

Article

# Entrepreneurial Orientation of Public Universities in Republic of Serbia-Empirical Study

Mirjana Cvijić , Jovana Tatarski, Ivana Katić, Aleksandar Vekić and Jelena Borocki \*

Department of Industrial Engineering and Management, Faculty of Technical Sciences, University of Novi Sad, 21000 Novi Sad, Serbia; cvijic.mirjana@gmail.com (M.C.); j.tatarski@uns.ac.rs (J.T.); ivana.katic@uns.ac.rs (I.K.); aleksandar.vekić@gmail.com (A.V.)

\* Correspondence: borocki@uns.ac.rs; Tel.: +381-63-454-357

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**Abstract:** This study explores the impact of entrepreneurial orientation on the activities of state universities in the Republic of Serbia. Using the ENTRE-U scale, the researchers have graded the entrepreneurial orientation (EO) of the employees at state universities in the Republic of Serbia. In the theoretical part, the detailed literature review is provided, which contributes to a better understanding of terms like entrepreneurial orientation and entrepreneurial university. Using data from 282 respondents who work at the state universities in the Republic of Serbia, the researchers validate the ENTRE-U questionnaire in a specific context. With this, it is proven that the ENTRE-U scale is applicable not only for developed countries but also for the developing countries, such as the Republic of Serbia. The general conclusion is that with using the ENTRE-U scale, it is possible to predict the level of innovativeness, as well as the nature of innovative activities that are conducted at state universities in the Republic of Serbia. The entrepreneurially oriented universities differ from those which lack entrepreneurial orientation by the extent of their research mobilization, unconventional approaches, the level of cooperation with industries, and the way university policies are implemented.

**Keywords:** entrepreneurial orientation; entrepreneurial university; triple helix; ENTRE-U scale; Republic of Serbia

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## 1. Introduction

The transformation of universities and the declination in the university paradigm was the founding matter of many theories of change concerning scientific and university systems (Gibbons et al., 1994; Etzkowitz, 1989, 1996; Laydesdirff and Etzkowitz, 1998; Etzkowitz, 2011; Etzkowitz et al., 2012) [1]. The development of science and scientific policy as it exists today has been radically influenced by those theories. What they have in common is the deviation from the standard understanding of the university role, in which the university creates fundamental knowledge, and, thus, is perceived as the primary mover of innovation and economic growth. These new university roles are recognized as one of many constituents that influence the technological change, which concentrates on the application, and not just the creation of knowledge [1].

The model of the triple-helix is one of the most popular models that explain the appearance and functioning of entrepreneurial universities. It assumes that the production of knowledge and innovation in the context of a knowledge economy is seen as the interaction between three key players: universities, the government, and the economy. It is deduced that knowledge is not only produced through a process of co-evolution and convergence but also the constant interaction and customization between those three helices. When the system enters its mature phase, the helices can adopt the characteristics of others, which means that the university or research group might have characteristics

of a company, while a company can adopt certain education or research roles within a research consortium or network [1].

Achieving the right alignment between the missions of teaching, research and economic development is crucial in building an entrepreneurial university [2]. Countries whose education and culture systems differ, react differently to changes and demands of the environment [3]. Significant differences exist between higher education systems across different countries and even between institutions within the same educational system. Since the systems are not uniform, the ability of a university to engage effectively in entrepreneurial activities is constrained by its context and resource-based capability and capacity [4]. According to Carnoy (1999), the factors that influence reforms in education include the country's financial situation, the interpretation of that situation, as well as the educational role of the public university [3,5]. When state funding becomes insufficient, universities are prompted to diversify their sources of revenue, become more resourceful, and direct their resources towards greater knowledge commercialization [6]. Clark (1998) argues that the problem is a simple one; there is a misbalance of demands made on universities and resources universities use to meet those demands [3]. An essential basis for entrepreneurial university reform should be a broad and diversified funding base, which would introduce more flexibility to university activities. In other words, the universities are doing business now themselves. The scientists are becoming entrepreneurs by developing new products and starting their own companies to market their research knowledge and inventions [7]. As the lines between science, industry, and government grow increasingly blurry, the role of knowledge and technology transfer in the utilization of research findings continues to increase [6,8–10]. In view of these developments, both the scientific and political communities have begun paying greater attention to academic entrepreneurship [10,11].

Unlike most developed countries in the world, the state universities in the Republic of Serbia are more valued than private ones. The state universities are mostly financed from the state budget. Donations from private companies are rarely an option, and neither is the establishment of public-private partnerships. Most research initiated by the state universities are carried out through projects funded by the Ministry of Education, Science and Technological Development, or by participating in different EU projects. The other part of the funds is sourced from non-budget students who pay scholarships. Private universities in the Republic of Serbia are still a minority and mainly oriented towards social sciences. They are financed mostly from the student's scholarships, they lack tradition and they have greater difficulty obtaining EU projects. The entrepreneurial orientation of the universities has been acknowledged as a positive aspect of activities that is characteristic for universities just a few years back. Recently, entrepreneurship has become an important trend in the whole country as a result of actions initiated from the government and state institutions. The Year of Entrepreneurship 2016 initiative has been launched and it included a set of various government programs aimed at empowering entrepreneurial strengths, helping entrepreneurs who are starting their businesses or have already developed one to a certain point, as well as providing financial and non-financial foundation for long-term development of entrepreneurial environment [12]. The legal framework allows launching private small and medium enterprises (SMEs) in the Republic of Serbia only for more than 30 years.

The analysis of entrepreneurial orientation on state universities in the Republic of Serbia is important for establishing a potential for the creation of new knowledge and its commercialization through patents, licenses, or establishing spin-off companies. The current problems that are persistent in Serbian society are the large unemployment rate, young people leaving, low rate at which new companies are founded, insufficient investments in education and research and development activities, weak cooperation between universities and economic subjects, unfavorable position of universities in relation to the leading ones in EU and worldwide. It is upon universities in the Republic of Serbia to take the initiating role in solving these problems and turning them into opportunities. They are expected to be the mainstay of the economy and social development, laying out the fertile ground for new entrepreneurial endeavors. Along that path, they need to evolve from traditional research-based

systems into entrepreneurial universities which have strong bonds with the economy subject and encourage entrepreneurial activities of their employees.

In this paper, the researchers used the ENTRE-U scale developed by Todorovic et al. (2011) for the entrepreneurial orientation assessment of the public universities in the Republic of Serbia. In the theoretical part, the detailed literature review is provided which contributes to a better understanding of terms like entrepreneurial orientation and entrepreneurial university. Using data from 282 respondents who work on the state universities in the Republic of Serbia the researchers validate the ENTRE-U questionnaire in specific context. With this, it is proven that the ENTRE-U scale is applicable not only for developed countries, but also for the developing countries, such as the Republic of Serbia. According to the data available to the authors, similar research was not conducted in universities in European developing countries. The researchers want to discover more about the interviewees' perception of entrepreneurial universities, as well as what is the impact of entrepreneurial orientation on the activities on state universities in the Republic of Serbia. The paper has the following structure:

- literature review (Section 2),
- method and data (Section 3),
- research results and discussion (Section 4), and
- concluding remarks and suggestions for future research (Section 5).

Section 2 is the theoretical part of the paper and it contributes to a better understanding of terms entrepreneurial orientation and entrepreneurial university. Section 3 introduces the preliminary results in the form of descriptive statistics of the questionnaire, followed by confirmatory factor analysis of the ENTRE-U scale. After presenting the methods used in research, research results and discussion are displayed (Section 4). At the end, conclusions and future research directions are given in Section 5.

## 2. Literature Review

The roots of entrepreneurial orientation research originate from the work of Mintzberg (1973). Through his strategic decision-making theory, Mintzberg described an entrepreneurial strategy-making mode as a managerial disposition, which materializes through an active search for new opportunities, which allow for dramatic growth even in uncertain environments [13,14]. Ceptureanu et al. (2017) conclude that there is a strong relationship between the strategy and the corporate entrepreneurship and that the effect of those relations depends on organizational capabilities [15]. In addition, several studies show that among the strengths of successful organizations are entrepreneurs' ability to handle uncertainty and resilience [16]. Some companies are in a position to discover, evaluate, and exploit new opportunities better than the others because they implement entrepreneurial orientation as their strategic orientation [17]. Miller and Friesen (1982) proposed that entrepreneurial orientation captures the nature of the innovative strategy of the firm [14]. Merz and Sauber (1995) defined entrepreneurial orientation as the firm's degree of proactivity in its chosen product-market unit as well as its willingness to innovate and create new offerings [14]. Lumpkin and Dess (2001) observed entrepreneurial orientation as an organization-level phenomenon that involves key decisions made on behalf of the entire organization [14], and so they improved their previous definition of EO as a set of processes, practices, and decision-making activities that lead to new entries [18] (p. 136). They also supplemented the dimensions of innovation, proactivity, and risk-taking, determined by Miller (1983) [6,19,20], with tendencies to act independently and inclinations to be aggressive toward competition [6,14,18,21]. According to Avlonitis and Salavou (2007), entrepreneurial orientation is an organizational phenomenon that mirrors a managerial capability by which companies adopt proactive and aggressive initiatives in altering the competitive scene for their advantage [14,22]. Despite the considerable level of agreement on the essential dimensions of an entrepreneurial orientation as related to large commercial organizations, the application of the concept on other organizational entities remains largely an unmapped area [6]. On the other hand, the literature agrees

that the importance of EO dimensions and their mutual relationship can vary in complex ways, even within the private sector [6,23]. Although the corporate entrepreneurship literature defines EO as a well-studied theoretical paradigm, not much is known about the applicability of the paradigm to other organizational contexts. The meaning of entrepreneurial orientation varies between industries and organizational forms and is especially visible when an industry can be observed through unique organizational forms, such as universities [6].

In terms of entrepreneurial orientation in universities, human capital endowments and social networks are often perceived as two foundations of scientists' ability to contribute new knowledge to the society [24,25]. Hedner et al. (2011) state that entrepreneurial activity and the degree of entrepreneurial resilience in society are significantly affected by its social norms [26]. The literature on academic entrepreneurship often underlines that network ties to industrial subjects or governmental support agencies are favorable to an entrepreneurial career [25,27,28]. Other sources implicate that academic scientists dedicate their time and effort toward academic entrepreneurship if they see a favorable appraisal of their entrepreneurial activity and the commercial use of research knowledge [25]. Blumenthal et al. (1996) concludes that scientists funded by industry have more patents, bring more innovative solutions to the market, and more often take risks to establish enterprises [9,29]. What is more, Landry et al. (2006) write that researchers are more likely to take part in a spin-off creation themselves if they engage in consulting activities on behalf of private firms, government agencies, or organizations related to their field of research [9,27]. Prodan and Drnovsek (2010) suggest that entrepreneurial cultures at universities could be improved by entrepreneurship courses and seminars tailored specifically to the technical faculties or departments doctoral students and senior researchers' needs [9]. At a number of universities, research activities are combined with their education efforts, resulting in better application of education programs [6,30].

Etzkowitz et al. (2000) argue that universities worldwide are beginning to shift from their traditional primary role as providers of education and scientific knowledge creators to a more complex entrepreneurial university model, which integrates the additional role of knowledge commercialization and active participation in the development of private enterprises in both local and regional economy [31,32]. Among many definitions of the entrepreneurial university, the most commonly used is the one that implies entrepreneurial actions, structures, and attitudes in a university [3]. Universities need to adopt the entrepreneurship as their purpose and establish a culture in which every employee is dedicated to accomplish that purpose [33]. The entrepreneurial university is a university in which research groups are behaving like quasi-firms [34], while leaders of those groups act as entrepreneurs, or executives, as Ceptureanu et al. (2017) call them in their paper [15]. During their transition to entrepreneurial institutions, universities pass through different phases, similar to a business life-cycle. In their paper, Riviezzo et al. complement these claims by studying the effect of internal and external contextual characteristic, and conclude (in their conceptual model) that the evaluation process of a university into an entrepreneurial institution depends on the environmental context [33]. In this sense, any university that adopts a role within the triple-helix model and embraces the mission of improving regional or national economic performance can be considered as an "entrepreneurial university" [2,31]. The universities often balance between two extremes: being an institution characterized by a passion for knowledge and Mertonian values, and being a service enterprise driven by the business values [3,31]. Marginson (2000) agrees that universities should incorporate entrepreneurial features in such a way that their scholastic nature remains strong [3,35]. Rinne and Koivula (2005) point out that universities should function in an entrepreneurial manner, but in an academic, rather than economic sense. Economic success should be a result of academic success, not the other way round. If business ideology is applied directly to the university in its pure form, Barnett (2003) argues that it would ultimately corrupt the singularity of the academic mundus [3].

### 3. Method and Data

The questionnaire structure followed the structure of the ENTRE-U scale which was developed and used by Todorović [6]. Originally, the scale is a reliable instrument for evaluating entrepreneurial orientation at universities, which can also be used for successful anticipation of commercialization results (especially patents and spin-off companies) at the university departments. The differences between entrepreneurial orientation at universities and private enterprises have also been established. The interest in the application of the scale has grown over time so that it is currently a unique method for measuring entrepreneurial orientation in universities. The researchers who have used it in their studies have adjusted the scale and improved its practical application in the process [33,34,36]. The authors of this paper have no indication that such a scale has been used in other developing countries, which inspired them to validate it at state universities in the Republic of Serbia. Unfortunately, the accurate record of registered patents and spin-off companies at the universities in the Republic of Serbia is unavailable. Most universities lack dedicated technology transfer offices, which would support the commercialization of research and knowledge. Therefore, the focus of our research is different than the original one, being adapted to the context in which the study is conducted.

Before the questionnaire was generated and distributed, the inter-rater reliability was conducted, the technique which measures the degree of agreement between two or more coders who made independent ratings about the features of a set of subjects. In this paper, subjects of matter were ENTRE-U measures. The researchers were made the questionnaire in an online form, and in Serbian for this particular sample, and then sent it directly to e-mail addresses of university employees. The contacts were gathered from the university's web-pages, as well as the existing base of contacts available to the team which was engaged in this research. Only state universities were contacted. The number of completed questionnaires was 282. The number of sent e-mails was over 1300, which means that the response rate was over 21%. Each e-mail contained the link to the questionnaire web-page, along with all the necessary explanations related to the research, as well as the contact address in case the respondents have a comment, question, or they are interested in the research results. The respondents' structures by their title and fields of study are presented in Figures 1 and 2, respectively.

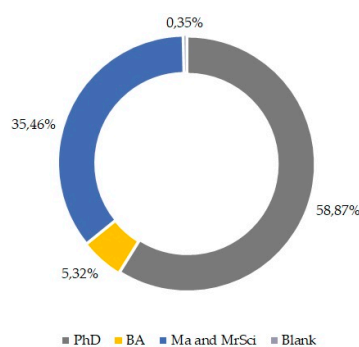


Figure 1. Structure of respondents by their title.

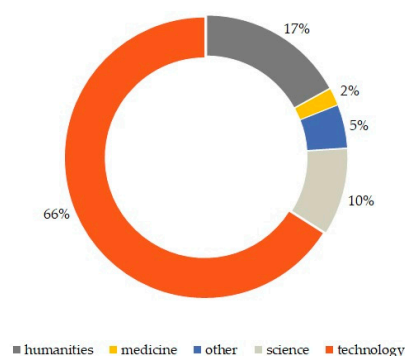


Figure 2. Structure of respondents by their fields of study.



### 3.1. Statistical Assessment of ENTRE-U Scale

#### 3.1.1. Descriptive Statistics of the Questionnaire

Table 1 shows descriptive statistics indicators for four dimensions of the ENTRE-U scale and for two dimensions of the questionnaire with items omitted from the original scale which is used in this paper. According to the values of kurtosis (Ku) and skewness (Sk), it can be concluded that on the level of the whole sample, the scores of dimensions which constitutes ENTRE-U questionnaire are normally distributed (do not go out of the range  $\pm 1.5$ ).

**Table 1.** Descriptive statistics indicators.

	N	Min	Max	AS	T AS	SD	Sk	Ku
RM	282	6	42	27.23	24.50	8.36	−0.39	−0.68
UC	282	7	54	34.74	31.50	9.74	−0.64	−0.09
IC	282	5	35	23.79	21.00	6.90	−0.66	−0.10
UP	282	4	28	17.58	17.50	5.55	−0.28	−0.39
Innovative	282	13	78	48.25	46.00	12.64	−0.32	−0.01
Traditional	282	13	66	37.98	31.50	10.40	0.28	−0.28

Legend. RM—Research Mobilization. UC—Unconventionality. IC—Industry Collaboration. UP—University Policy. Min—minimum value. Max—maximum value. AS—arithmetic mean. T AS—theoretic arithmetic mean. SD—standard deviation. Sk—skewness. Ku—kurtosis.

#### 3.1.2. Confirmatory Factor Analysis (CFA) of the ENTRE-U Scale

CFA is part of a broader concept named structural equation modeling (SEM). The second name for CFA explains the core of its implementation, and that is validity assessment of a measurement tool (questionnaire), i.e., it represents a model of relations between hypothetical constructs and manifested variables [37].

The data analysis was done in the IBM AMOS program (v.21). In line with recommendations from Koufteros et al. (2009), to test more than one model and to compare goodness-of-fit parameters, as well as to use data from prior tested measurement models of the ENTRE-U questionnaire, three models were tested [6,38]. The first model assumes a four-factor structure with correlated dimensions. The second model assumes a four-factor structure with one first-order factor. The third model assumes a four-factor structure with one first-order factor, but individual items are replaced with a set of items [39]. The fit parameters could be sensitive on low correlation between variables, so some authors suggest using a set of items, instead of individual items [40]. Sets are formed so that each set consists of two or three items, with the most similar loadings on component they belong to. For parameter assessment, the maximum likelihood method was used (ML). For goodness-of-fit assessment the following indices were used: Chi-square, Chi-square/df, Normed Fit Index (NFI—optimal value above 0.95, acceptable above 0.90), Parsimony Normed Fit Index (PNFI), Comparative Fit Index (CFI—optimal value above 0.95, acceptable above 0.90) and Root Mean Square Error of Approximation (RMSEA—optimal value below 0.05, acceptable below 0.08) [40]. The results of fit indices for three tested models are presented in Table 2 as follows.

**Table 2.** Fit indices for tested models.

Fit Index	Model 1 *	Model 2 **	Model 3 ***
Chi-square (df)	1466.8 (230)	746.40 (224)	42.90 (21)
Chi-square/df	6.37	3.33	2.05
NFI	0.69	0.84	0.98
PNFI	0.63	0.75	0.57
CFI	0.73	0.88	0.99
RMSEA	0.14	0.09	0.06

Legend. \*—four correlated dimensions; \*\*—four correlated dimensions with one first order dimension; \*\*\*—four correlated dimensions with one first order dimension—two or three items per set.

The fit indices point to the conclusion that the last model—the model with four correlated dimensions and one first order dimension, which is using sets of two or three items, has the most appropriate fit indices. On the other hand, fit indices are not acceptable for the first two tested models. The accepted model indicates that ENTRE-U is a single latent construct with interrelated indicators (dimensions). A latent construct is defined as a construct that cannot be directly measured but instead is represented by one or more variables (indicators) [41].

Table 3 shows standardized regression coefficients for sets of items on components they belong to, along with construct reliability (CR), Cronbach' alpha ( $\alpha$ ), and the average variance extracted (AVE) for individual dimensions of ENTRE-U questionnaire. Standardized regression coefficients are generally high and their values vary in range from 0.804 to 0.955, and that is expected because sets of items are in question. Reliability of the ENTRE-U questionnaire dimensions, expressed through Cronbach' alpha, is very high for all four dimensions ( $\alpha > 0.86$ ), considering its value cannot be below 0.7 [41]. Construct reliability (CR) is high enough for all four dimensions and its values are moving from 0.88 to 0.90, the minimum value for this index is 0.70 [41]. Convergent validity of dimensions in the ENTRE-U questionnaire, measured by the average variance extracted (AVE), is also very good for all four dimensions and its values vary between 0.79 and 0.85, the minimum acceptable value for this index is 0.45 [42].

**Table 3.** Standardized regression coefficients, reliability indices and convergent validity.

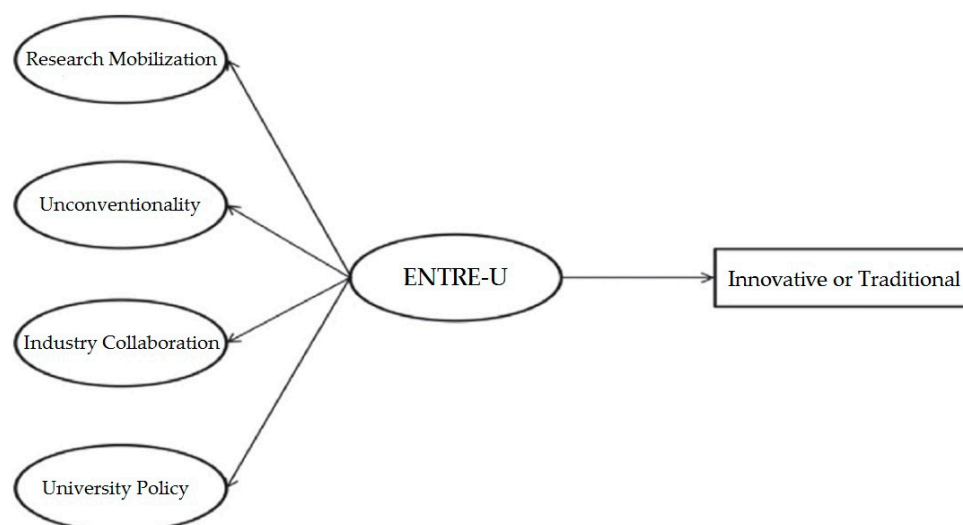
Factor/Set of Items	Standardized Regression Coefficients	Reliability Measures	
<b>Research Mobilization</b>			
RM145 *	0.915	AVE	0.81
RM234	0.889	CR	0.90
		$\alpha$	0.88
<b>Unconventionality</b>			
UC126	0.954	AVE	0.80
UC34	0.837	CR	0.90
UC57	0.804	$\alpha$	0.87
<b>Industry Collaboration organizacijama</b>			
IC134	0.955	AVE	0.85
IC25	0.812	CR	0.88
		$\alpha$	0.89
<b>University Policy</b>			
UP13	0.892	AVE	0.79
UP24	0.888	CR	0.88
		$\alpha$	0.86

Legend. \*—first set of items include item number 1, 4 and 5.

Based on the applied CFA, it is concluded that the internal validity of the ENTRE-U questionnaire is adequate and that its original structure corresponds to the structure of the gathered data. The assumed questionnaire structure, with four inter-correlated dimensions, was confirmed based on how the interviewees in the Republic of Serbia answered the questions (with greater similarity on the same-dimensional entries than on entries of different dimensions). Through an insight in the values that measure the reliability, which are very high for all four dimensions, the researchers conclude that the questionnaire is reliable as well, providing a good measure of the constructs for which it is intended. The remaining values from Table 3 confirm the conclusion that the ENTRE-U questionnaire is reliable.

The final step is to test the predictive validity of the ENTRE-U scale, so two structural models are created. In both models, the independent (predictive) variable is the ENTRE-U, while the dependent

(criterion) variables are the dimensions of the questionnaire used in this research, more precisely, Innovative and Traditional, one model each. The models are presented in Figure 3 as follows.



**Figure 3.** Structural model where ENTRE-U is independent variable, and dependent variables are dimensions Innovative and Traditional.

Table 4 reports the results. The overall model fit is similar to that of the CFI, as this analysis only adds one measured variable. Regression coefficients for the model which include the dependent variable Innovative ( $\beta = 0.796$ ,  $p < 0.001$ ;  $R^2 = 0.633$ ) are important and statistically significant. The ENTRE-U dimensions explain 63.3% of the Innovative variance. That means there is a strong and positive correlation between all dimensions of the ENTRE-U construct and Innovative dimension.

Regression coefficients for the model which include dependent variable Traditional ( $\beta = -0.008$ ,  $p > 0.05$ ;  $R^2 = 0.001$ ) are not statistically significant. The dimensions of the ENTRE-U construct do not correlate with dimension Traditional. In other words, the ENTRE-U dimensions didn't explain a significant proportion of the variance, for the variable Traditional. Changes in the ENTRE-U measures have no influence on regular activities characteristic for a more traditional way of functioning at state universities.

**Table 4.** Standardized regression coefficients for the structural model.

	Innovation	Traditional
ENTRE-U→Research Mobilization; Standardized regression weight	0.943	0.957
ENTRE-U→Unconventionality; Standardized regression weight	0.921	0.913
ENTRE-U→Industry Collaboration; Standardized regression weight	0.900	0.908
ENTRE-U→University Policy; Standardized regression weight	0.784	0.762
ENTRE-U→Innovative/Traditional; Standardized regression weight ( $R^2$ )	0.796 (0.633)	−0.008 * (0.001)
Chi-square (df)	89.32 (31)	79.38 (31)
Chi-square/df	2.885	2.561
NFI	0.964	0.965
PNFI	0.664	0.665
CFI	0.976	0.978
RMSEA	0.082	0.075

Legend. \*—all regression weights are significant when  $p < 0.001$ , except weight ENTRE-U→Traditional, which is not significant ( $p > 0.05$ ).



Being a second-order construct with four mutually-related dimensions, ENTRE-U is likely to influence practical endeavors to make universities more entrepreneurial. The decision-makers need to concentrate on each of individual dimensions in order to encourage its development. Introducing only one dimension, while discouraging another, will likely lead to an unsuccessful implementation of EO since these dimensions are correlated and one will affect other [6].

#### 4. Research Results and Discussion

The research in this paper explains that by using the ENTRE-U scale, it is possible to predict the level of innovativeness, as well as the nature of innovative activities that are conducted at state universities in the Republic of Serbia. A review of traditional activities can be the first step in successfully developing other, more entrepreneurial activities [2]. The results show that entrepreneurially oriented universities differ from those which don't have that orientation by the extent of their research mobilization, unconventional approaches, the level of cooperation with industry, and the way the university policy is implemented. Research mobilization (the first dimension) is focused on generating research results through the research process which stakeholders find more suitable for transfer and application. The first dimension initiates a deviation from systems that support knowledge creation and innovation at the individual, to group, organizational, and community levels. Items which correspond the most with this dimension of ENTRE-U and are used in our questionnaire refer not only to off-campus activities but also to regular research and teaching activities, which has a big influence on performance review of faculty members. In other words, employees who realize their ideas through research projects outside the university, cooperating with external stakeholders, have a bigger innovative potential from those who do not. The next item in the set that belongs to this dimension is related to the proportion of faculty research and teaching activities which can be significantly changed to correspond to the specific situation of individual faculty members. Employees who focus on results and are not limited by the procedures related to lecturing, research papers, and other activities at the university, achieve better innovative performances. The last item in the set is reversely coded and refers to the involvement of industry in training of graduate students, which is not supported by the university (number 1 has the maximum score in the 7 point Likert scale).

The second dimension, Unconventionality, focuses on searching for new opportunities and research results which are relevant and beneficial to stakeholders. The entries that have the highest regression coefficients refer, first, to off-campus opportunities and activities that differ from regular research and teaching activities. Taking a certain risk, employees whose research projects are funded by the industry find new opportunities and the ways in which they can be used, and help the university achieve better results in entrepreneurial orientation. Secondly, reverse code item which refers to a low level of co-operation between faculty members and private sector and another reverse coded item which refers to the situation where faculty members seldom establish their own firms or professional practices. Revers coded items describe the employees who are not entrepreneurially oriented, who avoid cooperating with the private sector, and those who lack the initiative to realize their ideas practically through spin-off companies.

The third dimension, industry collaboration, focuses on the university, faculty, department, and the student activation with the associated industry. The items which explain this dimension the most refer to off-campus activities, forming groups allocated to liaison activities between the industry and universities and adjusting the research proportion and teaching contribution with the aim to respond to the specific situation of individual faculty members. Here, the focus is on the cooperation with the industry which significantly simplifies the existence of technology transfer offices. These offices act as technology brokers because they connect research results with potential investors or economy subjects.

The fourth factor, the department perception of university policies, also seems to be having a role in empowering the entrepreneurial orientation of universities. It deals with challenges in the university strategy and organization, which derive from employees who act entrepreneurially and want to change the university culture. The essential items are related to off-campus activities which represent the

base for performance reviews of faculty members and the existence of specialized groups of faculty members (like technology transfer offices) who are dedicated to closer and effective co-operation between industry and university. Those facts contribute to better results in terms of their practical use and more resources suitable for new project investments.

The ENTRE-U construct successfully predicts the type of activities that characterized a particular university and separate the innovative ones, from those that don't want to change their conventional way of doing things, based on the level of their entrepreneurial orientation. Hence, the ENTRE-U is more strongly related to innovative component and that is logical considering the content of the innovative component. The universities that are entrepreneurially oriented are more open to co-operation with external stakeholders, new opportunities for commercialization of research results, closer and more effective ties to specific industries, establishing an organizational structure which support those ties, and university policies that spur entrepreneurial activities of its faculty members through different performance review systems.

## 5. Concluding Remarks and Suggestions for Future Research

Through science and environment, the economy and society need to explore the new field of development, the one which stimulates economic, technological, social, and cultural innovations; thus, helping the Republic of Serbia improve its global competitiveness. The economic research in the Republic of Serbia show high quality and cover broad areas of study, but they are not sufficiently focused on exceptionality and application of study results in the practice. The faster social and economic development of the country requires a stronger influence of science, which would improve the quality and relevance of the scientific studies. At the same time, the actual circumstances of financial scarcity challenge the conventional role of university professors, who now have to act as heads of research teams. Besides research excellence, their primary functions are expected to shift towards maintaining the research groups and acquiring the necessary funds for the whole team. Scientific introversion needs to be replaced by communicative, highly mobile, and well-informed scientific managers who are also globally recognized scientific experts in their field. It's necessary to establish strategic management within every scientific institution, provided that the institution is capable of identifying its technological competencies and managerial abilities, as well as, to tie these strengths to resources significant for achieving the competitive advantage. The competitive advantage can be achieved by the commercialization of research results, by setting up spin-off companies, participation in founding business incubators, and consulting services, for which the universities in the Republic of Serbia need entrepreneurial culture and orientation, stimulating university policies, recognition of opportunities, and intensive cooperation with the industry.

It is evident that certain authors claim that entrepreneurial orientation is significantly influenced by the context of its analysis. The contextual influence is more present in studies in which companies have the main role, and less present in the case of universities. The aim of this paper was to review the influence of specific conditions in developing countries on university activities, and their employees' attitude towards entrepreneurship and entrepreneurial orientation. Universities in the Republic of Serbia are not independent legal subjects which manage faculties, as it is the case in developed countries. The faculties are financially independent, which allows them a limited freedom to choose strategic directions, goals, and mechanism for their accomplishment. The employees receive additional incomes through cooperation projects with the state economy, which is currently going through hardships. The degree of development of entrepreneurial initiatives instigated from universities has also been influenced by the situation at the beginning of the 21st century when university professors were not allowed to start their own businesses. The benefits of entrepreneurship have become evident only in the last few years, and support systems which would empower it are still in their infancy. Therefore, the researchers are discussing a context which is significantly different from those included in the previous studies.

The researchers have graded the entrepreneurial orientation of the employees at state universities in the Republic of Serbia through the ENTRE-U scale. It was concluded that the scale is applicable not only in developed countries such as Canada and the EU but also in developing countries, such as the Republic of Serbia. Actually, this is the first study concerned with measuring the entrepreneurial orientation at state universities in developing countries. The approach used in this paper is different than the original because records of registered patents and spin-off companies at universities are not available. There are no official mechanisms which would compile a unique database of patents and university spin-off companies. The motivation was also the fact that certain theorists claim that concentrating solely on patents and licenses as indicators of the EO can cause a counterproductive effect among the university employees [2]. In this sense, the focus of the research is different from the original one, because it is adapted to the context in which it is conducted.

Based on the applied CFA, the researchers concluded that the internal validity of the ENTRE-U questionnaire is adequate and that its original structure corresponds to the structure of the gathered data. The assumed questionnaire structure, with four inter-correlated dimensions, was confirmed based on how the interviewees in the Republic of Serbia answered the questions. In addition, this study suggests support for the previous theoretical proposition that ENTRE-U is a second order construct with a number of inter-correlated dimensions. The CFA concludes that the questionnaire is reliable as well, providing a good measure of the constructs for which it is intended. Two structural models were created. In both models, the independent, predictive variable is represented by the ENTRE-U, while the dependent, criterion variable in one model is Innovative and in the other Traditional. A strong and positive correlation between all four dimensions of the ENTRE-U construct and Innovative dimension is detected. That means that ENTRE-U measures are able to successfully predict the level of innovativeness, as well as the nature of innovative activities that are conducted at state universities in the Republic of Serbia. The character of that relation is logical, considering the content of the innovative component presented in the previous section. On the other hand, changes in the ENTRE-U measures have no influence on regular activities which are characteristic for traditional state universities. The entrepreneurially oriented universities differ from those which don't have that orientation by the degree of their research mobilization, unconventional approaches, the level of cooperation with industry and the way university policy is implemented.

This research has several limitations. First, the respondents' reply rate for participation in the study was 21%. It is possible that the sample unintentionally included respondents with certain characteristics (e.g., a more positive attitude towards scientific research, regular use of e-mail) Second, the dependent variable Traditional does not correlate with dimensions of the ENTRE-U construct, so it is necessary to explore other measures, outside the ENTRE-U scale, that are more suitable for explaining the traditional aspects of the state universities. Third, the sample does not include private university employees, so we cannot claim that the results apply to private universities, as well.

The future research could include the larger sample of interviewees employed on state universities, as well as interviewees from private universities in the Republic of Serbia. Today, the private universities are less valued than state universities, they are a minority, and mainly oriented toward social sciences. They are financed mostly from students' scholarships, but they are trying to become more progressive by diversifying their existing funding base. The private universities in the Republic of Serbia could gain a better position and competitive advantage if they incorporate entrepreneurial orientation in their strategy and culture. It would be interesting to provide a comparative analysis which would showcase possible differences in the employees' perception of entrepreneurial orientation and entrepreneurial universities, their impact on the nature of activities that are conducted on the university, as well as the commercialization of the results. Comparative analyses could also be made between states with a special focus on specifics of the context in which the research is conducted. Due to similarities and common characteristics of the countries in the ex-YU region (for example global competitiveness index-GCI), the researchers assume that the scale will be applicable in those countries too. Since there are no indications that mechanisms for supporting the knowledge commercialization

will improve in near future, greater efforts are needed for defining a common basis for measuring the entrepreneurial orientation of employees in the SME sector and at the universities. More research is needed on the entrepreneurial ecosystem in Serbia, its course of development, as well as, how the role of universities has changed, especially by the introduction of the third mission; a role in economic growth.

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