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WHAT CREATES THE INNOVATIVE ORGANISATIONAL DESIGN IN SCIENCE AND RESEARCH ORGANISATIONS (SROs) IN SERBIA? THE INFLUENCE OF STRATEGIC PROJECT MANAGEMENT FACTORS

Šta oblikuje inovativni organizacioni dizajn u naučnoistraživačkim organizacijama u Srbiji? Uticaj faktora strateškog upravljanja projektima

Abstract

Efficient strategic project management in SROs (Science and Research Organisations) implies the existence of an integrated strategic management concept closely linked to an innovative organisational design. The aim of the paper is to examine the influence of certain factors of strategic project management on creating an organisational design that encourages innovation in scientific research organizations. An empirical research in SROs in Serbia has been conducted as well. Our research is empirically presented on the example of SROs in Serbia as a representative of developing countries. Our findings show that the external and internal environment, project portfolio, resources, monitoring, methods, and techniques mainly influence an organisational design. These elements of strategic project management account for 67.3% of the explained variability in a developed regression model. This paper extends the current strategic and project management literature with a new conceptual model on the link between strategic project management factors and an innovative organisational design in SROs. The presented analysis can help strategic and project managers establish adequate strategic guidelines for organisational development activities to improve the efficiency of scientific research results and the level of their innovativeness.

Keywords: *organizational design, strategic management, project management, scientific-research organizations (SROs)*

Sažetak

Efikasno strateško upravljanje projektima u NIO (naučnoistraživačkim organizacijama) podrazumeva postojanje integrisanog koncepta strateškog upravljanja koji je usko povezan sa inovativnim organizacionim dizajnom. Cilj rada je da se ispita uticaj određenih faktora strateškog upravljanja projektima na kreiranje organizacionog dizajna kojim se podstiču inovacije u naučnoistraživačkim organizacijama. U radu je sprovedeno i empirijsko istraživanje u naučnoistraživačkim organizacijama u Srbiji. Naši nalazi pokazuju da eksterno i interno okruženje, portfolio projekata, resursi, monitoring i metode i tehnike utiču na organizacioni dizajn. Ovi elementi strateškog upravljanja projektima čine 67,3% objašnjene varijabilnosti u razvijenom regresionom modelu. Ovaj rad proširuje trenutnu literaturu o strateškom i projektnom menadžmentu novim konceptualnim modelom o povezanosti faktora strateškog upravljanja projektima i inovativnog organizacionog dizajna u NIO. Prikazana analiza može pomoći strateškim i projektnim menadžerima da postavе adekvatne strateške smernice za aktivnosti organizacionog razvoja u cilju poboljšanja efikasnosti naučnoistraživačkih rezultata i stepena njihove inovativnosti.

Ključne reči: *organizacioni dizajn, strateški menadžment, projektni menadžment, naučnoistraživačke organizacije*

Introduction

For a long time, in literature, scholars observed the innovative behaviour of companies mainly through a technological dimension. Organizational elements (organizational structure, organisational culture, organisational learning, teamwork, leadership, and motivation), which belong to non-technological dimension, began to be considered essential factors of success in innovative companies at the end of the twentieth century. Moreover, organisational design is becoming a necessary factor for strategically managed innovative companies. Since 2006, Community Innovation Survey – the statistical report on companies' innovation activity data has incorporated the part related to the organisational components of innovative companies [76].

Organizational design is a framework in which certain behaviours occur in organisations, at the individual, group, and corporate (organisational) levels. The innovative behaviour of a company is a strategic commitment of the management to be innovative, whether the company is a companion to others, i.e. an imitator, or a leader in creating new products and services, new managerial technologies and style leadership, i.e. an innovator [67].

The organizational design provides the guidelines for a decision-making process in an organisation [25]. Designing scientific-research organisations (SROs) represents a complex process that involves fitting these organisations' technological and non-technological dimensions. It means encompassing scientific research activities, engaging highly competent workers, and society needs. It is necessary to direct the creative potential of these organisations toward the market and social demands without losing scientific curiosity.

Nowadays, SROs are facing challenges and remodelling as a result of a new form of supply and demand in a volatile environment, especially in developing countries. In the economies facing privatisation, liberalisation, and lack of public funds, the organisations dealing with scientific research are forced to develop cooperation with other national innovation stakeholders, e.g. the economy, governments, and civil society. All these activities demand well-educated strategic management. One of the mistakes developing countries make is merely copying the models

from developed countries. On the contrary, scientific research and development need to be aligned with the identified needs within the national innovation system [7]. SROs are one of the leading actors of the national innovation system that reflect considerable external changes. These include political, economic, and demographic changes, as well as the need to maximize the utilization of science and research activities to operate most effectively and efficiently (see [24], [36], [40], [48], [53], [62], [74], [85], [96]). Understanding the performance of SROs is a very demanding task because it involves simultaneous consideration of researchers' characteristics, the organisational characteristics of the SRO itself, and the characteristics of a particular industry [51]. The results of the scientific research in these organisations occur as an interaction between different decisions and choices, including the size and location of research and development (R&D) capacity, division of labour among different groups, technological development and the use of different technologies, staffing, resource allocation, project management, a process design, and other factors. Establishing operational coherence and synergy to achieve the best possible results indicates the importance of strategic project management in SROs [81]. It integrates the concept of strategic management and project-based scientific research work comprehensively.

The link between strategic and project management has become increasingly important, as it can be seen from the extensive literature related to different aspects of these topics [44], [63], [77]. A significant contribution to understanding project management in SROs is the evaluation of research and development (R&D) project management approaches, from the traditional one focusing on completing project tasks within the timeframe and budget to the modern approach focusing on meeting the market needs [88]. Due to its increasing importance, numerous scholars have focused on the relationship between strategic orientation and the organisational elements in SROs. Effective strategic management in SROs mainly involves organisational design that encourages innovations. Creating and developing new ideas and the success of innovation are closely connected with an organisational context [95]. A large number of studies in management have shown managerial harmonisation between

individual components of a management process and the establishing of close links between corporate functions and R&D activities. This enables power dispersion from the top management to the management of departments leading to the improvement of a R&D process and a flexible search for business opportunities [71].

This paper contributes to the existing theory and practice by extending the current strategic and project management literature with a new conceptual model on the association between strategic project management factors in SROs and an innovative organisational design. It considers the influence of strategic management by selecting relevant strategic management factors and examining their contribution to an organisational design. The next chapter offers a profound literature review on the presented topic and develops the research hypotheses. The third chapter presents the research methodology, while the fourth one shows the results. Finally, the discussion and conclusion sections are given.

Theoretical background and hypothesis

Organisational design

For a long time, organisational structure and design were considered synonymous in economic literature [65]. With the development of organisation theory, especially with the appearance of contingency theory, the term organisational design has become more than an organisational structure [42]. The strategy has become the main driver for creating an organisational design. Many factors enable running an organisation besides its formal structure and the internal relationships between the units within the organisation as usually presented in a typical organisation chart [32].

An organisational design is a tool for aligning all the components of an organisation towards goal implementation, defining the success of organisations, and shaping their performance [17], [72], [89]. In the literature, there is no universal model of organisational design which can be implemented in practice. The model components differ from one organisation to another and are grounded on logic and principles [32]. It is noticed that the greater the number of stakeholders involved, the greater is the

efficiency of organisational design application [89]. An organisational design involves specific types of organisational behaviour of employees aiming to enhance organisational effectiveness. The influences from the modern economy place emphasis on knowledge as a factor of competitive advantage. The focus has shifted from organisation's material resources towards employees' skills and competencies and new forms of organisational structure [79]. Numerous research examined how particular organisational design components affect organisations' innovative behaviour. Some authors examined the relationship between leadership, innovations, and organisational culture as a component of organisational design directed towards employees [43], [78], [84], [86], [91]. Organisational culture influences strategic and operational decisions, activities and interactions, and determines organisational performance. Moreover, organisational culture determines the character of interpersonal relations, the reward and motivation system, influences the reduction of conflicts, and facilitates coordination. However, organisational culture is determined by numerous factors, especially by a leadership style – “leaders create organisational culture according to their own personal traits, values, and style” [39]. It was shown that organisational culture fosters innovation and creativity within organisations [2], [56], [58], [59], [100]. Other authors underlined that the size of a company is also crucial for developing an organisational culture that fosters innovation [49], [50]. The impact of organisational culture on project execution is widely recognised [8], [90]. The organisational culture in SROs, such as institutes and universities, is seen as a tool for fostering the implementation of technological innovation and knowledge sharing, as well as a response to globalisation [6], [13], [29], [52], [57], [101]. Managing “knowledge workers”, performance, and rewards highlights the importance of people management in the knowledge economy [93]. Human resource development and its link with innovation ought to be analysed within the context of organisational culture and leadership capabilities [41], [14], [87]. Creating the successful organisational design which encourages innovation is a very complex process that involves aligning a set of organisational components, which should be combined in the best possible way to

create and improve the environment that encourages innovation in the first place [67], [14], [94], [69], [4], [61].

An innovative organisational design means that structure, processes, rewards, and people should be managed towards innovation. At a strategic level, there is a need for a skill to combine two antagonistic capabilities of an organisation: innovative and operative [30], [92]. The organisational context of SROs implies a set of instruments that enables a smooth running of all phases of a R&D process. SROs strive to institutionalise their R&D management components through an appropriate organisational context that enables them to maximise the efficiency of an entire R&D process. The organisational component integrates scientific research specifics, such as project management, cooperation within and between project teams, budget management, a human resources development plan, linking strategic and operational activities by creating a project management unit, etc. Structuring science and research activities effectively implies overcoming the resistance to change, willingness to take risks, and encouraging innovative behaviour of employees in organisations.

The innovative organizational design in the context of this paper implies an organisational concept that encourages innovativeness in an organization.

SROs, strategic project management, and innovation

As previously mentioned, SROs are significant actors within the national innovation system. They represent the knowledge base and foster innovation and the performance of national economies. Research institutes in the narrow sense, are recognisable, strategically-oriented research organisations that perform crucial functions within European innovation systems [7]. The importance of these institutions is, foremost, in engendering knowledge, which presents the critical component of technological progress. Faculties create highly educated staff and engineers who can create new knowledge. Institutes, research centres, and universities alike perform the function of knowledge-engendering and inciting technological progress [15], [60], [73]. SROs' scientific work aims to improve the existing

knowledge base, whereas R&D activities aim to direct research towards market demands.

A major imperfection of most strategic management models in SROs, especially in developing countries, indicates that neither a scientific research process nor a strategic management process is viewed in a sufficiently analytically comprehensive framework. In most cases, only specific components of these processes are described, further implying that strategic management in these organisations has been facing numerous organisational challenges [10].

For SROs, project management is seen as a core competence [55]. Effective management of individual projects and entire project programs and portfolios has become necessary in modern management practice. In SROs, effective project management generally improves the scientific knowledge base and the efficient use of scientific research results, especially considering the high costs involved [23], [87]. The approach of managing a project influences project performance in an organisation [21]. Project managers should support the creative thinking of project team members and turn it into concrete scientific results (scientific papers, reports, journal articles, etc.) or concrete technologies or technological processes within the appropriate timeframe and budget [23].

In addition, the fact that the research results of SROs should be further applicable indicates the need for professional development of the management of SROs. In developing countries, SROs management has evolved under the influence of the changes that are taking place in the field of R&D. The abbreviation R&D puts together pure research and innovation activities with cost and product optimization [64]. Nowadays, R&D is seen as an input to innovations, not only in terms of their impact on organizations but also on society as a whole. The importance of market information in defining scientific research projects was pointed out long ago [27], [28]. For this reason, understanding the project management process in SROs involves understanding strategic orientation in managing innovations [19], [38]. Innovation management is closely connected with assigning responsibility for innovation within a company to develop, organise, and manage innovation activities in line with its organisational context [14], [5], [11], [46]. This should be enabled through

organisational adaptation to new concepts or behaviour typical for innovative organisations [17]. According to the literature, innovation can be defined as measuring the efficiency of R&D activities in organisations that can lead to technological and organisational changes [76], [14], [97]. Nevertheless, besides technological innovations, non-technological innovations are also crucial for organisations. Organisational innovations are seen as a business process which comprises activities such as strategic management and human resource management [76].

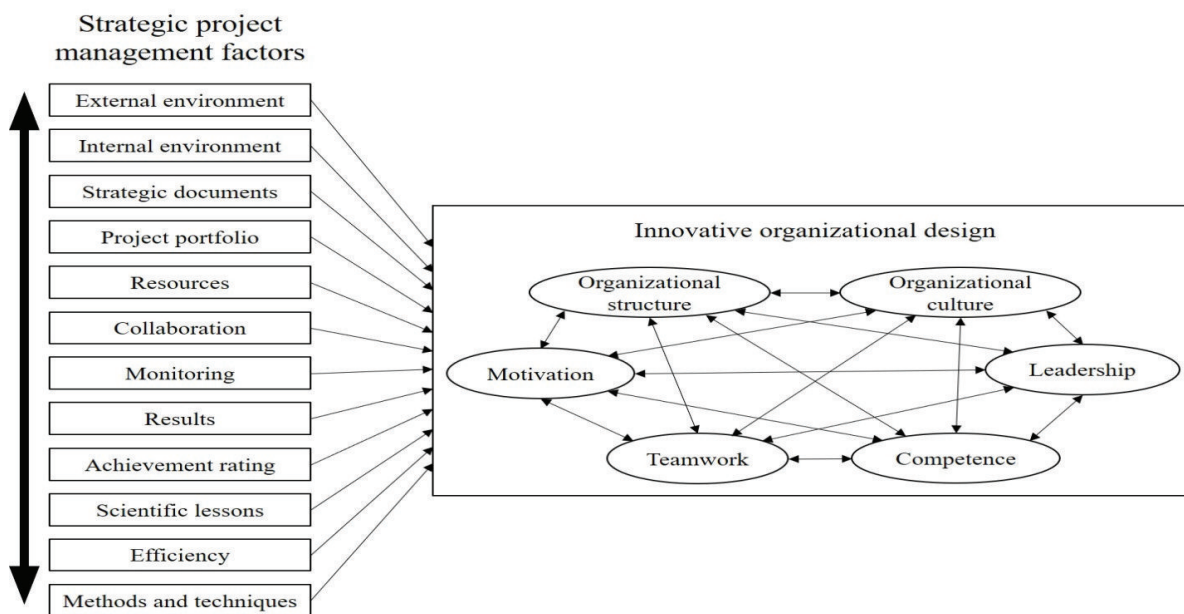
Hypothesis development

It is a significant challenge to develop a comprehensive framework for strategically managed scientific and research work in SROs. There is a consensus in the literature that organisational innovativeness is crucial for long-term sustainability [66]. According to the literature, we incorporated the strategic and project management components in our model [63], [98] to examine their influence on an innovative organisational design. Most researchers suggest that organisational design is multidimensional, and a large scale of organisational factors can influence scientific and research work and their utilization. This literature review has focused on understanding the content of the organisational dimension that will enable an organization to be innovative.

An integrated strategic management model in SROs represents a system of several interconnected elements which describes the core elements of strategic management in an organization: planning, implementation, and evaluation. The development of such a model is a challenging task. It connects the concept of strategic management and project-oriented scientific research activities. The general shortcomings of most strategic management models in SROs relate to the process of R&D itself and the fact that a strategic management process needs to be viewed in a more integrated, analytically acceptable framework. In literature, frequently, only some of the phases of this process are described, which does not provide detailed insight into the importance of strategic management with all its components in SROs, further implying that strategic management in these organisations faces numerous methodological and organisational challenges.

In this paper, we aim to examine the relationship between the selected components of strategic project management in SROs and the organisational design that fosters innovation, with a specific focus on Serbia. A significant challenge was to describe a conceptual framework of strategic management in SROs. After a detailed theoretical analysis and taking into account the specificity of the scientific research system in Serbia, relevant factors that describe the process of strategic management in this type of organisation were selected

Figure 1: Research model framework



and presented by several consistent variables: external environment, internal environment, strategic documents, project portfolio, resources, collaboration, monitoring, results, achievement rating, scientific lessons, efficiency assessment, and strategic management methods and techniques (see Table 3 and Figure 1).

The paper is based on the hypothesis that certain factors of strategic project management influence the creation of the organizational design that encourages innovation in scientific and research organizations. A successful organisational design that fosters innovation means aligning the organisational components in a way that enables creating and improving the innovation-induced environment. Based on the previous literature review, we developed the concept of the organisational design that triggers innovation in SROs, as presented in Table 2 and Figure 1, which includes: organisational structure, organisational culture, leadership, teamwork, and employees' motivation ([4], [14], [57], [67], [69], [94]). Within this framework, we aim to investigate whether and how particular components of strategic project management interact to enhance an innovative organisational design.

This hypothesis proposes that the application of the strategic management model in SROs involves the implementation of an innovative organisational design of the organisation. Figure 1 proposes the conceptual model. It presents the defined indicators that describe the strategic management process and their connection to organisational design and its components (see Table 2).

Methodology

The research was conducted in Serbia as a representative of developing countries. The data used in this research are part of a broad national survey investigating various aspects of strategic project management in SROs in Serbia. The survey's focal point were specific projects managed and completed in different SROs in Serbia. The problem of strategic management in SROs is recognized in Serbia at a strategic level, within the Strategy of Scientific and Technological Development of the Republic of Serbia for the period from 2016 to 2020 – Research for Innovation:

“Most scientific research organisations do not have a strategic approach to managing research and directing research toward innovation” [33], [34, p. 31].

There is also an ongoing project SAIGE (Serbia Accelerating Innovation and Growth Entrepreneurship), which aims to present clear guidelines when it comes to implementing innovation in business environment.

Data collection

The survey sample counts 187 respondents from different SROs in Serbia that participated in the distinctive projects. The assumption foreshadowing the survey was that strategic project management in SROs should be understandable to all employees in an organisation regardless of their project role. The questionnaire was distributed to employees in SROs that participated in separate projects. The characteristics of the sample are summarized in Table 1.

Most of the participants come from SROs that are scientific institutes (48.1%), then faculties (34.2%), while 10.2% are research and development (R&D) institutes,

Table 1: Sample characteristics

Characteristics	N	% of N
Project participation		
Principal investigator	27	14.4
Project participant	155	82.9
Other	5	2.7
SRO employment		
Researcher – Scientific title	100	53.5
Researcher – Teaching title	58	31.0
Researcher – Research title	25	13.4
Expert associates	4	2.1
Type of SRO		
Scientific institute	90	48.1
R&D institute	19	10.2
Institute of National Importance	14	7.5
Faculty	64	34.2
Scientific area of an SRO		
Natural sciences	55	29.4
Technological sciences	73	39.0
Social sciences	59	31.6
Number of employees in an SRO		
Less than 50 employees	56	29.9
50-250 employees	80	42.8
More than 250 employees	51	27.3
Sex		
Male	83	44.4
Female	104	55.6

and 7.5% are institutes of national importance. By the size of SROs, 27.3% have more than 250 employees, 42.8% are medium size counting 50-250 employees, and 29.9% are small SROs, with less than 50 employees. From the respondents' outlook, 14.4% are principal investigators of the beheld projects, while 82.9% are project participants. The percentage of scientific areas of the respondents is balanced (29.4% natural sciences, 39% technological sciences, 31.6% social sciences). Additionally, the average age of the respondents is 44 years, while 44.4% are male and 55.6% are female.

The empirical research framework is primarily based on integrated strategic management model elements. The big challenge was determining the variables describing strategic project management in SROs. Following an extensive literature review and the specificity of Serbia's scientific research system, appropriate indicators of strategic management in SROs were selected. The indicators are first systematized at the general level within the primary phases of strategic management and then within the thematic units within these phases.

We established the main dependent variable – *Organisational design*. It consists of 6 sub-elements measured on a 5-point Likert scale (1 – ‘strongly disagree’ to 5 – ‘strongly agree’). The structure of the measure is given in Table 2. The components of organizational design are also visible in the research model framework, presented in Figure 1. The Cronbach's alpha of the scale organizational design is 0.885 (see Table 3), which exceeds the threshold [54] and designates the very good internal consistency of the scale [18], [45].

Table 3 presents the exhaustive set of measurement scales that describe strategic project management in SROs. Measurement scales are created after an extensive analysis of organizational elements that encourage innovative behaviour in an organization ([4], [14], [61], [67], [69], [94]). Each variable consists of 4-13 sub-elements measured on the 5-point Likert scale, in the same way as the main dependent variable, as described above (the complete list of the variable sub-elements is available upon request). The Cronbach's alpha internal consistency scale measures are larger than 0.8 for almost all the variables (minimal

Table 2: Organisational design sub-elements

Organisational design	
Organisational structure	The organisational structure is adequate and facilitates the implementation of project tasks
Organisational culture	The business culture of the organisation enables the successful completion of project tasks
Leadership	Principal investigator is a leader with strong professional and operational skills
Competence	Human resources expertise is adequate and facilitates project tasks
Teamwork	Effective teamwork enables successful completion of project tasks
Motivation	Employee motivation is adequate and facilitates project tasks

Source: Adjusted from [4], [14], [57], [67], [69], [94]

Table 3: Measurement scales, mean, SD, number of sub-elements, Cronbach's alphas, Harman's unrotated single factor test

Variable	Mean	SD	No. of sub-el.	Cronbach's alpha	CMB Harman's test
External environment	2.92	0.882	10	0.891	33.295%
Internal environment	2.79	0.619	11	0.782	
Strategic documents	2.91	1.245	4	0.888	
Project portfolio	2.83	1.086	7	0.901	
Resources	2.83	0.996	5	0.803	
Collaboration	3.05	0.942	5	0.795	
Monitoring	2.68	1.149	4	0.878	
Results	3.34	1.011	7	0.836	
Achievement rating	2.72	1.109	6	0.902	
Scientific lessons	2.41	1.186	4	0.933	
Efficiency	3.21	1.125	13	0.963	
Methods and techniques	2.19	1.145	3	0.869	
Organizational design	3.35	1.057	6	0.885	

Source: Adjusted from [4], [14], [61], [67], [69], [94]

value is 0.782), which designates very good to excellent internal consistency [18], [45], [16].

Results

Since all the answers in the questionnaire were collected simultaneously, regardless of the dependent or independent variables, we tested if the responses in our research were facing the common method bias (CMB) [82], [83]. CMB is observed through the presence of a systematic variance [9] that can inflate or deflate a relationship among variables [20] which can lead to unsound conclusions. We wanted to check whether the variations in responses are caused by the instrument rather than the actual predispositions of the respondents. To do so, we performed Harman’s unrotated single factor test. The test showed that a single factor accounts for 33.295% of all the variables in the model. Since it is less than 50%, our research instrument is showed to be free from significant common method bias effects. Therefore, we can conclude that there is no substantial CMB present in the data.

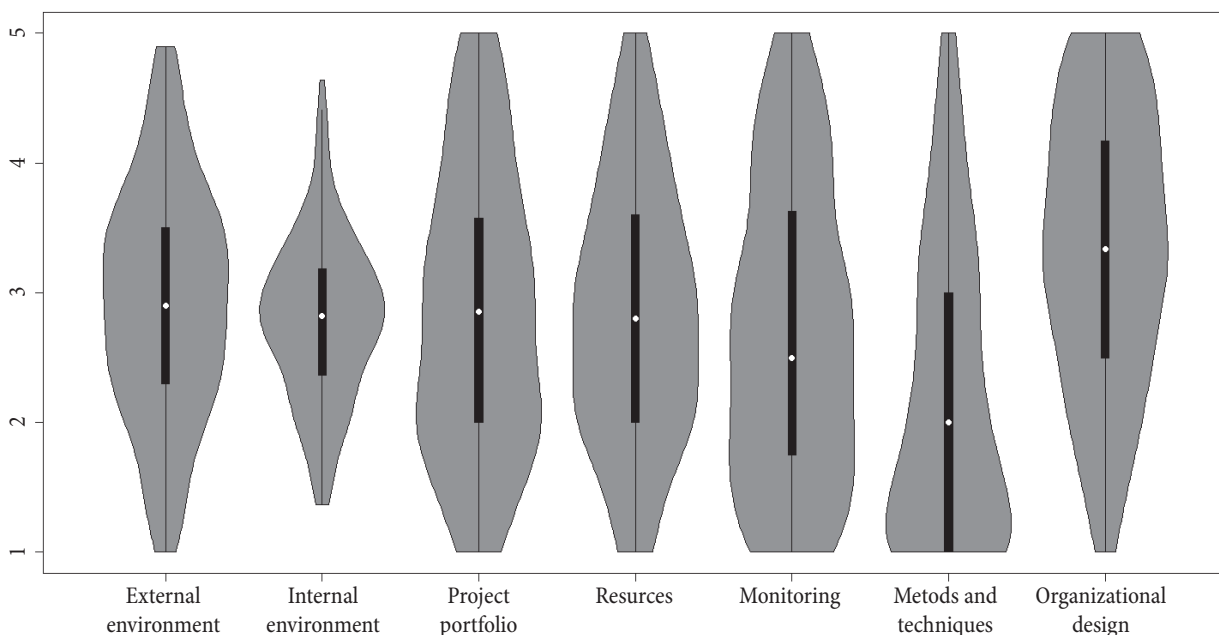
The correlation coefficients among the research variables are presented in Table 4. All the correlation coefficients among variables are statistically significant. One of them is significant at the 0.05 level of significance (Project portfolio and Achievement rating, $r = 0.184$), while

all others are significant at 0.001 level of significance. The strongest correlation is found between pairs of variables Project portfolio and Achievement rating ($r = 0.845$), Project portfolio and Recourses ($r = 0.828$), as well as Achievement rating and Recourses ($r = 0.828$). Organizational design, as the main dependent variable, is weakly correlated with the variable Results ($r = 0.263$). It is moderately correlated with External environment ($r = 0.492$), Internal environment ($r = 0.545$), Strategic documents ($r = 0.614$), Collaboration ($r = 0.544$), Scientific lessons ($r = 0.651$), Efficiency ($r = 0.361$), and Methods and techniques ($r = 0.595$). Withal, it is strongly correlated with Project portfolio ($r = 0.768$), Resources ($r = 0.771$), Monitoring ($r = 0.744$), and Achievement rating ($r = 0.722$).

To further test the central hypothesis of this research and examine which factors mutually shape organizational design in SROs, we have performed a multiple backward regression analysis. The regression model was used to eliminate all the nonsignificant duplicated effects of the hypothesized predictor variables from the initial model. The results of the analysis are presented in Table 5.

The initial model includes the variables that are the elements of strategic project management examined in this survey, as presented in the conceptual model given in Figure 1. As shown in Table 5, this model is statistically significant at 0.001 level ($F = 29.930$, $p < 0.001$). The

Figure 2: Violin plot of the variables included in the final regression model



coefficient of determination is 0.67, suggesting that the initial model accounts for 67% of the variability of innovative organizational design. However, this model suffers from other drawbacks; about 33% of the initially included variables are statistically significant in the model.

Multiple backward regression model was performed in seven iterations. All the nonsignificant variables were iteratively excluded from the model. As presented in Table 5, the final model is statistically significant at 0.001 level ($F = 59.760, p < 0.001$). The coefficient of determination shows that the predictors that were kept in the final model account for 67.3% of the explained variability in

the model. The most significant influence is found with Project portfolio ($stdB = 0.384, t = 3.818, p < 0.001$) and Resources ($stdB = 0.327, t = 3.960, p < 0.001$), where a better Project portfolio and a more intensive resource allocation account for better Organizational design. The descriptive violin plots of the variables that are included in the final regression model are given in Figure 2.

Figure 2 further examines the structure of the variables in the final model. From Figure 2 and Table 3, it can be noted that the dependent variable organizational design has the highest mean value and is skewed to the right. Resources are closest to normally skewed, while

Table 4: Correlation coefficients

Variable	Correlation coefficients												
	1	2	3	4	5	6	7	8	9	10	11	12	13
1 External environment	-												
2 Internal environment	0.712***	-											
3 Strategic documents	0.607***	0.550***	-										
4 Project portfolio	0.639***	0.613***	0.768***	-									
5 Resources	0.567***	0.571***	0.762***	0.828***	-								
6 Collaboration	0.531***	0.639***	0.464***	0.546***	0.537***	-							
7 Monitoring	0.551***	0.468***	0.688***	0.793***	0.765***	0.558***	-						
8 Results	0.318***	0.266***	0.184*	0.306***	0.245***	0.398***	0.274***	-					
9 Achievement rating	0.562***	0.552***	0.729***	0.845***	0.828***	0.510***	0.788***	0.268***	-				
10 Scientific lessons	0.452***	0.437***	0.602***	0.754***	0.685***	0.501***	0.756***	0.275***	0.762***	-			
11 Efficiency	0.286***	0.348***	0.305***	0.447***	0.397***	0.413***	0.436***	0.364***	0.455***	0.437***	-		
12 Methods and techniques	0.551***	0.482***	0.764***	0.811***	0.730***	0.447***	0.720***	0.271***	0.808***	0.673***	0.346***	-	
13 Organizational design	0.492***	0.545***	0.614***	0.768***	0.771***	0.544***	0.744***	0.263***	0.722***	0.651***	0.361***	0.595***	-

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5: Results of the multiple backward regression model for Organizational design

Variables	Initial model		Final model	
	B	StdB	B	StdB
Intercept	3.535*		3.381*	
External environment	0.091	0.122	0.089*	0.119
Internal environment	0.123	0.130	0.140*	0.149
Strategic documents	-0.069	-0.053		
Project portfolio	0.328***	0.385	0.328***	0.384
Resources	0.397***	0.300	0.432***	0.327
Collaboration	0.081	0.059		
Monitoring	0.382**	0.269	0.427***	0.301
Results	0.024	0.027		
Achievement rating	0.116	0.118		
Scientific lessons	0.009	0.007		
Efficiency	-0.033	-0.075		
Methods and techniques	-0.370*	-0.194	-0.340*	-0.178
Model statistics				
ANOVA F	29.930***		59.760***	
R ²	0.693		0.685	
Adjusted R ²	0.670		0.673	

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; B - Unstandardized Coefficients, StdB - Standardized Coefficients

project portfolio that mostly affects the organizational design and the monitoring is slightly skewed to the left. From Figure 2 and Table 3, it can also be noted that the internal environment has the lowest variance among the hypothesized variables, followed by the external environment, which makes them most stable.

Based on all stated above, we find that the most important strategic project management factors that shape innovative organizational design are external and internal environment, project portfolio, resources, monitoring, and methods and techniques.

Discussion

Based on the findings of this research, it was shown that the empirical results mainly support our study framework and the research hypothesis. The organizational design was significantly correlated (Table 3) with all the strategic project management factors in SROs. However, when disposing of the duplicity of the variability, regression analysis shows that variables that are significant in the final model are the internal environment, external environment, project portfolio, resources, monitoring, and methods and techniques. Our findings are supported in the literature to a large extent.

SROs' resources take a significant place as a factor of strategic management that influences organizational design ($r = 0.771$, Tables 4 and 5). This finding is in accordance with the previous literature [1]. Taking into consideration SROs characteristics, the main resources in SROs are people. Employees in SROs are mainly highly educated, trained to have great work autonomy and to show initiative. They are career-oriented rather than company-oriented [26]. Knowledge is recognised as a very important resource in today's economy and can be assessed as the fourth factor of manufacturing (besides capital, land, and labour) [80], [99]. Nowadays in business world, knowledge as an element of "intangible assets" has become a key resource of an organisation and a basic source of its competitive advantage [22]. Thus, it can be assumed that the pillars of organizational design in SROs are human resources. Unfortunately, it was observed in post-communistic economies that young, educated

experts are more and more commonly leaving their home countries. Many scientists who had the will and desire to make a change left SROs and moved to either a foreign company representative or abroad, where better work conditions are offered both financially and intellectually [85]. Still, the situation has been improving in Serbia in the last ten years. Our research results show that the SROs management is becoming more aware of the human resources management significance.

The phase of strategy implementation is a challenging task for the management of SROs. It implies the process of "reviving" the strategy. Within this phase of strategic management, there are activities connected to the efficient allocation of resources in a way that encourages creative behaviour and provides support for joint initiatives for the development and commercialization of the results of scientific research. Strategy implementation in SROs should consider the complexity of managing technological innovations and the problems associated with uncertainty, the specific nature of knowledge, and unpredictable costs and risks [37]. Next to human resources, financial resources are equally important for innovative organizational design. Science, Research and Innovation activities, which require a large share of financial resources to generate new knowledge, technologies, and innovations, are mostly project-oriented and are mainly performed by enterprises, higher education institutions, and research institutes [12], [47], [75].

In the operational aspect, project management and a project portfolio are found to be highly important aspects of the strategic management model in SROs of Serbia ($r = 0.768$). Management in SROs often considers multiple and conflicting goals to choose a desirable project portfolio. Multi-project aspects of SROs lead to an increasing need for coordination and control of complex projects, as well as their alignment with strategic goals of an organization, aimed at choosing a project with the best chances of success, avoiding risk accumulation, and realizing project management synergy [12], [31]. In addition, the significant influence of methods and techniques ($r = 0.595$) on organizational design indicates the SROs management awareness about the importance of using certain methodological tools applying to project

management, which, eventually, has a positive impact on all the components of organizational design. However, in the final regression model, when combined with other predictors in the model, methods and techniques seemed to have a negative influence on organizational design. This is probably due to the fact that well-addressed project portfolio and resources allocation in SROs successfully determine organizational design, with fewer requirements for a specific methodological approach.

R&D activities are risky by themselves, and their results are difficult to measure and evaluate. Strategic management of SROs should be flexible so as not to limit the autonomy of researchers too much as it could badly affect their creativity. Also, SROs must serve both public and private interests, further complicating the strategic management process [75], [35]. The control and evaluation of the strategy implementation are a significant part of strategic management of SROs. They apply mechanisms to monitor the success of previously taken steps. To perform this process successfully, it is also necessary to define critical factors of organization success [3]. Monitoring and evaluation enable an organization, based on previous and current activities, to select relevant information which can be later used to fine-tune and plan future activities. In this context, it is encouraging that monitoring ($r = 0.744$) and achievement rating ($r = 0.722$) significantly influence organizational design in SROs.

In Serbia, for long period, science was considered an activity whose purpose is itself and whose functioning would be impossible through projects financed by the Ministry of Science, Technology, and Innovation. This was a consequence of a centralistic approach to making decisions. Investments in science were almost invisible since positive effects were only seen through the efficient workings of the national innovation system. The main driver of investments in science was increasing pressure on the market, which progressively lead to strategic research integration, developments, innovations, and commercial strategies. Research has proven that factors such as innovations, knowledge, competitiveness, internal relationships between employees, and environmental influences greatly determine the relationship between strategic orientation and performance [70]. Establishing

the connection between R&D policy and other policies (education, economic development et al.) is crucial for Serbia.

An application of a comprehensive approach in managing projects in SROs should enable their efficient organisational restructuring. In Serbia, most research institutes are financed by public funds, setting their missions at the moment of their creation. These facts indicate that in addition to their scientific significance SROs are often directed towards a general significance and are often aligned with the needs of a society and its citizens. Nevertheless, their mission has evolved over time, and they have started shifting their activities towards the market. To successfully integrate market needs into scientific research results, organisational acclimatisation of SROs is necessary.

Moreover, all activities in the environment should be aligned with the specific nature of SROs. The strategic orientation of SROs needs to be seen as a set of components that could direct the organisational design to create effective scientific and research results. The main goal of strategic management in SROs is efficient and effective management of a R&D process, which contributes to advanced usage of scientific research results, leading to cost reduction, and increased key knowledge bases [76].

In Serbia, project activities are mostly realised through partnerships made among SROs (faculties, universities, institutes, and the economy). Managers of organisations that develop innovation should consider organisational design an essential factor to capitalise on their collaborative innovation practice [24]. Even though cooperation was correlated to organizational design ($r = 0.544$), it was not found to be influential in our final regression model. Nevertheless, the cooperation should be marked as a significant strategic component of SROs that impacts an organizational design. One of the future directions of the research includes further investigation of this affiliation since the integrated approach to strategic management enables establishing the cooperation with all stakeholders outside an organisation and encourages technology transfers [68].

This research adds new empirical evidence to understanding project management concepts in SROs.

The presented theoretical approach enables easier understanding of R&D processes and has far-reaching implications for management practice. As mentioned before, employees in SROs are mostly highly educated, so they demand significant autonomy in their work. In the context of strategic management, the organisational design represents a complex topic for further research. It also has to be considered in different contexts. This especially applies to human resource development and functional organisation of project activities at an organisational level.

Conclusion

Since the second half of the last century, the scientific research system in Serbia has been experiencing the process of transformation from a planning system to a market-driven system. Developing an integrated model of strategic management applicable to SROs in Serbia should enable the efficient restructuring of these organisations. All changes and macroeconomic impacts from the transition economy have influenced strategic management development within SROs. In addition to investing within scientific research capacities and practice, it is important to invest in improving the quality of the management of its scientific research organization. One way is by highlighting the importance of a strategic approach to an organisational design.

An integrated approach to strategic management in SROs implies the organisational design which creates innovation. Our research has shown that, regarding SROs in Serbia, all components of strategic project management impact an organisational design, yet some are more influential than others. The most critical factors include environment, project portfolio, resources, and monitoring. The external environmental impacts lead to scientific results guiding market needs and society. Having in mind the specific nature of scientific research work, the efficient allocating of available resources leads to efficient strategic management in SROs, creating benefits not only for the organisation's management but also for the decision-makers at a national level by maximizing the horizontal coordination quality of policies, planning, and budget management. The research refers to Serbia, but

the results can be helpful for most developing countries where a planned system has been transformed to a market-based system since these countries do not have sufficiently developed incentive mechanisms for adjusting R&D within SROs to market demands.

This research presents a step forward compared to the research conducted so far. It contributes by adding the connection between strategic management and organisational design to the theory of strategic project management, with special regard to the nature of SROs in developing countries such as Serbia. It makes the strategic design management components more concrete, which has a decisive impact on an innovative organisational design. The field of strategic management is a relatively new specialised management area. Through the development of integrated models, strategic management inevitably contributes to organisational development's constant growth and sustainability.

Complex strategic management in SROs is determined by the organisational design which incites innovation. This concept needs to be analysed further in theory. The reasons lie in the fact that a strategic management process is complex, and it will take some time to adapt it to specific characteristics of SROs. Therefore, at a conceptual level, this paper has contributed to the knowledge fund in this area and, consequently, boosted it. The presented analysis can help strategic and project managers of SROs to set adequate strategic guidelines for organisational development activities to improve the efficiency of scientific research results and the level of their innovativeness.

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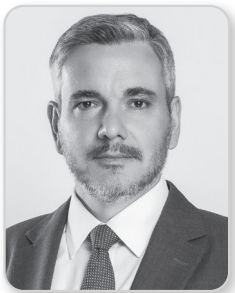
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