ECONOMIC THEMES (2023) 61(3): 387-406

DOI 10.2478/ethemes-2023-0020

DO INDUSTRIAL CLUSTERS CONTRIBUTE TO ORGANIZATIONS' INNOVATION PERFORMANCE? PATH ANALYSIS

Ivana Kostadinović

Faculty of Economics, University of Niš, Republic of Serbia

✉ *ivana.kostadinovic@eknfak.ni.ac.rs*

Violeta Jovanović

Faculty of Management, Metropolitan University Belgrade, Republic of Serbia

✉ *violetajovanovic025@gmail.com*

Sunčica Stanković

Faculty of Business Economics and Entrepreneurship, Belgrade, Republic of Serbia

✉ *suncica.stankovic@vspep.edu.rs*

UDC 334.758:001.895

Original scientific paper

Abstract: The increasing turbulence of the economic environment leads to changes in the business style, and adapting to this new style requires a cluster approach. In this sense, the goal of the research relates to determining the impact of the cluster internal and external interaction on innovative performance and innovative performance on organizational performance, as well as determining the impact of the cluster internal and external relational embeddedness on innovative success and innovation success on organizational performance using path analysis. The obtained results indicated direct positive and statistically significant influences between the observed variables, except in the case of the influence of innovative performance on organizational performance, where no direct significant connection was found. The study's findings showed that the promotion of industrial clusters alone cannot ensure the generation of innovations for the benefit of the organizations that are members of the cluster, but should also consider the organization's specificity for successful implementation.

Received: 29.12.2022
Accepted: 20.09.2023

Keywords: cluster internal interaction, cluster external interaction, organizational performance, innovative performance, innovative success, path analysis, Republic of Serbia

JEL classification: M21, L22, L25, L53, O30, C54.

1. Introduction

In modern conditions, the company's business is determined by quality, innovation, speed, flexibility, connectivity, building a critical mass of capital, and production/service potential due to the increasing turbulence of the economic environment. Adapting to this new business style requires a cluster approach. Porter (2000, p. 16) defines a cluster as "geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions ... in a particular field that competes but also cooperates." Everywhere in the world, companies tended to cooperate in some way much earlier than the term cluster entered the economic literature. Clustering existed centuries ago in the form of geographical concentration of craft and manufacturing workshops, but the importance of industrial clusters increased along with industrialization and the development of competition (Mićić, 2010). At the core of this concept is cooperation, as a joint action of at least two companies, to increase business performance, or achieve a synergy effect - when the joint effect is greater than the sum of individual effects. Namely, companies are not isolated entities but interact with customers, suppliers, competitors, and public institutions in performing their activities. According to Savić (2017), a cluster is a compromise of large buyers, specialized suppliers, qualified human resources, strong financiers, and well-developed support institutions. Therefore, the cluster initiative represents an organized effort to connect companies, research institutions and specialized agencies in a business cluster.

The formation of industrial clusters composed of companies, institutions, and organizations that unite financial resources, human capital, technological, scientific, innovative, and other potential and other resources, aims to create, maintain and increase competitiveness. The competitive advantage of a company can be related to the quality of connections and the system of relations it establishes with other entities (Bošković, and Kostadinović, 2011; Kostadinović, 2016). The comparative advantage of clustered companies is based on their specialization, cooperation, greater flexibility, and diversification (Gligorijević, and Kostadinović, 2012).

Stimulating cluster development is one of the models for raising the efficiency of business and development of small and medium enterprises (SMEs), which often have problems achieving strategic business goals. Clusters contribute to the rapid development and strengthening of SMEs in the industry. In some cases, it happens that they can achieve a higher degree of competitiveness than companies. In addition to strengthening competitiveness, linking into clusters is an effective instrument for enabling companies to produce goods and services, with which they will generate income on the domestic and international markets. Porter presented clusters as the basis of the "new competitive economy", emphasizing their importance for increasing the competitiveness of companies in the domestic and

international markets (Porter, 1998). Cooperation, access to specialized institutions and data, as well as a quick exchange of information, knowledge, and experience of employees and management, enable companies within the cluster to achieve better results and those activities that they would not be able to achieve individually (Ilić, 2006). Clusters increase innovation capacity, diffusion of technologies, and concentration of experts and thereby increase productivity. The development of several organizations with related activities, in close locations, gradually leads to changes in the structure of the organization and the local environment. The environment becomes attractive for potential partner organizations and other business entities that want to realize financial benefits. The possibility of employment in a certain activity leads to migration, while the mutual interactions of organizations within the cluster lead to changes in the cluster's organizational structure.

Šlogar (2021) suggests that organizations, to increase their competitive advantage, need to develop innovative systems, processes, and products. Also, Kostadinović (2019) points out that clusters, as a form of connecting companies, contribute to increasing the competitiveness of the organization, primarily due to the introduction of innovations. Since the organization's innovative ability, apart from the boundaries of the company, is increasingly limited by external resources that exist in a particular location, cluster membership should not benefit an organization in terms of financial results or growth performance, but in terms of its innovation (Lecock et al.2011; Žiška et al., 2018). As a key to innovation activities, Afauh (1998) and Porter (1999) propose the application of new knowledge in creating corporate value. The acquired knowledge in innovation processes, i.e. in the process of creating and confirming the concept of new products, is extended not only to different departments, but also to different organizations, and from these reasons knowledge management is one of the most important forms of risk reduction during technical systems reform (Lai et al., 2014). The innovation capacity and organizational performance are directly affected by the organization's ability to recognize, acquire, understand and use external knowledge (Terstriep, and Luthje, 2012; Žiška et al., 2018). Based on the results of empirical research conducted by Terstriep, and Luthje (2012), high-quality relational connections contribute the most to the benefits of organization cluster placement. According to these authors, participation in joint projects related to innovation and/or planned knowledge transfer contributes to the overall organization's innovation success and performance. As specific connections, clusters often accelerate the flow of ideas, innovation, and creativity. Such a system in which knowledge is transferred and the joint creation of a market product enables the creation of social capital, is one of the ways of achieving competitiveness (Kim & Shim, 2018).

As a global model of SME development, clusters develop more intensively in countries where small business has reached a higher level of development, which have a tradition of encouraging the development of SMEs, where there is

experience with the development of small business incubators, and where there is a highly qualified, trained and educated workforce. Supporting clustering is an important tool for stimulating economic development in countries with economies in transition (Litvinenko et al., 2018).

In Serbia, cluster development began in 2005, as part of the "Strategy for the Development of Innovative and Competitive Small and Medium Enterprises in the Period 2008-2013". However, it seems that this concept of organizing and networking in the Serbian industry is slowly being accepted. This is also shown by the value of the Global Innovation Index for Serbia, for the year 2022. According to this index, Serbia is in 55th place in the world, out of a total of 132 countries, which is not a bad result, but it is in 32nd place in Europe, out of a total of 39 countries (GGI, 2022). However, it is encouraging that this year's index mentions the Serbian S&T cluster for the first time, which offers comprehensive IT solutions and services. Geographically, university centers in Serbia have the greatest potential for cluster development, which also represent the largest industrial centers, with the largest number of professional workforces, and relatively good physical infrastructure.

2. Cluster development in the Republic of Serbia

The previous development of business infrastructure elements in the Republic of Serbia did not take into account the requirements of SMEs and the areas in which they operate. This resulted in weak effects on the growth of competitiveness, insufficient work efficiency, and a lack of stable sources of financing. Also, interesting is the fact that there is a significant difference in the concentration of business infrastructure elements between the regions of southern and eastern Serbia, and the region of Šumadija and western Serbia, on the one hand, and the regions of Belgrade and Vojvodina, on the other.

In 2006, the construction of industrial clusters began, with the financial support of the state. The clusters are currently in various stages of development. However, there are still no clusters in Serbia in the last, fourth phase (sustainability of clusters). Given that there is no single database that includes all clusters, it is very difficult to determine the exact number of clusters in Serbia. However, it is evident that the number of clusters in Serbia is increasing, which indicates the need for SMEs for clustering (connection). In Serbia, there are legally registered clusters that, due to insufficient development and inviolable cooperation between participants, do not function in practice (Paraušić, Cvijanović, 2014). However, the improvement of the innovation potential of the Serbian economy depends on the cluster's development (Paraušić, Domazet, 2018). The fact is that the highest concentration of clusters is in the five largest cities of Serbia: Belgrade, Niš, Novi Sad, Kragujevac, and Subotica, while the concentration is significantly lower in other places. In February 2011, the Council for Clusters was formed, as the body

responsible for the development of clusters in Serbia, where the members of the Council are representatives of cluster organizations. After that, in 2015, on the initiative of seven clusters from the territory of Serbia, a non-profit association was formed. The association is called the Association of Serbian Clusters (ASKA), and it gathers clusters from the territory of the Republic of Serbia. The main goal of this association is the development of clusters, as drivers of economic development.

Small and medium-sized enterprises are recognized as generators of new entrepreneurial ideas and innovations because the SME sector shows a high ability to turn quality ideas into good projects (Stojanović & Radukić, 2012). In Serbia, the cluster members are dominated by micro-enterprises, entrepreneurs, and small enterprises, while the participation of medium and large enterprises is significantly smaller. The number of cluster members varies among cluster initiatives. The largest companies participate in the work of the automotive industry cluster - a total of 12, and the furniture cluster from Kragujevac has the fewest members, a total of 5. There are several good examples of clusters in Serbia. Those clusters managed to achieve positive results in a very short time.

The first example of such a cluster is Šumadijski cvet, which cooperates with foreign partners. With the help of foreign partners, this cluster exports flowers and imports raw materials and markets its products in several surrounding countries: Germany, Austria, V. Britain, etc. This cluster also successfully implemented several important projects of the Ministry of Economy and Regional Development, which were aimed at uniting and strengthening the cluster. The goal of this cluster, in the coming period, is to improve technology, increase production and export, increase and improve cooperation with foreign partners on the EU projects, and take a leading position in the flower market in Serbia. Another positive example of cluster business in Serbia is Vojvodina IKT (ICT) cluster. The ICT cluster is a meeting place for the best IT companies in Serbia. It brings together the best companies from the ICT sector and has around 1,500 employees. The main role of this cluster is to create conditions for the development of the ICT sector, to provide a favorable environment for strengthening the cooperation between the cluster members, to provide a common platform for performance, both on the domestic and foreign markets, to point out all the opportunities provided by the development and improvement of ICT activities, products, and services, to accelerate the development of the ICT industry in Vojvodina and Serbia. The cluster with the highest specialization index is Dunđer. It is the first construction cluster in the country with the headquarters in Nis, it has about 100 members, among them: contractors, faculties, scientific research centers, and universities. The cluster has an exceptional international cooperation with technology parks from Germany, Greece, Italy, Spain, Slovenia, Portugal, and England. Dunđer cluster differs from other clusters in that it is the winner of the first award for technological innovation in 2010. One of the most successful clusters in Serbia is the Automotive cluster. It includes 22 companies and 5 scientific institutions that employ a total of 8,100

people. The companies are located in Belgrade, Kragujevac, Novi Sad, Bečej, and Surdulica. This cluster pays the most attention to the improvement of communication and exchange of information between the members, finding opportunities for securing financial resources, education, and marketing activities, as well as the development of cooperation and internationalization. As a good example of a cluster in Serbia, we can point out the Fashion and Clothing Industry Cluster of Serbia (FACTS), which brings together the most eminent Serbian fashion companies and clothing manufacturers: Mona, Tiffany Production, Extreme Intimo, and others. Cluster member companies directly employ 3,100 people, and another 4,000 through the network of cooperative production companies. The total turnover of the cluster member companies is over EUR 70 million, while the realized export is over EUR 25 million.

As previously mentioned, the development of clusters contributes to the competitiveness and innovation potential of the economy, and it is especially so now, after the unexpected pandemic of the coronavirus when many companies faced the cancellation of orders, a large number of goods in warehouses, as well as the interruption of payment for delivered goods, the interruption in the supply chain of raw materials and by closing stores, it is important to stimulate the development of clusters, help and encourage clustering. Savić et al. (2021) dealt with the recovery of the Serbian economy after the Covid-19 pandemic and indicated the importance of the development of three perspective clusters in Serbia: technology cluster, agribusiness with organic food, and tourism. According to them, these clusters have a great potential for cooperation and can contribute to the development of other clusters. Investigating the goals of including organizations in clusters, Kostadinović and Stanković (2020) obtained the results according to which strategic collaboration, infrastructure and standards, information sharing, and lobbying have positive effects on innovation, while innovations have a positive effect on regional development in the context of the Republic of Serbia.

3. Overview of previous research and research questions

Initially, research on clusters was based on case studies and conceptual arguments (Ketels, 2013). Efforts to collect comprehensive empirical data on clusters in different locations have subsequently increased, and research has focused on testing the relationship between cluster strength and economic performance outcomes (Delgado et al., 2012). Also, there have been several studies that address issues of how the localization of organizations in geographic clusters can enable cooperation between these organizations, while nurturing their ability to create and maintain a competitive advantage (Lazerson, and Lorenzoni, 1999; Porter, 2000; Boari et al., 2003). On the other hand, researchers generally agree on the need to develop industrial clusters (Waits, 2000; Colgan, and Baker, 2003; Porter, 2003; Singh, and Jain, 2003), as a form of networking that can reduce the region's

susceptibility to changing demand, and stagnation (Ozkanli, and Akdeve, 2006). The constant cooperation of all constituent parts of the cluster is necessary for the advancement of industrial clusters (Bhawsar & Chattopadhyay, 2018). According to Delgado et al. (2012), regional economic performance depends on the composition of clusters in nearby regions, and not within narrow political borders, while the benefits arising from clusters can often extend to more countries. For this reason, important tools for regional development could be "policies that enhance complementarities across jurisdictions, such as supporting infrastructure and institutions that facilitate an access to demand, skills or suppliers in neighboring clusters" (ibid, p. 36). From the aspect of regional competitiveness, prosperity is the most important criterion for classifying the region as competitive (Porter, 1990; 1998; Krugman, 1996), while clusters can be considered the important forms of spatial organization and the key drivers of organizational productivity, and thus regional prosperity (Pessoa, 2013).

In addition to productivity, innovation is recognized as a key factor in organizational competitiveness (Dess, & Picken, 2000). As an aid in innovation to enter new markets, it is necessary to exchange the knowledge between organizations, which is much easier to achieve between companies within a cluster, so a large number of authors connect the innovative potential of companies with clusters (Lai et al., 2014; Bittencourt et al., 2019). The possibilities of knowledge exchange and the creation of innovations within clusters, as well as the use of qualified labor, were recognized as early as Alfred Marshall's research (1920). Such geographical agglomerations as clusters enable a greater innovative capacity for the companies that belong to them (Porter, 1990; Baptista, 2000). The innovation policy is of particular importance for many clusters. Therefore, clusters participate in the development of innovative products to reduce the financial risk (Mazur et al., 2016). The innovative clusters continuously build on already existing connections between their participants, and at the same time develop new connections with the external environment (Mindlin et al., 2016). Due to their peculiarities, the innovative clusters achieve certain benefits, which are reflected in: the improvement of business formations, increase in productivity, and the improvement of the possibility to create innovations (Fundeanu & Badele, 2014; Kostygova et al., 2019).

According to Rocha (2004), clusters enable the creation of positive externalities. The revious research indicates a strong connection between the innovation and clusters, as well as the tendency of companies belonging to clusters to be more innovative than isolated organizations (Bell, 2005; Giuliani, 2010; Engel, 2015; Bittencourt et al., 2019). Due to their characteristics, organizations have different innovative capabilities (Trippl et al., 2015), and it is difficult to determine the reason why the organizations belonging to clusters are more innovative than others (Prim et al., 2016). Clusters are characterized by the attraction of talent, which enables the exchange of information and the creation of

knowledge for innovation (Manning et al., 2010). Clusters enable companies to acquire knowledge and information through the interaction with various institutions such as universities, companies, and the government. Such interactions lead to the creation of innovations and improved organizational performance (Bittencourt et al., 2019). According to Lai, et al., (2014), for the better innovative performance of companies in clusters, the cooperation between clusters and science parks and universities is necessary, because they represent the important sources of knowledge. Knowledge is one of the most important factors for improving the innovative performance of industrial clusters (Arikan, 2009; Belso-Martinez et al., 2011). The capabilities of industrial organizations are enhanced by the information and knowledge exchange within the cluster (Casanueva et al., 2013; Lissoni, 2001; Lorenzen & Maskell, 2004).

When it comes to the organization size, Huang et al. (2012) showed that smaller companies can benefit more from belonging to clusters, and achieve higher innovative performance than larger companies. The access to common resources that companies within the cluster have is an important element that enables the increase of innovative capacities and the realization of better innovative performances. (Molina-Morales & Martínez-Fernández, 2004). According to Silvestre and Neto (2014), the innovation capabilities of a cluster consisting of two capabilities, namely: technology development capabilities and technology diffusion capabilities. In his research, Forsman (2009) mentions four dimensions of the innovation ability of clusters, namely: entrepreneurial ability, networking ability, internal knowledge ability and management ability. Good governance is important to increase the possibility of exploiting collective knowledge to create an innovation (Lazoi et al., 2011).

Žižka et al. (2018) compared the impact of clusters on the innovative performance of companies in the traditional textile industry and new industries in nanotechnology. They also compared the companies that are the members of cluster organizations and companies that operate independently. They showed that the existence of cluster organizations in the traditional textile industry has a significant impact on the effectiveness of innovations and the innovative performance of companies, while this was not the case with the new nanotechnology industry. Žižka et al. (2018) concluded that clustering affects an organization's innovative performance, but not in all types of industries. Thus, the effect of cluster organizations on innovation activities depends on the type of industry. Chandrashekar et al. (2019) proved that an innovation has no significant effect on organizational performance in a cluster context in India. Similar results were obtained by Terstriep and Lüthje (2012) in the context of two regional clusters located in Germany and Switzerland. The results of the study, conducted by Cotic-Svetina et al. (2008), point to a positive connection between the local labor market and innovation performance, as well as to the fact that there is a negative connection between the interaction with local organizations and

innovation performance. Zhao et al. (2010) indicate a positive association of the network mechanism with the innovative performance. Lai et al. (2014) investigated the effects of knowledge management on the innovative performance of industrial clusters in Taiwan. They concluded that knowledge management improves the creation, acquisition, and dissemination of knowledge within the cluster, which has direct positive effects on the innovative performance. Expósito-Langa et al. (2015) in their research integrated internal, external, and relational dimensions that are considered the determinants of innovation processes in clusters, and concluded that the companies in clusters must develop individual capacities in parallel with system resources, to improve the innovative performance. Internal and external interactive learning is important for small and medium-sized companies that do not have research and development centers, so they can compensate for this lack with cluster connections that enable interactive learning (Thomä & Zimmermann, 2020). The connection between clustering and the innovative performance of the organization was also confirmed by Mendes et al. (2021), who also indicated that cluster networking is particularly important for low-tech companies. Taking into account the above, the following research questions were asked:

1. Does increased cluster internal interaction leads to a significant increase in innovative performance?

2. Does increased cluster external interaction leads to a significant increase in innovative performance?

3. Does innovative performance significantly relate to overall organizational performance?

Terstriep and Lüthje (2012), using micro-level data from two ICT clusters located in Germany and Switzerland, examined the relationship between cluster internal and external relational embeddedness and innovation success and found that both positively and significantly influence the success of the innovation. In addition, according to the research results of the mentioned authors, the success of the innovation has a positive and significant effect on the company's performance. With this in mind, the following research questions were posed:

4. Is cluster internal relational embeddedness positively related to innovation success?

5. Is cluster external relational embeddedness positively related to innovation success?

6. Is innovation success positively related to organizational performance?

4. Research methodology

The subject of the research is the contribution of clusters to the innovative performance of organizations, using path analysis. The research aims to determine the impact of: 1) the cluster internal and external interactions on innovative

performance; 2) innovative performance on organizational performance; 4) the cluster internal and external embeddedness on innovative success; and 5) innovative success on organizational performance.

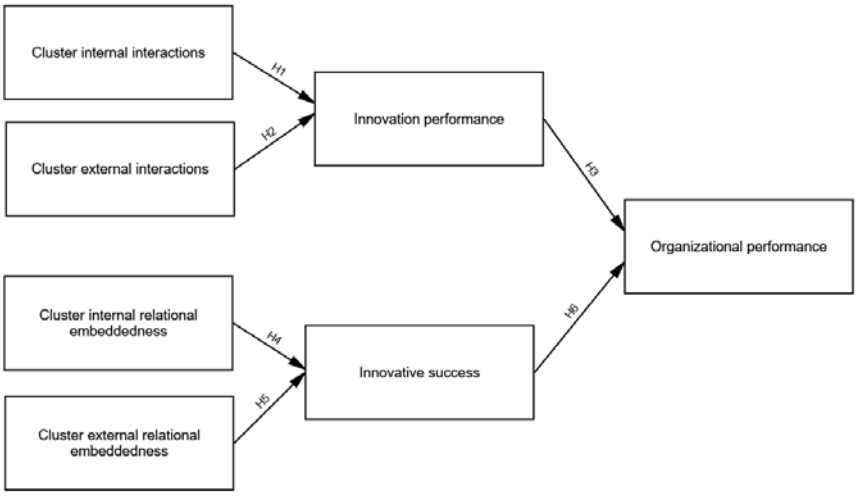
To answer the set goals and research questions, a survey was conducted, which included 351 respondents, i.e. managerial staff, employed in organizations operating within two clusters in Serbia: FACTS and Vojvodina ICT cluster. For the research, a questionnaire was constructed, which included: in the first part respondents' attitudes on cluster internal external interaction, in the second part respondents' attitudes on cluster internal and external relational embeddedness, in the third part respondents' attitudes on innovative performance, in the fourth part respondents' attitudes on innovative success, and in the fifth part, respondents' attitudes on organizational performance. Questionnaires were distributed by email. The survey, including the pilot test, was conducted from March to October 2022, and 351 completed questionnaires were collected. It was determined that there were no irregularities, such as missing data.

Exogenous variables: The *Cluster internal and external interaction* scale consists of 5 items each, taken from Terstriep and Lüthje (2012). The respondents were asked to rate the frequency of internal (CII) and external (CEI) interaction with competitors, complementary organizations, and customers, as well as research and public bodies, on a 5-point Likert scale. The *Relational embeddedness* scale consists of 3 items each (Terstriep and Lüthje, 2012) and refers to the quality of interaction within (CIRE) and outside the cluster (CERE). The respondents were asked to indicate on a 5-point Likert scale the degree to which they cooperate with competitors, complementary organizations, and customers, as well as research and public bodies when it comes to knowledge exchange and/or joint projects.

Endogenous variables: *Innovation performance* (IP) refers to the new and improved existing products and/or services and process innovations introduced in the last three years. The instrument for measuring innovation performance was taken from Gunday et al. (2011) and consists of 6 items, measured on Likert's 5-point scale. *Innovative success* (IS) refers to the degree of success in launching innovations in the market, the ability to enter new markets, and overall market success compared to competitors. The instrument for measuring innovation success was taken from Terstriep and Lüthje (2012) and consists of 3 items, measured on Likert's 5-point scale. *Organizational performance* (OP) refers to total sales, production cost, return on assets (profit/total assets), the overall profitability of the organization, and return on sales (profit/total sales). The instrument for measuring organizational performance was taken from Gunday et al. (2011) and consists of 5 items, measured on Likert's 5-point scale.

The conceptual model, which shows the assumed relationships between the variables in the research, is given in Figure 1.

Figure 1. Conceptual model



Path analysis was used to determine the relationship between variables in the research. As a form of multiple regression, path analysis evaluates causality models by examining the relationships between dependent and multiple independent variables. Path analysis can be viewed as one of the SEM models, unlike structural equation modeling (SEM), which does not use latent variables, but only the observed ones (Jeon, 2015).

5. Research results

5.1. Measurement model

The measurement model was assessed by confirmatory factor analysis, which confirmed the existence of 7 factors. The first factor explains less than 50% of the total variance, i.e. 37.3%, which, according to Podsakoff et al. (2012), proves that there is no common method variance in data. Also, the VIF values are less than 3 (from 1.348 to 2.154), which suggests the absence of multicollinearity. Based on the results shown in Table 1, all fit indicators are at an acceptable level.

Table 1. The model fit indicators

	χ^2/df ($\leq 3^*$)	NFI ($\geq .90^*$)	TLI ($\geq .90^*$)	CFI ($\geq .95^*$)	RMSEA ($\leq .08^*$)	SRMR ($\leq .08^*$)
Obtained values	1.770	.993	.993	.997	.047	.0163

Note: * - recommended values based on Hu & Bentler (1999), Byrne (1994)

Based on the results shown in Table 2, the respondents rated the CERE variable the best, while the CII variable has the lowest mean value. The highest dispersion of results was recorded for the OP variable, and the smallest for the IS variable. The data from Table 2 also indicate the fulfillment of the conditions of convergent validity (AVE values). In addition, the internal consistency of the construct (Cronbach's α values), as well as the composite reliability (CR value) indirectly indicate the fulfillment of convergent validity conditions.

Table 2. Mean, standard deviation, Cronbach's alpha, composite reliability, and average variance extracted

	Mean	SD	Cronbach's α (> 0.7*)	CR (> 0.7**)	AVE (≥ 0.5**)
CII	3.94	.850	.843	.862	.677
CEI	3.97	.799	.866	.814	.593
CIRE	4.05	.756	.825	.898	.639
CERE	4.08	.817	.838	.908	.663
IP	3.98	.712	.809	.930	.689
IS	4.06	.704	.814	.843	.643
OP	3.26	.938	.980	.920	.697

Note: * - recommended values based on Pallant (2007), ** - recommended values based on Fornell & Larcker (1981)

The fulfillment of the conditions of discriminant validity (Table 3) is indicated by the values of $\sqrt[2]{AVE}$ each of the constructs in a pair that is greater than the correlation between the constructs, according to Fornell and Lacker's criterion (Fornell & Larcker, 1981).

Table 3. Discriminant validity

Construct	CII	CEI	CIRE	CERE	IP	IS	OP
CII	**.823***						
CEI	.621	**.734***					
CIRE	.355	.333	**.799***				
CERE	.377	.314	.524	**.814***			
IP	.682	.566	.372	.384	**.830***		
IS	.426	.372	.681	.608	.438	**.802***	
OP	.164	.132	.213	.206	.172	.246	**.835***

Note: * - $\sqrt[2]{AVE}$

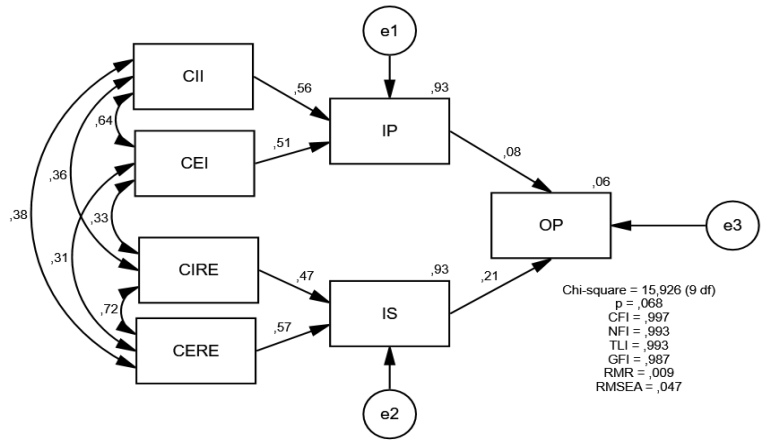
5.2. Structural model

The squared multiple correlations (R^2) are of crucial importance for the evaluation of the structural model because it indicates the predictive power of the model. The value of this coefficient (Table 4 and Figure 2) for the innovation performance variable is 0.931, and for the innovation success variable, it is 0.930, which according to Chin (1998) is an essential value. However, for the organizational performance variable, R^2 is 0.064, which is a weak value, but considering that innovation performance and success are only two variables included in the model, out of several, that can affect organizational performance, then this value is not uncommon. Based on the obtained results, CII IP ($\beta = 0.556$, $p < 0.001$), and CEI ($\beta = 0.510$, $p < 0.001$) directly significantly and positively influence IP. However, IP has a positive but not statistically significant impact on OP ($\beta = 0.080$, $p > 0.05$). The results also indicate a direct positive impact of CIRE ($\beta = 0.469$, $p < 0.001$) and CERE ($\beta = 0.568$, $p < 0.001$) on IP. In addition, the results indicate a significant direct and positive impact of IS on OP ($\beta = 0.211$, $p < 0.001$).

Table 4. Results of testing the relationship between the variables included in the research

Paths	β	t	p	R^2
CII ⟶ IP	.556	30.409	.0001	R^2_{IP} = .931 R^2_{IS} = .930 R^2_{OP} = .064
CEI ⟶ IP	.510	27.892	.0001	
IP ⟶ OP	.080	1.429	.153	
CIRE ⟶ IS	.469	22.839	.0001	
CERE ⟶ IS	.568	27.648	.0001	
IS ⟶ OP	.211	3.768	.0001	

Figure 2. Structural model



6. Conclusion

The conducted study aimed to determine the effects of internal and external interactions of organizations involved in clusters on innovative performance, innovative performance on organizational performance, internal and external embeddedness of organizations in clusters on innovative success, and innovative success on organizational performance.

The findings indicate a positive direct and statistically significant influence of internal and external interactions of organizations involved in clusters on innovative performance. These results are consistent with the results of other authors' studies (Zhao et al., 2010; Mendes et al., 2021). The findings of the study by Žižka et al. (2018) suggest that clustering influences the innovative performance of firms, but that the effect of cluster organizations on innovative activities depends on the type of industry. On the other hand, the obtained results indicate that innovative performance is not a significant determinant of the overall performance of an organization operating within a cluster, which is in line with the research results of other authors (Terstriep & Lüthje, 2012; Chandrashekar et al., 2019). The findings of the current study also indicate a statistically significant positive influence of internal and external embeddedness of organizations in clusters on innovative success, as well as innovative success on organizational performance. Such influences were confirmed by the results of an earlier study by Terstriep and Lüthje (2012).

In addition to contributing to a better understanding of the advantages of clusters from the aspect of organizations, that is, at the micro level, this study shows that both entrepreneurs and cluster managers, apart from quantity, should also take into account the quality of relationships, in terms of increasing the frequency of meetings and so on. Pointing out the importance of not only the promotion of industrial clusters but also taking into account the specificities of the industries included in the cluster in the cluster policy is the basic practical implication of this study.

The conducted study also has certain limitations. The first limitation is primarily related to the sample size. In this sense, future research could include a larger sample, which increases the possibility of generalizing the results. Another limitation concerns the number of variables included in the analysis. Namely, innovative performance and the success of innovation are only some of the determinants of the overall performance of the organization, so future research could also include other variables, such as, for example, net income. In addition, the current study only investigates direct associations between the observed variables, and therefore, future research could be based on examining indirect associations, but also by including moderator variables such as, for example, absorptive capacity.

References

Arikan, A. T. (2009). Interfirm knowledge exchanges and the knowledge creation capability of clusters. *Academy of Management Review, 34*(4), 658–676. https://doi.org/10.5465/AMR.2009.44885776

Boari, C., Odorici,V. & Zamarian, M. (2003). Clusters and Rivalry: Does Localization Really Matter?. *Scandinavian of Management*, *19*, pp. 467-489. https://doi.org/10.1016/S0956-5221(03)00035-6

Baptista, R. (2000). Do innovations diffuse faster within geographical clusters?. *International Journal of industrial organization, 18*(3), 515-535. https://doi.org/10.1016/S0167-7187(99)00045-4

Bell, G. G. (2005). Clusters, networks, and firm innovativeness. *Strategic Management Journal, 26*(3), 287–295. https://doi.org/10.1002/smj.448

Belso-Martinez, J. A., Molina-Morales, F. X. & Mas-Verdu, F. (2011). Clustering and internal resources: Moderation and mediation effects. *Journal of Knowledge Management, 15*(5), 738–758. https://doi.org/10.1108/13673271111174302

Bhawsar, P. & Chattopadhyay, U. (2018). Evaluation of industry cluster competitiveness: a quantitative approach. *Benchmarking: An International Journal, 25* (7), 2318-2343. https://doi.org/10.1108/BIJ-02-2017-0022

Bittencourt, B. A., Daniel, V. M., Zen, A. C. & Galuk, M. B. (2019). Cluster Innovation Capability: a systematic review. *International Journal of Innovation, 7*(1), 26-44. https://doi.org/10.5585/iji.v7i1.157

Bošković, G. & Kostadinović, I. (2011). Klasteri malih i srednjih preduzeća – ključ ekonomskog razvoja, Savremeni trendovi u Evropskoj uniji: implikacije za Srbiju. *Tematski zbornik*, Novi Sad: Visoka poslovna škola strukovnih studija.

Byrne, B.M. (1994). *Structural Equation Modeling With EQS and EQS/WINDOWS: Basic Concepts, Applications, and Programming*. 1st Edition. SAGE Publications, Inc.

Casanueva, C., Castro, I. & Galán, J. L. (2013). Informational networks and innovation in mature industrial clusters. *Journal of Business Research, 66,* 603–613. https://doi.org/10.1016/j.jbusres.2012.02.043

Chandrashekar, D., Hillemane, B.S.M., Joshi, K.A. & Priyadarshi, T. (2019). Effect of Innovation on Firm Performance - The Case of a Technology Intensive Manufacturing Cluster in India. *International Journal of Innovation and Technology Management, 16*(1), 1-31. https://doi.org/10.1142/S0219877019500524

Chin, W.W. (1998). The partial least squares approach to structural equation modeling. George A. Marcoulides (Ed.): *Modern methods for business research*. Mahwah, N.J: Lawrence Erlbaum, 295–336.

Colgan, C. S. & Baker, C. (2003). A Framework for Assessing Cluster Development. *Economic Development Quarterly*, *17*(4), pp.352-366. https://doi.org/10.1177%2F0891242403256667

Cotic-Svetina, A., Jaklic, M. & Prodan, I. (2008). Does collective learning in clusters contribute to innovation? *Science and Public Policy, 35*(5), 335–345. https://doi.org/10.3152/030234208X319357

Delgado, M., Porter, M. E. & Stern, S. (2012). Clusters, Convergence, and Economic Performance. *NBER Working Paper*, No. 18250.

Delgado, M., Ketels, C., Porter, M. E. & Stern, S. (2012) The Determinants of National Competitiveness, *NBER Working Paper*, No. 18249. Cambridge, MA: NBER https://doi.org/10.3386/w18249

Dess, G. G. & Picken, J. C. (2000). Changing roles: leadership in the 21st century. *Organizational Dynamics, 28*(3), 18–34. https://doi.org/10.1016/S0090-2616(00)88447-8

Engel, J. S. (2015). Global Clusters of Innovation: Lessons from Silicon Valley. *California Management Review, 57*(2), 36-65. https://doi.org/10.1525/cmr.2015.57.2.36

Expósito-Langa, M., Tomás-Miquel, J. V. & Molina-Morales, F. X. (2015). Innovation in clusters: exploration capacity, networking intensity and external resources. *Journal of Organizational Change Management. 28*(1), 26-42. https://doi.org/10.1108/JOCM-10-2013-0192

Fornell, C. & Larcker, D.F. (1981). Structural Equation Models with Unobservable Variables and Measurement Error: Algebra and Statistics. *Journal of Marketing Research, 18*(3), 382–388. https://doi.org/10.2307/3150980

Forsman, H. (2009). Improving innovation capabilities of small enterprises: cluster strategy as a tool. *International Journal of Innovation Management, 13*(2), 221-243. https://doi.org/10.1142/S1363919609002273

Fundeanu, D. D. & Badele, C. S. (2014). The impact of regional innovative clusters on competitiveness. *Procedia-Social and Behavioral Sciences,* 124, 405-414. https://doi.org/10.1016/j.sbspro.2014.02.502

Giuliani, E. (2010). Network Dynamics in Regional Clusters: A New Perspective from an Emerging Economy. Industry Studies Association. *Working Paper Series.*

Gligorijević, Ž. & Kostadinović, I. (2012). Industrijski klasteri: važna poluga mehanizma za unapređenje konkurentnosti industrije. *Nauka+praksa, 15*, GAF, Niš.

WIPO. (2022). *Global Innovation Index 2022. What is the future of innovation-driven growth?* Geneva, Switzerland: World Intellectual Property Organization, available at: https://www.globalinnovationindex.org/gii-2022-report

Gunday, G., Ulusoy, G., Kilic, K. & Alpkan, L. (2011). Effects of innovation types on firm performance. *International Journal of Production Economics, 133*(2), 662-676. https://doi.org/10.1016/j.ijpe.2011.05.014

Huang, K., Yu, C. J. & Seetoo, D. (2012). Firm innovation in policy-driven parks and spontaneous clusters: the smaller firm the better? *The Journal of Technology Transfer, 37*(5), 715-731. https://doi.org/10.1007/s10961-012-9248-9

Hu, L. & Bentler, P.M. (1999). Cutoff Criteria for Fit Indexes in Covariance Structure Analysis: Conventional Criteria versus New Alternatives. *Structural Equation Modeling: A Multidisciplinary Journal, 6*(1), 1–55. https://doi.org/10.1080/10705519909540118

Ilić M. (2006) Poslovni inkubatori i klasteri kao model razvoja malih i srednjih preduzeća u industriji, *Industrija,* 4, str. 63 -98

Jeon, J. (2015). The Strengths and Limitations of the Statistical Modeling of Complex Social Phenomenon: Focusing on SEM, Path Analysis, or Multiple Regression Models. *International Journal of Economics and Management Engineering, 9*(5), 1634-1642.

Ketels, C. (2013). Recent research on competitiveness and clusters: what are the implications for regional policy?. *Cambridge Journal of Regions, Economy and Society, 6*(2), 269-284. https://doi.org/10.1093/cjres/rst008

Kim, N. & Shim, C. (2018). Social capital, knowledge sharing and innovation of small-and medium-sized enterprises in a tourism cluster. *International journal of contemporary hospitality management, 30*(6), 2417-2437. https://doi.org/10.1108/IJCHM-07-2016-0392

Kostadinović, I. & Stanković, S. (2020). Innovation Clusters As An Association Model Of The Small And Medium-Sized Enterprises: The Context Of Regional Development. Sixth International Scientific-Business Conference – LIMEN 2020. *Leadership, Innovation, Management and Economics: Integrated Politics of Research*, 47-56. https://doi.org/10.31410/LIMEN.S.P.2020.47

Kostadinović, I. (2016). *Poslovna infrastruktura kao instrument nove industrijske politike Republike Srbije*. (doktorska disertacija). Univerzitet u Nišu, Ekonomski fakultet.

Kostadinović, I. (2019). Clusters as an expressive form of business infrastructure (Annex theory analysis). *Economic Themes, 57*(1), 51-65. DOI: 10.2478/ethemes-2019-0004

Kostadinović, I. (2021). *Poslovna infrastruktura u funkciji privrednog razvoja Republike Srbije*. [Business infrastructure in the function of economic development of the Republic of Serbia]. Niš: Univerzitet u Nišu, Ekonomski fakultet.

Kostygova, L., Sidorova, E. & Vikhrova, N. O. (2019). Modern clusters and assessment of their innovative development. *Entrepreneurship and Sustainability Issues, 7*(1), 603. https://doi.org/10.9770/jesi.2019.7.1(42)

Krugman, P. (1996). Making sense of the competitiveness debate. *Oxford Review of Economic Policy, 12*(3), 17-35.

Lai, Y., Hsu, M., Lin, F., Chen, Y. & Lin, Y. (2014).The effects of industry cluster knowledge management on innovation performance. *Journal of Business Research, 67*(5), 734-739. https://doi.org/10.1016/j.jbusres.2013.11.036

Lazoi, M., Ceci, F., Corallo, A. & Secundo, G. (2011). Collaboration in an aerospace SMEs cluster: innovation and ICT dynamics. *International Journal of Innovation and Technology Management, 8*(03), 393-414. https://doi.org/10.1142/S0219877011002398

Lazerson, M. & Lorenzoni, G. (1999). The Firms That Feed Industrial Districts: A Return to the Italian Source. *Industrial and Corporate Change, 8*(2), 235-266. https://doi.org/10.1093/icc/8.2.235

Lecocq, C., Leten, B., Kusters, J. & van Looy, B. (2011). Do Firms Benefit from being Present in Multiple Technology Clusters? An Assessment of the Technological Performance of Biopharmaceutical Firms. *Regional Studies, 46*(9), 1107–1119. http://doi.org/10.1080/00343404.2011.552494

Lissoni, F. (2001). Knowledge codification and the geography of innovation: The case of Brescia mechanical cluster. *Research Policy, 30*(9), 1479–1500. https://doi.org/10.1016/S0048-7333(01)00163-9

Litvinenko, I.L., Klochko, E.N., Zelinskaya, M.V., Polyanskaya, O.A. & Martynenko, N.K. (2018). Features of managing innovative clusters of modern Russia. *Espacios, 39*(31), 23.

Lorenzen, M. & Maskell, P. (2004). The cluster as a nexus of knowledge creation. P. Cooke, & A. Piccaluga (Ed.): *Regional Economies as Knowledge Laboratories.* 77–92.

Manning, S., Ricart J. E.,Rique, M. S. R. & Lewin, A. Y. (2010). From blind spots to hotspots: How knowledge services clusters develop and attract foreign investment. *Journal of International Management, 16*(4), 369-382. https://doi.org/10.1016/j.intman.2010.09.007

Marshall, A. (1920). *Principles of Economics.* London: MacMillan.

Mazur, V.V., Barmuta, K.A., Demin, S.S., Tikhomirov, E.A. & Bykovskiy, M.A. (2016). Innovation clusters: Advantages and disadvantages. *International Journal of Economics and financial issues, 6*(1), 270-274.

Mendes, T., Braga, V., Silva, C., Ratten, V. & Braga, A. (2021). The influence of industrial clusters on SMEs earliness and postentry speed: Exploring the role of innovation activities. *Thunderbird International Business Review, 63*(5), 623-650. https://doi.org/10.1002/tie.22226

Mićić V. (2010) Clusters – factor of improvement of Serbian industry competitiveness. *Ekonomski horizonti, 12*(2) pp. 57-74

Mindlin, Y.B., Novikov, S.V., Kireev, S.V., Adamenko, A.A. & Belitskaya, O.V. (2016). Innovative territorial clusters. *International Journal of Economics and Financial Issues, 6*(8), 251-256.

Molina-Morales, F.X. & Martínez-Fernández, M.T. (2004). How much difference is there between industrial district firms? A net value creation approach. *Research Policy, 33*(3), 473-486. doi:10.1016/j.respol.2003.10.004

Ozkanli, O. & Akdeve, E. (2006). Cluster and innovation as regional development. Presented in the *II. International Strategic Management Conference*, 07-09 June 2006, Istanbul. Avaible on: https://www.researchgate.net/publication/232273731_CLUSTER_and_INNOVATION_as_REGIONAL_DEVELOPMENT (13.11.2022).

Parausić, V. & Domazet, I. (2018). Cluster Development and Innovative Potential in Serbian Agriculture. *Economics of Agriculture, 65*(3), 1159-1170. DOI: 10.5937/ekoPolj1803159P

Paraušić, V. & Cvijanović, J. (2014). Competitiveness of Serbian agro-economy - clusters in function of sustainable regional competitiveness. Belgrade: Institute of Agricultural Economics.

Pallant, J. (2007). *SPSS Survival Manual. A Step by Step Guide to Data Analysis using SPSS for Windows*. 3rd edition. Open University Press.

Pessoa, A. (2013). Competitiveness, clusters and policy at the regional level: rhetoric vs. practice in designing policy for depressed regions. *Regional Science Inquiry Journal*, *V* (1), 101-116.

Podsakoff, P.M., MacKenzie, S.B. & Podsakoff, N.P. (2012). Sources of method bias in social science research and recommendations on how to control it. *Annual Review of Psychology, 63*, 539-569. https://doi.org/10.1146/annurev-psych-120710-100452

Porter, M.E. (1998). Clusters and the new economics of competitiveness. *Harvard Business Review*, *76*(6), 77-90.

Porter, M.E. (2003). The Economic Performance of Regions. *Regional Studies*, *37*(6and 7), 549–578. https://doi.org/10.1080/0034340032000108688

Porter, M.E. (1990). *The Competitive Advantage of Nations*. Basingstoke: Macmillan.

Porter, M.E. (2000). Location, Competition, and Economic Development: Local Clusters in a Global Economy. *Economic Development Quarterly, 14*, 15-34. https://doi.org/10.1177%2F089124240001400105

Prim, A.L., Amal, M. & Carvalho, L. (2016). Regional cluster, innovation and export performance: an empirical study. *BAR-Brazilian Administration Review, 13*(02), https://doi.org/10.1590/1807-7692bar2016160028

Rocha, H.O. (2004). Entrepreneurship and Development: The Role of Clusters. *Small Business Economics, 23*(5), 363–400. https://doi.org/10.1007/s11187-004-3991-8

Savić, Lj. (2017). *Ekonomika industrije.* Deveto izmenjeno i dopunjeno izdanje. Beograd: Centar za izdavačku delatnost, Ekonomski fakultet u Beogradu.

Savić, N., Lazarević, J., Vjetrov, A. & Marinković, E. (2021). Serbian economy recovery in the post COVID-19 era: Cluster approach. *Ekonomika preduzeća, 69*(3-4), 243-259. DOI: 10.5937/EKOPRE2103243S

Silvestre, S.S. & Silva-Neto, R. (2014). Capability accumulation, innovation, and technology diffusion: Lessons from a Base of the Pyramid cluster. *Technovation, 34*(5), 270-283. https://doi.org/10.1016/j.technovation.2013.09.007

Singh, R.P. & Jain, R.K. (2003). Improving Local Economies Through Technology Transfer: Utilizing Incubators to Facilitate Cluster Development. *Technology Transfer and Commercialization*, *2*(3), 249-262. https://doi.org/10.1504/IJTTC.2003.003169

Stojanović, B. & Radukić, S. (2012). Potential for Innovation and Competitiveness of Serbian Small and Medium Enterprises. Monograph: *Managing Structural Changes: Trends and Requirements,* 334-345.

Šlogar, N. (2021). Relationship between market orientation and innovativeness in companies. *International Review*, 3-4, 21-29. DOI: 10.5937/intrev2103021S

Terstriep, J. & Lüthje, C. (2012). Do clusters as open innovation systems enhance firms' innovation performance? In Proceedings of the 19th International Product Development Management Conference *Transformative Research in Product and Service Innovation.* (pp. 18-19). Manchester, UK.

Thomä, J. & Zimmermann, V. (2020). Interactive learning—The key to innovation in non-R&D-intensive SMEs? A cluster analysis approach. *Journal of Small Business Management, 58*(4), 747-776., https://doi.org/10.1080/00472778.2019.1671702

Trippl, M., Grillitsch, M., Isaksen, A. & Sinozic, T. (2015). Understanding Cluster Evolution. *Papers in Innovation Studies, 2015/46*. Lund University, CIRCLE - Centre for Innovation Research.

Waits, M.J. (2000). The Added Value for the Industry Cluster Approach to Economic Analysis, Strategy Development and Service Delivery. *Economic Development Quarterly*, *14*(1), 35-50. https://doi.org/10.1177%2F089124240001400106

Zhao, Y., Zhou, W. & Huesig, S. (2010). Innovation as Clusters in Knowledge Intensive Business Services: Taking ICT Services in Shanghai and Bavaria as an Example. *International Journal of Management, 14*(1), 1–18. https://doi.org/10.1142/S1363919610002520

Žižka, M., Valentová, H. V., Pelloneová, N. & Štichhauerová, E. (2018). The effect of clusters on the innovation performance of enterprises: traditional vs new industries. *Entrepreneurship and Sustainability Issues*, *5*(4), 780-794. https://doi.org/10.9770/JESI.2018.5.4%286%29

DA LI INDUSTRIJSKI KLASTERI DOPRINOSE INOVACIONIM PERFORMANSAMA ORGANIZACIJA? ANALIZA PUTANJE

Rezime: Sve veće promene privrednog okruženja dovode do promena stila poslovanja, a prilagođavanje ovom novom stilu zahteva klaster pristup. U tom smislu, cilj istraživanja se odnosi na utvrđivanje uticaja interne i eksterne interakcije klastera na inovativne performanse i inovativne performanse na performanse organizacije, kao i na utvrđivanje uticaja kvaliteta interakcija unutar i izvan klastera na uspeh inovacija i uspeh inovacija na performanse organizacije primenom analize putanje. Dobijeni rezultati ukazuju na direktne pozitivne i statistički značajne uticaje između posmatranih varijabli, osim u

slučaju uticaja inovacionih performansi na performanse organizacije, gde nije utvrđena direktna značajna povezanost. Nalazi studije su pokazali da samo promocija industrijskih klastera ne može da obezbedi generisanje inovacija za dobrobit organizacija koje su članice klastera, već treba uzeti u obzir i specifičnost organizacije radi što uspešnije implementacije.

Ključne reči: interna interakcija klastera, eksterna interakcija klastera, organizacione performanse, inovacione performanse, inovativni uspeh, analiza putanje, Republika Srbija

Authors' biographies

Ivana Kostadinović, PhD, graduated from the Faculty of Economics in Nis in 2007 with a Master's Degree in General Economics, defending her Master's thesis titled *"Economic Analysis of the European Model of Regionalization of the Republic of Serbia"*. She also completed her doctoral academic studies at the Faculty of Economics in Niš, Macroeconomics, in 2016 and defended her doctoral thesis. Since 2008, she has been working at the Faculty of Economics in Niš, first as a teaching assistant, and later, in 2017 as an assistant professor; from 2022 as an associate professor in the subjects Economics of Industry, Industrial Management, Tourism Economics, Regional Economy and Industrial economy. She is the author of several scientific papers, published in leading national journals and proceedings of scientific conferences of national and international importance.

Violeta Jovanović, PhD, is active in the fields of sustainable development, research and development management, organization and business management. She did her bachelor's and master's degrees in Bor, at the Technical Faculty. Her doctoral thesis was defended in 2016 at the Faculty of Management Zaječar. She has published several books and peer-reviewed papers. Since 2008 she worked at the Faculty of of Management Zaječar, first as a teaching assistant, then in 2017 as an assistant professor, and from 2022 as an associate professor. Since 2022 she has been working at the Faculty of Management, Metropolitan University Belgrade

Sunčica Stanković, PhD, graduated from the Higher School of Management in Zaječar in 2005. She graduated from the Faculty of Business Studies in Belgrade in 2007. She completed her doctoral academic studies at the Faculty of Economics in Niš, Macroeconomics, in 2018 and defended her doctoral thesis. She was elected an assistant professor in 2021 at the Faculty of Management, Zaječar, Megatrend University, Belgrade, for the narrow scientific field: Mathematical Economics, and from 2022 an assistant professor at the Faculty of Business Economics and Entrepreneurship in Belgrade, also for the narrow scientific field: Mathematical economics. She is the author of several scientific papers, published in leading national journals and proceedings of scientific conferences of national and international importance.