance among companies with different capital structure.

To test the assumption we calculated leverage level of companies and, in accordance with their leverage level, companies are divided into 3 categories by equal percentiles based on scanned cases. Leverage levels are shown in the Table 1.

Table 1 Leverage levels

Leverage level	
1= ≤ 0.30695	low leverage
2 = 0.30696-0.56680	moderate leverage
3 = > 0.56680	high leverage

Source: The authors

ANOVA Analysis is applied to investigate if there is significant difference between mean values of the 3 financial performance ratios: ROE, ROA and NPM with 3 groups of leverage levels.

The following hypothesis are tested by the procedure of ANOVA:

H1: There is no significant difference between mean of ROE in the 3 groups of leverage.

H2: There is no significant difference between mean of ROA in the 3 groups of leverage.

H3: There is no significant difference between mean of NPM in the 3 groups of leverage.

The hypotheses were tested using ANOVA Analysis by Statistical Package for the Social Sciences, version 20.

3. Results and discussion

All the variables were checked to identify univariate outliers, which represent extreme values that did not conform to the normal frequency distributions and represent unusual cases that were not representative. By analysing the table of descriptive statistics and extreme values we found that variables contain outliers. After identification of these outliers they were excluded from database, as recommended by Pallant (2009).

One-Way ANOVA investigates if the mean values of the 3 financial performance indices – ROE, ROA and NPM – varied significantly with respect to three ordinal leverage levels. The first ratio of financial performance that was tested is ROE. The results are shown in the table 2.

Table 2 ANOVA: ROE (return on equity)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.017	2	.009	1.181	**.310**
Within Groups	.976	133	.007		
Total	.993	135			

Source: The authors

Hypothesis H1 was accepted at $\alpha = 0.05$ indicated by p = 0,310 for the F (2, 133) = 1,181. There is no statistically significant difference between mean of ROE in the 3 groups of leverage.

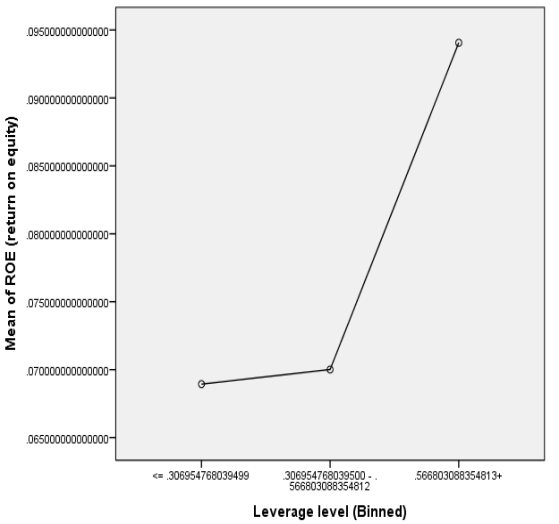

Figure 1 Relationship between mean of ROE and leverage levels
Source: The authors

In Figure 1, we can see that the lowest mean of ROE is in the group of low leverage (<0.30695) and the highest mean of ROE is in the group of high leverage (> 0.56680). However, if we look at Table 3, we can see that the differences between the means are actually very small.

Table 3 Descriptive Statistics ROE (return on equity)

	N	Mean	Std. Deviation
<= .306954768039499	47	.068939820497182	.091992212047923
.306954768039500 - .566803088354812	48	.070011896587708	.071061036806440
.566803088354813+	41	.094057511753664	.093439810787051
Total	136	.076890445452042	.085772207451046

Source: The authors

Table 4 ANOVA: ROA (return on assets)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.005	2	.003	.902	.408
Within Groups	.379	135	.003		
Total	.384	137			

Source: The authors

Based on the results of the ANOVA analysis, which are shown in Table 4, hypothesis H2 was accepted. There is no statistic significant difference at $\alpha = 0.05$ between mean of ROA in the 3 groups of leverage; $F(2, 135) = 0.902$.

In Figure 2 we can see that the highest mean ROA is at the lowest leverage level and at the highest leverage level, the mean ROA is the lowest.

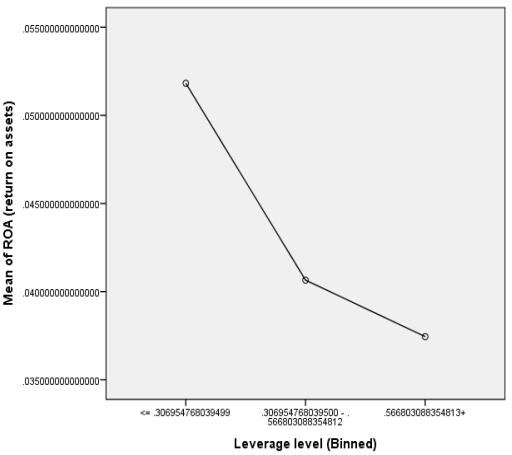

Figure 2 Relationship between mean of ROA and leverage levels
Source: The authors

Although the difference in mean values on the diagram appears to be significant, the actual difference in the mean values is very small, as can be seen in the Table 5.

Table 5 Descriptive Statistics ROA (return on assets)

	N	Mean	Std. Deviation
<= .306954768039499	43	.051821001388419	.065864223816591
.306954768039500 - .566803088354812	48	.040653807324665	.043085456375192
.566803088354813+	47	.037447830701018	.048694953303918
Total	138	.043041549668361	.052913825050009

Source: The authors

Hypothesis H3 was rejected at $\alpha = 0.05$, indicated by $p = 0.042$ for the F statistic. There is statistically significant difference between mean of NPM in the 3 groups of leverage: $F(2, 132) = 3.248$.

Table 6 ANOVA: NPM (net profit margin)

	Sum of Squares	df	Mean Square	F	Sig.
Between groups	.034	2	.017	3.248	**.042**
Within groups	.689	132	.005		
Total	.723	134			

Source: The authors

Although a statistically significant difference is confirmed, an eta square must be calculated to determine the effect size:

$$\text{Eta square} = \frac{\text{Sum of Squares Between Groups}}{\text{Total Sum of Squares}} \quad (1)$$

Eta square = 0.0470

Based on the value of eta square it was found that, even though the result is statistically significant, the real impact of the difference in mean values of the groups is small.

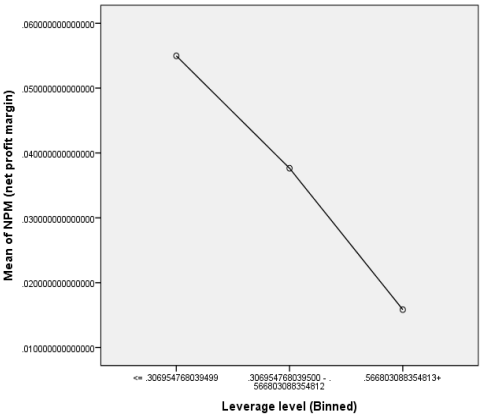

Figure 3 Relationship between mean of NPM and leverage levels
Source: The authors

The highest mean of NPM is present at the lowest leverage level (<= 0.30695) and the mean NPM is then systematically decreased with respect to increasing leverage. It can be concluded that the increase in the level of leverage has a negative impact on the financial performance of the company, measured by the indicator of net profit margin, which can also be seen in descriptive statistics shown in Table 7.

Table 7 Descriptive Statistics NPM (net profit margin)

	N	Mean	Std. Deviation
<= .306954768039499	43	.054972957772628	.095980719332439
.306954768039500 - .566803088354812	47	.037643862879869	.038045562575542
.566803088354813+	45	.015841978858169	.073107270988242
Total	135	.035896205838477	.073431636036101

Source: The authors

These findings provide evidence to conclude that lower leverage levels are associated with higher NPM levels, and in order to improve their financial performance, small businesses need to reduce the leverage level, i.e. to increase the share of their own sources of financing in the capital structure.

Conclusion

The study analysed the effect of capital structure on the financial performance of small enterprises in the Autonomous Province of Vojvodina, Republic of Serbia. Financial performance was measured by ROE (return on equity), ROA (return on assets) and NPM (net profit margin), and according to the ratio of total debts to total assets, which was used to express capital structure, companies were divided in 3 groups (1=low leverage, 2=moderate leverage and 3=high leverage). An attempt was made to answer the question of whether there are differences in financial performance between companies with different levels of leverage. The aim of the study was to investigate using ANOVA analysis if there is significantly difference between mean values of ROE, ROA and NPM with respect to three ordinal leverage levels.

The main findings suggest that there is no statistically significant difference between the indicators of financial performance ROE and ROA in the 3 groups of leverage. We can conclude that leverage levels do not significantly affect the value of ROE and ROA. Besides different groups of leverages, a statistically significant difference is only confirmed in indicator NPM, but when an eta square was calculated to determine the effect of size it was found that even though the result is statistically significant, the real impact of the difference in mean values of the groups is small. Based on the above, it can be concluded that the level of leverage does not significantly influence the financial performance of the company and that the most significant result of the conducted research may indicate that the mean NPM is decreasing with respect to increasing leverage, in other words, companies with lower levels of leverage have higher NPM.

The research results are to some extent in line with the results of similar studies conducted in developing countries, since most of these studies have identified a negative link between the capital structure and financial performance of enterprises. The negative relationship can be explained by the fact that companies in developing countries, due to the underdevelopment of capital markets, are mainly financed by bank loans, especially short-term debt, which is the dominant source of

borrowed funds, which is also the case for companies in Serbia. Short-term debt is a relatively expensive source of financing that can expose companies to illiquidity and refinancing risk. Also, companies operating in underdeveloped markets face financial distress and interest rate instability, so inflation and tax rates are of great importance in determining the optimal capital structure of these companies (Karadeniz, Kandir, Balcilar & Onal, 2009). Very high interest rates can be considered the main stumbling block against modernisation and competitiveness of companies, as Ciutacu, Chivu & Iorgulescu (2009, p. 743) cite when it comes to Romanian companies.

Small enterprises should be especially careful when it comes to additional borrowing because high indebtedness additionally creates an increase in the risk of default, which certainly affects charging a higher interest rate by the bank to these companies, which ultimately causes the cost of debt to be quite high and, in order not to jeopardize their survival on the market, small businesses should turn to increasing their own sources of financing.SM

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All tables, graphs and diagrams are expected to back your research findings. They should be clearly referred to and numbered consecutively in Arabic numerals. They should be placed in the text at the appropriate paragraph (just after its reference).

Tables should be centered. All tables must have captions. The title of your table should follow the table number. Tables should not be wider than the margins of the paper.

Figures should be centered. All figures must have captions. The title of figures should appear immediately below the figure. The title of the figure should follow the figure number. Figures should not be wider than the margins of the paper. Figures will not be redrawn by the publisher. Figures should be high-quality gray-scale graphics (please, do not use colors): vector drawings (with text converted to curves) or 300 dpi bitmaps. Please do not supply any graphics copied from a website, as the resolution will be too low. In all figures taken or adapted from other sources, a brief note to that effect is obligatory, below the figure. One sentence at least referring to the illustration is obligatory.

Mathematical expressions should be numbered on the right side, while all variables and parameters must be defined.

PROOF

Authors are responsible for ensuring that all manuscripts (whether original or revised) are accurately typed before final submission. One set of proof will be sent to authors, if requested, before the final publication, which must be returned promptly.

REFERENCING GUIDE

The references should specify the source (such as book, journal article or a web page) in sufficient detail to enable the readers to identify and consult it. The references are placed at the end of the work, with sources listed alphabetically (a) by authors' surnames or (b) by the titles of the sources (if the author is unknown). Multiple entries by the same author(s) must be sequenced chronologically, starting from the earliest, e.g.:

Ljubojević, T.K. (1998).
Ljubojević, T.K. (2000a).
Ljubojević, T.K. (2000b).
Ljubojević, T.K., & Dimitrijević, N.N. (1994).

Here is a list of the most common reference types:

A. PERIODICALS

Authors must be listed by their last names, followed by initials. Publication year must be written in parentheses, followed by a full stop. Title of the article must be in sentences case: only the first word and proper nouns in the title are capitalized. The periodical title must be in title case, followed by the volume number, which is also italicized:

Author, A. A., Author, B. B., & Author, C. C. (Year). Title of article. *Title of Periodical, volume number*(issue number), pages.

➲ Journal article, one author, paginated by issue

Journals paginated by issue begin with page 1 in every issue, so that the issue number is indicated in parentheses after the volume. The parentheses and issue numbers are not italicized, e.g.

Tanasijević, V. (2007). A PHP project test-driven end to end. *Management Information Systems, 5* (1), 26-35.

➲ Journal article, one author, paginated by volume

Journals paginated by volume begin with page 1 in issue 1, and continue page numbering in issue 2 where issue 1 ended, e.g.

Perić, O. (2006). Bridging the gap: Complex adaptive knowledge management. *Strategic Management, 14*, 654-668.

➲ Journal article, two authors, paginated by issue

Strakić, F., & Mirković, D. (2006). The role of the user in the software development life cycle. *Management Information Systems, 4* (2), 60-72.

➲ Journal article, two authors, paginated by volume

Ljubojević, K., & Dimitrijević, M. (2007). Choosing your CRM strategy. *Strategic Management, 15*, 333-349.

➲ Journal article, three to six authors, paginated by issue

Jovanov, N., Boškov, T., & Strakić, F. (2007). Data warehouse architecture. *Management Information Systems, 5* (2), 41-49.

➲ Journal article, three to six authors, paginated by volume

Boškov, T., Ljubojević, K., & Tanasijević, V. (2005). A new approach to CRM. *Strategic Management, 13*, 300-310.

➲ Journal article, more than six authors, paginated by issue

Ljubojević, K., Dimitrijević, M., Mirković, D., Tanasijević, V., Perić, O., Jovanov, N., et al. (2005). Putting the user at the center of software testing activity. *Management Information Systems, 3* (1), 99-106.

➲ Journal article, more than six authors, paginated by volume

Strakić, F., Mirković, D., Boškov, T., Ljubojević, K., Tanasijević, V., Dimitrijević, M., et al. (2003). Metadata in data warehouse. *Strategic Management, 11*, 122-132.

➲ Magazine article

Strakić, F. (2005, October 15). Remembering users with cookies. *IT Review*, *130*, 20-21.

➲ Newsletter article with author

Dimitrijević, M. (2009, September). MySql server, writing library files. *Computing News, 57,* 10-12.

➲ **Newsletter article without author**

VBScript with active server pages. (2009, September). *Computing News,57,* 21-22.

B. BOOKS, BROCHURES, BOOK CHAPTERS, ENCYCLOPEDIA ENTRIES, AND BOOK REVIEWS

➲ **Basic format for books**

Author, A. A. (Year of publication). *Title of work: Capital letter also for subtitle*. Location: Publisher.

Note: "Location" always refers to the town/city, but you should also include the state/country if the town/city could be mistaken for one in another country.

➲ **Book, one author**

Ljubojević, K. (2005). *Prototyping the interface design*. Subotica: Faculty of Economics.

➲ **Book, one author, new edition**

Dimitrijević, M. (2007). *Customer relationship management* (6th ed.). Subotica: Faculty of Economics.

➲ **Book, two authors**

Ljubojević, K., Dimitrijević, M. (2007). *The enterprise knowledge portal and its architecture*. Subotica: Faculty of Economics.

➲ **Book, three to six authors**

Ljubojević, K., Dimitrijević, M., Mirković, D., Tanasijević, V., & Perić, O. (2006). *Importance of software testing*. Subotica: Faculty of Economics.

➲ **Book, more than six authors**

Mirković, D., Tanasijević, V., Perić, O., Jovanov, N., Boškov, T., Strakić, F., et al. (2007). *Supply chain management*. Subotica: Faculty of Economics.

➲ **Book, no author or editor**

Web user interface (10th ed.). (2003). Subotica: Faculty of Economics.

➲ **Group, corporate, or government author**

Statistical office of the Republic of Serbia. (1978). *Statistical abstract of the Republic of Serbia*. Belgrade: Ministry of community and social services.

➲ **Edited book**

Dimitrijević, M., & Tanasijević, V. (Eds.). (2004). *Data warehouse architecture*. Subotica: Faculty of Economics.

➲ **Chapter in an edited book**

Boškov, T., & Strakić. F. (2008). Bridging the gap: Complex adaptive knowledge management. In T. Boškov & V. Tanasijević (Eds.), *The enterprise knowledge portal and its architecture* (pp. 55-89). Subotica: Faculty of Economics.

➲ **Encyclopedia entry**

Mirković, D. (2006). History and the world of mathematicians. In *The new mathematics encyclopedia* (Vol. 56, pp. 23-45). Subotica: Faculty of Economics.

C. UNPUBLISHED WORKS

➲ **Paper presented at a meeting or a conference**

Ljubojević, K., Tanasijević, V., Dimitrijević, M. (2003). *Designing a web form without tables*. Paper presented at the annual meeting of the Serbian computer alliance, Beograd.

➲ **Paper or manuscript**

Boškov, T., Strakić, F., Ljubojević, K., Dimitrijević, M., & Perić, O. (2007. May). *First steps in visual basic for applications*. Unpublished paper, Faculty of Economics Subotica, Subotica.

➲ **Doctoral dissertation**

Strakić, F. (2000). *Managing network services: Managing DNS servers*. Unpublished doctoral dissertation, Faculty of Economics Subotica, Subotica.

➲ **Master's thesis**

Dimitrijević, M. (2003). *Structural modeling: Class and object diagrams*. Unpublished master's thesis, Faculty of Economics Subotica, Subotica.

D. ELECTRONIC MEDIA

The same guidelines apply for online articles as for printed articles. All the information that the online host makes available must be listed, including an issue number in parentheses:

Author, A. A., & Author, B. B. (Publication date). Title of article. *Title of Online Periodical, volume number*(issue number if available). Retrieved from http://www.anyaddress.com/full/url/

➲ **Article in an internet-only journal**

Tanasijević, V. (2003, March). Putting the user at the center of software testing activity. *Strategic Management*, *8* (4). Retrieved October 7, 2004, from www.ef.uns.ac.rs/sm2003

➲ **Document from an organization**

Faculty of Economics. (2008, March 5). *A new approach to CRM*. Retrieved July 25, 2008, from http://www.ef.uns.ac.rs/papers/acrm.html

➲ **Article from an online periodical with DOI assigned**

Jovanov, N., & Boškov, T. A PHP project test-driven end to end. *Management Information Systems*, 2 (2), 45-54. doi: 10.1108/06070565717821898.

➲ **Article from an online periodical without DOI assigned**

Online journal articles without a DOI require a URL.

Author, A. A., & Author, B. B. (Publication date). Title of article. *Title of Journal, volume number*. Retrieved from http://www.anyaddress.com/full/url/

Jovanov, N., & Boškov, T. A PHP project test-driven end to end. *Management Information Systems*, 2 (2), 45-54. Retrieved from http://www.ef.uns.ac.rs/mis/TestDriven.html.

REFERENCE QUOTATIONS IN THE TEXT

➲ **Quotations**

If a work is directly quoted from, then the author, year of publication and the page reference (preceded by "p.") must be included. The quotation is introduced with an introductory phrase including the author's last name followed by publication date in parentheses.

According to Mirković (2001), "The use of data warehouses may be limited, especially if they contain confidential data" (p. 201).
Mirković (2001), found that "the use of data warehouses may be limited" (p. 201). What unexpected impact does this have on the range of availability?

If the author is not named in the introductory phrase, the author's last name, publication year, and the page number in parentheses must be placed at the end of the quotation, e.g.

He stated, "The use of data warehouses may be limited," but he did not fully explain the possible impact (Mirković, 2001, p. 201).

➲ **Summary or paraphrase**

According to Mirković (1991), limitations on the use of databases can be external and software-based, or temporary and even discretion-based. (p.201)

Limitations on the use of databases can be external and software-based, or temporary and even discretion-based (Mirković, 1991, p. 201).

➲ **One author**

Boškov (2005) compared the access range…

In an early study of access range (Boškov, 2005), it was found...

➲ When there are **two authors**, both names are always cited:

Another study (Mirković & Boškov, 2006) concluded that…

➲ If there are **three to five authors**, all authors must be cited the first time. For subsequent references, the first author's name will cited, followed by "et al.".

(Jovanov, Boškov, Perić, Boškov, & Strakić, 2004).

In subsequent citations, only the first author's name is used, followed by "et al." in the introductory phrase or in parentheses:

According to Jovanov et al. (2004), further occurences of the phenomenon tend to receive a much wider media coverage.

Further occurences of the phenomenon tend to receive a much wider media coverage (Jovanov et al., 2004).

In "et al.", "et" is not followed by a full stop.

➲ Six or more authors

The first author's last name followed by "et al." is used in the introductory phrase or in parentheses:

Yossarian et al. (2004) argued that…

… not relevant (Yossarian et al., 2001).

➲ Unknown author

If the work does not have an author, the source is cited by its title in the introductory phrase, or the first 1-2 words are placed in the parentheses. Book and report titles must be italicized or underlined, while titles of articles and chapters are placed in quotation marks:

A similar survey was conducted on a number of organizations employing database managers ("Limiting database access", 2005).

If work (such as a newspaper editorial) has no author, the first few words of the title are cited, followed by the year:

("The Objectives of Access Delegation," 2007)

Note: In the rare cases when the word "Anonymous" is used for the author, it is treated as the author's name (Anonymous, 2008). The name Anonymous must then be used as the author in the reference list.

➲ Organization as an Author

If the author is an organization or a government agency, the organization must be mentioned in the introductory phrase or in the parenthetical citation the first time the source is cited:

According to the Statistical Office of the Republic of Serbia (1978), …

Also, the full name of corporate authors must be listed in the first reference, with an abbreviation in brackets. The abbreviated name will then be used for subsequent references:

The overview is limited to towns with 10,000 inhabitants and up (Statistical Office of the Republic of Serbia [SORS], 1978).

The list does not include schools that were listed as closed down in the previous statistical overview (SORS, 1978).

➲ When citing **more than one reference from the same author**:

(Bezjak, 1999, 2002)

➲ When several **used works by the same author were published in the same year**, they must be cited adding a, b, c, and so on, to the publication date:

(Griffith, 2002a, 2002b, 2004)

➲ **Two or more works in the same parentheses**

When two or more works are cited parenthetically, they must be cited in the same order as they appear in the reference list, separated by a semicolon.

(Bezjak, 1999; Griffith, 2004)

➲ **Two or more works by the same author in the same year**

If two or more sources used in the submission were published by the same author in the same year, the entries in the reference list must be ordered using lower-case letters (a, b, c…) with the year. Lower-case letters will also be used with the year in the in-text citation as well:

Survey results published in Theissen (2004a) show that…

➲ To **credit an author for discovering a work**, when you have not read the original:

Bergson's research (as cited in Mirković & Boškov, 2006)…

Here, Mirković & Boškov (2006) will appear in the reference list, while Bergson will not.

➲ When **citing more than one author**, the authors must be listed alphabetically:

(Britten, 2001; Sturlasson, 2002; Wasserwandt, 1997)

➲ When there is **no publication date**:

(Hessenberg, n.d.)

➲ **Page numbers must always be given for quotations**:

(Mirković & Boškov, 2006, p.12)

Mirković & Boškov (2006, p. 12) propose the approach by which "the initial viewpoint…

➲ **Referring to a specific part of a work**:

(Theissen, 2004a, chap. 3)

(Keaton, 1997, pp. 85-94)

➲ **Personal communications, including interviews, letters, memos, e-mails, and telephone conversations**, are cited as below. (These are *not* included in the reference list.)

(K. Ljubojević, personal communication, May 5, 2008).

FOOTNOTES AND ENDNOTES

A few footnotes may be necessary when elaborating on an issue raised in the text, adding something that is in indirect connection, or providing supplementary technical information. Footnotes and endnotes are numbered with superscript Arabic numerals at the end of the sentence, like this.[1] Endnotes begin on a separate page, after the end of the text. However, Strategic Management journal **does not recommend the use of footnotes or endnotes.**

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