

## Article

# Entrepreneurial Strategic Orientation: Prerequisite for SMEs Success in IoT and Digital Transformation Sphere?

Mirjana Cvijić Čović , Jelena Borocki , Vladimir Djaković , Aleksandar Vekić \*  and Andrea Okanović

Faculty of Technical Sciences, University of Novi Sad, 21000 Novi Sad, Serbia;  
cvjic.dr440.2010@uns.ac.rs (M.C.Č.); borocki@uns.ac.rs (J.B.); v\_djakovic@uns.ac.rs (V.D.);  
andrea.katic@uns.ac.rs (A.O.)

\* Correspondence: vekic@uns.ac.rs

**Abstract:** Entrepreneurial orientation (EO) is a multidimensional construct that reflects a firm's tendency to be innovative, proactive, and risk-taking. Previous research has demonstrated that companies with a strong EO possess a competitive advantage in the market when compared to those with a conservative approach to management. The objective of this study is to analyse the entrepreneurial orientation of small and medium-sized enterprises (SMEs) using the ENTRE-U scale and to identify the dimensions of EO that are critical for achieving business success in the context of digital transformation and IoT implementation. The identification of these dimensions is facilitated through a survey method and exploratory factor analysis. After administering the ENTRE-U scale to a representative sample of SMEs that use modern technologies, such as IoT, four distinct dimensions of EO emerged. Each dimension of EO has a significant impact on firm performance. By adhering to the established EO dimensions and using the proposed methodology, managers can develop an efficient business model that aligns with the current digital market demands, enhances SMEs (survival, resilience, and sustainability), and addresses the high uncertainty prevalent in today's business environment.

**Keywords:** entrepreneurial orientation; ENTRE-U scale; EO dimensions; EO measurement; IoT; digital transformation strategy



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## 1. Introduction

In an era of rapid digitalization, scientific and technological progress in business has gained momentum, while sources of new knowledge are widespread. However, no company has all the necessary elements to stay on top and bring significant innovations to the market. An increasing number of SMEs are seeking to achieve sustainable competitive advantages by leveraging the latest digital technologies to innovate their business models, as opposed to solely adapting their products, services, and/or processes [1,2]. Specialized knowledge and technologies are the dominant and safe sources of competitive advantage. The competitive advantage of a company is rarely permanent, and the rights it owns to a certain technology or patent can only prolong the life of the acquired advantage [3]. Most of the technological knowledge that will have a significant impact on the world in five or ten years is currently of limited use. The technological knowledge that will transform the world in less than fifteen years is currently in the form of prototypes in laboratories. There are also many technologies and knowledge that are in the early stages of development [4].

Entrepreneurial activity has changed significantly under the accelerated application of new digital technologies in SMEs, leading to the creation of new business models. The adoption of these technologies can enable companies to strengthen their competitive advantage and create new digital opportunities based on their products and services [5]. It has a broader impact on regional development [6]. However, researchers do not have a clear picture of the contribution of digital technologies, such as IoT, to the success

and growth of the company [6]. This article is motivated by the growing need to create effective entrepreneurial strategies based on new business models supported by digital transformation and its core technologies such as IoT and the need for empirical research in this area.

Sustainability and digitalization are two terms that have gained increased attention as they represent potential transforming forces for businesses and society [7]. In the 1990s, it was not possible to imagine the wider use of webcams and the establishment of sustainable business models, including this type of equipment. Today, webcams are common in home and business environments [8]. In such dynamic and turbulent conditions imposed by the global structure of the digital society, start-ups can become market leaders in a relatively short time, while current leaders can, at the same time, be in a position of struggling for survival. Today, the survival of businesses may depend on their adoption and effective use of new technologies. New digital technologies enable companies to optimize and transform various operations, procure rare resources in real-time, secure necessary investments, create new value, enhance connectivity with clients, etc. [9].

The great responsibility of a company is reflected in the acquisition and proper allocation of resources to achieve its set goals. Superior resources and better, more advanced processes enable a company to outperform the competition [3]. However, questions remain as to why some firms are successful or unsuccessful in their operations and why, when faced with the same environmental conditions, they achieve different levels of business results [10,11].

Today, business is conducted under conditions of high uncertainty and faces significant challenges during current crises. Companies are constantly looking for effective ways to respond to these challenges in terms of reducing risk and ensuring growth and profitability, even in these circumstances. The company's ability to successfully overcome obstacles and problems due to crises is a good indicator of its resilience. The concept of organizational resilience became popular in the literature in the 1990s, and a more recent definition views this concept as "the ability of an organization to anticipate potential threats, to respond effectively to unexpected events, and to learn from them, resulting in a dynamic capability designed to facilitate organizational change [12]". The organization's resilience can be linked to digital transformation and IoT, significantly improving it [13]. SMEs that strike a balance between their entrepreneurial orientation and resilience have a high chance of becoming market leaders and change makers. Digital transformations have a stimulating effect on the resilience of SMEs and, therefore, on entrepreneurial orientation. Additionally, digital transformations affect the redesign and modification of the existing business models of SMEs [14].

In addition to competitive abilities, the chosen strategy has an impact on the achieved results related to the competition [15]. Strategic management is a tool for the top management team that provides a business framework, develops unique resources and skills necessary to achieve goals, and responds adequately to contextual changes in the external environment [3]. By adopting an entrepreneurial strategic orientation, companies can reap benefits [16], especially in a technologically advanced environment [17] with short product life cycles and uncertain future profit flows [18]. Key decision-makers use entrepreneurial orientation as a strategic option to achieve the company's purpose, reshape the vision, and achieve a competitive advantage [11,18,19]. They do not even have to be entrepreneurs, because entrepreneurial firms can exist without them and still reflect the entrepreneurialism of their employees [20].

The paper has the following structure: a review of scientific literature (Section 2), research methodology (Section 3), results and discussion (Section 4), and conclusions (Section 5).

Section 2 is the theoretical part of the paper, with a detailed review of the literature. It facilitates an understanding of the potential relationship between entrepreneurship, value creation, and the implementation of digital technologies such as IoT. It provides a better understanding of the concept of entrepreneurial orientation, the dimensions that determine

it, and the way it can be measured and monitored. The research question is defined at the end of this section.

Section 3 covers the research methodology, which includes research aims, data collection procedures, operationalization of the research instrument, and sample characteristics. Following the research methodology, the statistical methods used to create the EO measurement questionnaire, the results, and the discussion are presented in Section 4. At the end of the paper, there is a conclusion with guidelines for future research in Section 5.

## 2. Review of Scientific Literature

### 2.1. Entrepreneurship, Value Creation, and Digital Transformation

Entrepreneurship is a social function that involves designing and constructing new value through the creative combination of business resources. It also involves perceiving business opportunities and investing in a new business venture. Furthermore, entrepreneurship involves investing capital to create a new need in the market aimed at making a profit, while taking risks [21]. The importance of entrepreneurship is reflected in the fact that it is a source of new business, stimulating economic growth and production in a territory, changing and at the same time strengthening competition, and enabling the creation of completely new products, services, and technologies. A growing body of scientific evidence indicates that entrepreneurial activities significantly affect employment, productivity, and economic growth [22]. Entrepreneurship is closely related to innovation, and these concepts are important for all types of companies at all stages of their development. As authors Juell-Skielse and Hjalmarsson stated, “there are different organizational forms for stimulating innovation of digital technology in companies, even in companies within mature industrial domains, where it is difficult to fully utilize digital technologies due to closed innovation processes” [23].

Officially, there is no universally accepted definition of IoT [24], and many specifics are still being explored at the initiative of entrepreneurs, innovators, and legislators [25]. The ITU Telecommunication Standardisation Sector has defined IoT as a global structure of the information society that enables advanced services by interconnecting physical and virtual things within existing and evolving information and communication technologies [25]. In the context of IoT, a thing is a physical or virtual object that can be identified and integrated into a communication network [26]. For companies, IoT is not just a buzzword but an innovative emerging technology, a developing trend, and a widely applied strategy [24,27].

To achieve faster development, ensure market survival, and build resilience, a company must find ways to leverage all the benefits of digital transformation and implement related technologies such as IoT [28]. Together, they create numerous new opportunities, challenges, and consequences that cannot currently be fully understood. Contemporary entrepreneurs are aware that the world is close to another, i.e., a digital revolution that will accelerate changes in the economy, state, and society. It is also often referred to as the “second machine age” [25] or the “fourth industrial revolution” [25,29]. IoT is one of the key discoveries that is a consequence of the great progress of information and communication technologies (ICTs). It has huge potential across many sectors in terms of superior business results and competitive advantage [30]. Properly developed and used, it can provide an abundance of fundamental innovations and technological competencies that change the ways people, technologies, the economy, and society are connected [25,31,32]. At the same time, IoT adoption requires substantial organizational transformations due to unforeseen emerging risks that can disturb long-term business success [33]. Company-introduced digital transformation plays a critical role in shaping and redefining business models and strategies [34]. In the IoT industry, it is possible to differentiate between business models and the way in which these models generate and capture value, depending on the type of firm involved (well-established vs. independent ventures) [35]. Digitalization brings a profusion of data whose recording, processing, and analysis generate increasingly complex knowledge. The new knowledge opens the way to new business opportunities, boosts company profitability, and improves living standards, as well as the environment. Moreover,

it broadens the technological foundation of competitive advantage and necessitates the expansion of a company's core resources, as well as the acquisition of new capabilities [36]. The data collected by the implementation of IoT in business have been observed as new factors of production, reflecting the way business models, industry boundaries, and market structures change [25].

IoT is not only related to technology and digital transformation, it represents a comprehensive concept of possibilities for the improvement and development of modern business. In order to enable the creation, functioning, and development of a business, it is crucial to define a business model innovation (BMI). Author Bartels noted that the foundations of BMI lie in value creation, value delivery, and value capture, based on previous definitions of business models [37]. Value creation is significantly influenced by the adoption of new digital technologies, including the Internet of Things (IoT), which is evident in modern businesses facing substantial market uncertainty and instability [36]. New business models should respect all customer requirements and be adaptable to the changing business environment. The creation of a BMI is connected with digitalization and the acceptance of new technologies such as IoT [38]. BMI has proven to be particularly suitable for SMEs, as they can base their operations on it and implement the digital transformation process more easily [39]. In order to take full advantage of the BMI, which is supported by digital transformation, companies should constantly work on establishing meaningful partnerships, especially in terms of obtaining the necessary resources for business. Open business models enable companies to create and acquire value through partnerships with external partners [40]. Adjusting, improving, and constantly redesigning business models is crucial for modern companies and implementing innovations in their business. Continuous BMI is a powerful tool for achieving and sustaining a competitive advantage [41], providing a wide range of possibilities for creating new business opportunities for companies [42,43]. Digital transformation and IoT in business should accompany the process of continuous improvement of the business model.

Business models are used to capture how an organization creates and delivers value. Value creation is a process that depends on the company and its customers. However, all other participants connected to this process can make a significant contribution [44]. The adoption of IoT technology has the potential to significantly improve a company's performance in terms of reducing operational costs and creating additional value for customers. Moreover, it allows for the collection of pertinent real-time data, which can greatly facilitate informed decision-making at all levels of the organization [45]. The success of the IoT implementation in value creation of business models is connected with organizational (culture and governance) and technological (big data/analytics, infrastructure, and applications) requirements [46]. Sources of value creation through the implementation of IoT technology as the main technology of digital transformation can be based on four layers of the digital architecture: device layers, network layers, service layers, and content layers [47,48]. Nowadays, IoT has extensive applications in various industries, especially in retail, leading to changes in the way people shop and in customers' experience [49]. Along with big data analysis, they possess the potential to fundamentally alter the nature of interactions between businesses and individuals, optimizing the performance of systems and processes. Ultimately, deeper digitalization may save time, enhance people's quality of life, and invigorate businesses [5]. One previous research shows that entrepreneurial orientation (EO) played a partially positive mediating role in the relationship between BDAC (big data analytics capabilities) and BMI (business model innovation). This suggests that it stimulates the adoption of a strategic inclination towards decision-making characterized by high degrees of innovativeness, proactivity, and risk-taking [2].

## 2.2. The Concept, Dimensions, and Measurement of Entrepreneurial Orientation

Entrepreneurial orientation (EO) was first mentioned by Mintzberg in 1973 in his work on strategy defining [19,50]. Over time, EO has become one of the most actively explored areas of strategic management [49]. A group of authors also observed this trend in their

analysis of published papers on EO [18]. EO represents the degree to which companies demonstrate entrepreneurial tendencies and a managerial philosophy [51,52]. EO can be defined as “a set of processes, practices, and decision-making styles related to entering new or established markets with new or existing products and services” [53]. Companies with a strong EO gain a competitive advantage in the market over those with a more conservative managerial approach [16,18]. EO reflects a managerial capacity for taking proactive and aggressive initiatives to counter competitive forces and gain a market advantage [54,55]. This is in line with Russell Merz and Sauber’s findings, who defined EO as the degree of proactivity of a company in a particular market unit, as well as its willingness to innovate and create new offerings [56]. Zur considers EO as a process of value creation that provides various potential benefits to a company, certain groups, or individuals inside or outside the firm [57]. EO is important in all phases of a company’s life cycle, particularly when the company struggles to survive and tries to improve existing business results [58–60]. For company-level growth, EO is important for economic growth as a whole [22].

An entrepreneurially oriented company can be described as one that engages in product-market innovation, undertakes risky activities, and is a pioneer of proactive innovation, thus beating the competition [16]. This definition includes three basic EO dimensions, i.e., innovation, proactivity, and risk-taking [11,52]. Innovation is a predisposition for creative engagement and experimentation by introducing new products or services, as well as technological leadership via research and development activities in new processes [18]. Proactivity is a quest for opportunities, a long-term perspective that implies the introduction of new products and services before the competition and the ability to anticipate future needs [18,60]. Proactivity also implies the strategic elimination of operations that are in a mature phase or a phase of decline observed from the aspect of company life cycles [61]. Risk-taking refers to a company’s willingness to take bold actions in terms of committing resources to certain organizational initiatives with unknown effects [16,60]. The definition of EO dimensions given by Miller has been upgraded to complement the EO construct with the dimensions of competitive aggressiveness and autonomy [62]. Competitive aggressiveness is the endeavour attained to overtake the competition and implies a strong invasive attitude and an aggressive reaction to competitive threats. Autonomy refers to independent action taken by entrepreneurial leaders or teams focused on new ventures [18].

Previous research has shown that the measurement of entrepreneurial orientation (EO) extends beyond the United States, as considerable research has already been conducted in Europe (Sweden, Great Britain), Australia, and Asia (China) [63]. However, EO remains an under-researched area in countries of strategic importance, such as Brazil and India, as well as in clusters that include the Middle East, Latin America, and Africa [62]. Future research can explore the effects of national cultural contexts on the relationship between EO and firm performance [18]. The lack of empirical research in certain cultural clusters is an obstacle to generalizing EO research at the international level. However, this also presents an opportunity for future researchers to include neglected regions, particularly developing countries that frequently experience business crises.

The ENTRESALE measuring scale, first presented by Khandwalla in 1977, served as the basis for the development of the EO scale. Subsequently, Miller, Friesen, Covin, and Slevin applied this scale in their research [18]. Studies focusing on measuring EO have mostly relied on scales developed by Miller, Covin, and Slevin [62,64]. The original scale consisted of nine items that were evaluated using a seven-point Likert scale and grouped into three dimensions: innovation, proactivity, and risk-taking. Over time, the scales have been modified and adapted to specific research subjects. Researchers have made three types of modifications to the original scales. The first variation concerns the number of EO dimensions, which varies from study to study. The second variation is the number of scale items used to assess EO, which also varies from study to study. The last modification involves using the Likert scale between two opposing claims [18]. These modifications indicate that researchers prefer to experiment with scale adaptation instead of adhering to one measurement method.

According to Todorovic, it is essential to examine EO in other contexts, such as the public sector. As a result, a group of researchers developed the ENTRE-U scale, which successfully measured entrepreneurial orientation in universities [65]. Various authors have applied this new and modified ENTRE-U scale in research assessing the entrepreneurial orientation of university employees, such as a study conducted at public universities in Serbia [66]. The study showed that the use of the ENTRE-U scale can predict the level of innovation of universities and the nature of their innovative activities. The scale can be applied not only in developed countries and systems but also in developing countries such as the Republic of Serbia. This research paper distinguishes itself from others by exploring the scale's applicability to assess the EO of SMEs and its potential for further improvement and criterion alteration.

Based on the literature review, the following research question is proposed:

Research Question (RQ): How do the different dimensions of entrepreneurial orientation (EO) affect the selection of essential competencies necessary for digital transformation, and how does that impact the survival, resilience, growth, and development of SMEs in modern digital business conditions?

### 3. Research Methodology

#### 3.1. The Research Context

The aims of this research are:

- (1) To present the EO measurement scale to entrepreneurs and SME managers as a potential instrument that can direct the company's knowledge and technological skills towards encouraging employees to take initiative, become innovative, and shape and redefine the company's business model and strategy to acquire a unique digital identity and implement IoT concept. The ENTRE-U scale has been successfully applied in numerous research studies on the entrepreneurial orientation of employees in educational institutions and non-profit organizations [67–69]. To the best of the author's knowledge, this is the first study to use the given scale in a slightly modified form to assess the EO of employees in SMEs operating in the market in the Republic of Serbia and validates its internal structure on a specific sample and in a unique context.
- (2) To enable further development and adaptation of the ENTRE-U scale. The authors introduce the extended framework and apply it to Serbian SMEs using a large-sample questionnaire survey. The authors modified and adjusted the scale criteria for the assessment of EO of SMEs operating within the territory of the Republic of Serbia and using modern digital technologies that are associated with digital transformation (such as IoT). Thus, they significantly deviated from the predominant way of EO measuring for SMEs relying on the scales developed by Miller (1983) and Covin and Slevin (1989) [64]. After applying the modified criteria to a specific sample of 234 SMEs in the Republic of Serbia, four unique dimensions of EO were identified: Knowledge Flows, Unconventionality, Partnership Networks, and Company Policies. Applying the given criteria in practice and acting within the given dimensions is important for managers or business owners to assess the degree to which companies are entrepreneurially oriented and how this managerial type is associated with business results. Research shows that each EO dimension has an impact on company performance.

#### 3.2. Procedure

Data collection for this study was conducted between February and April 2020. Participants were from the territory of the Republic of Serbia and were invited to participate via email. The researchers used several company databases, including the Intellectual Property Office; HelloWorld IT insider service; the Top 100 Companies in 2018 in terms of profit, revenue, and exports; The Enterprise Europe Network; The Best Technological Innovation; The Best of Serbia; and Spin-Off and Start-Up Companies (the University of Novi Sad website), to form a contact list of companies. Email addresses were taken from these databases, as well as from the company websites and the Business Registers Agency

website. The questionnaires were administered in electronic format via Google Forms, and around 2000 emails were sent. The final number of respondents was 234, resulting in a response rate of approximately 12%.

All questions in the questionnaire were mandatory, which prevented missing data. Only companies that answered all questions were included in the study. Given the low response rate achieved (around 12%), which is typical of electronic questionnaires, the researchers checked for any specific effects on the generalization of research results [70,71]. The questionnaire and reminders were not resent to those who did not respond to the initial invitation to participate. Therefore, the researchers examined the possible influence of the non-respondents on the study's results (non-response bias).

To examine non-response bias, the Mann-Whitney U-test was applied, selecting 20% of early and late respondents [72]. The dependent variables represent the four dimensions of EO, while the independent variable is a two-level group: 20% of early respondents and 20% of late respondents who completed the questionnaire. The only statistically significant difference between the groups of early and late research participants was in the EO dimension of Knowledge Flows ( $Z = -2705$ ,  $p < 0.007$ ), with the group of early respondents achieving higher scores in this dimension compared with the group of late respondents. There were no other differences in the questionnaire, thus the bias was very weak and almost negligible.

### 3.3. Instruments

The questionnaire used to measure entrepreneurial orientation (hereinafter referred to as EOQ) was based on the ENTRE-U scale [65,72], with the author's consent to modify the scale to adapt it to SMEs. The ENTRE-U scale has been successfully applied in numerous studies of the entrepreneurial orientation of employees in educational institutions and non-profit organizations [67–69,72]. The present study is the first to apply the given scale in a modified form to SMEs operating in the Republic of Serbia, an emerging European economy and a potential future member of the EU.

The process of item adaptation involved adjusting the measurement subject and modifying each item of the questionnaire to ENTRE-U to accurately measure the entrepreneurial orientation of SMEs. The modified version of the questionnaire was translated into English by independent translators and English-speaking experts. The questionnaire was sent to the author of the original scale for review and verification. After obtaining consent to alter the questionnaire to suit the research needs, it was translated into Serbian and administered in electronic form. A dozen working versions of the questionnaire were distributed to professors and experts from various fields to fill out and identify possible ambiguities and technical shortcomings. The responses obtained at this stage are not included in the study. The questionnaire was distributed to appropriate respondents only after each suggestion and criticism was adopted and all discrepancies were resolved.

The questionnaire aims to assess four dimensions of entrepreneurial orientation: Company Policies, Knowledge Flows, Unconventionality, and Partnership Networks. It comprises 18 questions with a seven-point Likert-type response scale (ranging from 1: "I strongly disagree" to 7: "I strongly agree"). The Company Policies dimension (0.877) consists of five items (e.g., "Our company's policies aim to achieve both short-term and long-term goals."), the Knowledge Flows dimension (0.902) also includes five items (e.g., "Our company encourages employees to seek new knowledge and opportunities to realize their ideas in the market."), the Unconventionality dimension (0.771) includes four items (e.g., "Our company encourages employees to collaborate with colleagues working in other companies and organizations."), and the Partnership Networks dimension (0.795) also includes four items (e.g., "Interns who come to our company have the opportunity to gain current and practical knowledge and skills."). The correlations between EOQ dimensions are high, statistically significant, and positive.

### 3.4. Sample

The study involved 234 respondents, of whom 60.3% were male, and aged between 23 and 72 years ( $M = 42.01$ ,  $SD = 9.70$ ). Regarding the level of education, the largest proportion of respondents had completed either university education (44%) or master's/vocational studies (29.9%). Most respondents had work experience ranging from 16 to 20 years (22.2%) or 6 to 10 years (17.5%). In terms of the type of position in the company, the majority of respondents held managerial positions (53.0%).

Regarding the predominant activity in the companies, the largest number of participants could be classified in the fields of manufacturing (33.3%), information technology (IT) and communications (17.9%), innovation and technical activities (12.4%), as well as maintenance and repair of motor vehicles (12.4%). Companies were almost equally distributed between the service (55.1%) and production (44.9%) sectors, with domestic capital being the primary source (73.5%). Most companies included in this research had 51 to 250 employees (35.5%) or more than 250 employees (29.1%). Regarding the age of the company, the most represented were those aged 11–20 (32.9%), followed by those aged up to 10 (24.4%), and those aged 21–30 (20.1%).

## 4. Results and Discussion

In order to answer the research question, a number of statistical techniques were used. To arrive at the dimensions of EO that provide a different perspective on the company and the competencies necessary to gain a competitive advantage in an environment dominated by digital transformation, it was necessary to construct and validate a questionnaire for measuring EO. The activities that need to be carried out and their exact sequence are presented in this chapter in the section on the research results (4.1). This study's findings contribute to the literature on innovation management and provide a clear presentation of how entrepreneurial orientation (EO) and its specific components determine the performance of SMEs in the digital transformation era.

First, exploratory factor analysis was applied to determine the number of factors. It was found that the optimal number of factors in the specific sample is four. After analysing the content of each item that describes the factor, particularly those items with the highest scores (factor loading) on the specific factor, appropriate names were assigned to them. This step provided the conditions for defining modified dimensions of the ENTRE-U scale that are tailored to the subject of measurement, i.e., SMEs in the Republic of Serbia that are implementing digital transformation and utilizing new technologies (especially IoT). In the Republic of Serbia, the adoption of IoT has gained significant momentum, particularly among SMEs. Therefore, it was deemed crucial to assess the impact of this technology of digital transformation on EO in this specific context. Table 1 shows the original dimensions of the ENTRE-U scale and the ones modified for the specific sample.

**Table 1.** ENTRE-U dimensions vs. dimensions of modified ENTRE-U scale.

ENTRE-U Dimensions	Dimensions of Modified ENTRE-U Scale
Research Mobilisation (RM)	Knowledge Flows (KF)
Unconventionality (UC)	Unconventionality (UC)
Industry Collaboration (IC)	Partnership Networks (PM)
University Policies (UP)	Company Policies (CP)

After defining the dimensions of EO as shown in Table 1, reliability analysis and Item Response Theory (IRT) analysis were conducted to further investigate the psychometric properties of the items in the EO questionnaire and identify items with potentially poor psychometric properties. After removing problematic items, a final version of the EO questionnaire was obtained, consisting of 18 items. The remaining task was to present the values for descriptive statistical parameters of the dimensions, correlations between dimensions, and their reliability for the final version of the modified EOQ.

#### 4.1. Construction of EOQ as Research Results

Exploratory factor analysis (EFA) was applied to 23 items on the Entrepreneurial Orientation Questionnaire (EOQ) to determine the number and content of latent factors. The Guttman-Kaiser criterion was used to identify the optimal number of factors that correspond to the number of eigenvalues greater than 1.00 in the initial solution (prior to rotation). The characteristic root (eigenvalue) of a factor represents the amount of total variance that is explained by that factor [73].

Based on the results presented in Table 2, the optimal number of factors is four. The isolated solution with four factors explains 61.08% of the variance of all items, before rotation. Subsequently, a Promax rotation was applied, allowing correlations between the isolated factors. The four isolated factors explain 53.42% of the variance of all items in the rotated position.

**Table 2.** Guttman-Kaiser criterion for determining the number of factors.

Ordinal Number	Initial Values			Values after Extraction		
	VCR	% EV	C% EV	VCR	% EV	C% EV
1	10.64	44.35	44.35	10.21	42.55	42.55
2	1.66	6.91	51.26	1.16	4.83	47.38
3	1.26	5.24	56.51	0.85	3.54	50.91
4	1.10	4.58	61.08	0.60	2.50	53.42
5	0.98	4.10	65.18			

*Legend.* CR: the value of the characteristic root; % EV: the percentage of the explained variance; C % EV: the cumulative percentage of the explained variance.

After determining the number of factors, exploratory factor analysis, reliability analysis, and IRT analysis were applied to 23 EOQ items. The results of the mentioned analyses are presented in Table 3.

The results of the exploratory factor analysis are presented in the left part of Table 3. The dimensions of the EOQ were rotated into the Promax position and the partial factor loadings have adequate intensity for all four dimensions with acceptable values of  $>0.30$ . The only problematic item in terms of partial loadings is EO12, which belongs to the Knowledge Flows (KF) dimension, due to multiple loadings in both KF and Unconventionality (UC) dimensions.

In the middle part of Table 3, the item analysis results are represented by values of item-total correlation (ITC) and the reliability alteration according to the internal consistency type if the item is excluded from the analysis ( $\Delta\alpha$ ). Problematic items can be identified by very low and/or negative ITC values, such as EO14. The values of the  $\Delta\alpha$  coefficient that are higher than the  $\alpha$  coefficient (shown below the acronym of the dimension) indicate problematic items because their exclusion from the factor increases the factor's reliability. This is the case with EO14, which belongs to the Company Policies (CP) dimension.

The results of the IRT analysis are presented in the right part of Table 3. Difficulty thresholds refer to the number of logs required for a respondent to complete the next category of answers, with desirable values ranging from lower to higher in a clear order of thresholds. Item EO14 is an atypical item as it has a much larger range of thresholds in the logs compared with the remaining items. The difficulty thresholds of all EOQ items suggest that the items are easy and appropriate for respondents with slightly less knowledge. The discriminant parameter 'a' indicates whether an item can distinguish respondents with either low or high knowledge, with optimal values above 0.70. The problematic items that stand out based on this parameter are EO23, EO24, EO13, and EO14. The informativeness parameter indicates how much information an item carries about respondents with different levels of knowledge. Items with a lower informativeness parameter are the same items that have low discrimination, i.e., EO23, EO24, EO13, and EO14. Based on these results, it was decided to exclude items EO12, EO14, EO23, EO24, and EO13 from further analyses, resulting in a final version of the EOQ with 18 items.

**Table 3.** Results of exploratory factor analysis, reliability analysis, and IRT analysis.

3		Factor Loading						Item Difficulty							
Dimension	Item	PP	TZ	NK	PM	TAK	$\Delta \alpha$	$\beta 1$	$\beta 2$	$\beta 3$	$\beta 4$	$\beta 5$	$\beta 6$	a	Item Information
PP ( $\alpha = 0.852$ )	EO21	0.800				0.717	0.812	-3.07	-2.65	-2.43	-2.17	-1.90	-1.59	5.87	21.13 (99.88%)
	EO7	0.761				0.705	0.808	-4.99	-4.07	-3.42	-2.72	-1.75	-0.41	1.01	1.65 (66.45%)
	EO22	0.650				0.741	0.804	-4.63	-3.84	-3.25	-2.66	-1.90	-0.71	1.09	1.79 (69.25%)
	EO15	0.578				0.688	0.809	-4.61	-3.70	-2.95	-2.04	-1.18	0.02	0.90	1.48 (69.93%)
	EO23	0.553				0.645	0.813	-5.88	-4.39	-3.37	-1.99	-0.57	1.43	0.58	0.76 (58.24%)
	EO24	0.513				0.635	0.815	-6.64	-5.13	-4.04	-2.87	-1.41	0.42	0.56	0.67 (55.15%)
	EO13	0.413				0.627	0.817	-5.76	-4.62	-3.57	-2.57	-0.89	0.67	0.68	0.98 (60.58%)
	EO14	-0.368				-0.109	0.896	-75.16	-33.37	-3.36	32.92	67.75	107.04	0.02	0 (40.01%)
	EO4	0.365				0.558	0.823	-5.53	-4.40	-3.55	-2.47	-1.54	-0.35	0.83	1.2 (61.38%)
TZ ( $\alpha = 0.912$ )	EO1		0.652			0.767	0.894	-2.53	-1.78	-1.22	-0.70	-0.12	0.49	2.94	10.73 (99.64%)
	EO2		0.854			0.798	0.889	-2.64	-1.72	-1.27	-0.80	-0.20	0.42	3.50	14.05 (99.79%)
	EO3		0.829			0.809	0.888	-2.61	-2.05	-1.28	-0.80	-0.13	0.68	3.09	12.18 (99.66%)
	EO6	0.327	0.547			0.750	0.896	-3.24	-2.26	-1.74	-1.11	-0.52	0.25	2.38	8.01 (96.02%)
	EO9		0.483			0.692	0.904	-3.24	-2.22	-1.63	-1.09	-0.38	0.70	1.82	5.45 (93.66%)
	EO12		0.420	0.341		0.708	0.902	-2.52	-1.91	-1.42	-0.62	0.21	0.98	2.07	6.61 (98.57%)
NK ( $\alpha = 0.792$ )	EO8			0.744		0.643	0.712	-1.95	-1.26	-0.76	-0.13	0.57	1.41	2.72	10.1 (99.88%)
	EO5		0.350	0.587		0.583	0.741	-2.59	-1.44	-0.92	-0.17	0.46	1.21	1.89	5.92 (97.81%)
	EO10			0.694		0.516	0.782	-2.37	-1.67	-1.02	-0.34	0.42	1.09	1.21	2.68 (93.62%)
	EO11			0.696		0.654	0.707	-2.26	-1.47	-1.06	-0.30	0.44	1.28	2.06	6.62 (99.05%)
PM ( $\alpha = 0.795$ )	EO16				0.830	0.634	0.727	-2.00	-1.64	-1.40	-0.77	-0.11	0.57	2.37	6.88 (99.69%)
	EO17	0.376			0.480	0.551	0.769	-3.10	-2.45	-1.96	-1.24	-0.59	0.39	1.76	4.84 (94.14%)
	EO18				0.816	0.659	0.716	-1.73	-1.14	-0.77	-0.17	0.41	1.07	2.40	7.44 (99.83%)
EO19				0.466	0.589	0.751	-2.73	-2.15	-1.77	-1.04	-0.23	0.67	1.84	5.29 (96.94%)	

Legend: CP: Company Policy; KF: Knowledge Flows; UC: Unconventionality; PN: Partnership networks;  $\alpha$ : Cronbach's coefficient value when the item is excluded from further analysis; ITC: Item—Total Correlation;  $\beta 1$ – $\beta 6$ : Item difficulty; a: Item Discrimination. Exclusion criteria: factor loadings < 0.30 or multiple loadings with similar intensity; ITC that is lower in relation to the rest ITC value within factor;  $\alpha$ : values greater than a coefficient for the whole scale; Item difficulty: atypical values in relation to the rest of the factor items or the extreme values; a: values lower than 0.70; Item information: values lower than 60% indicate that the item has low value in terms of Item Information for the respondents who have either very high or very low level of knowledge.

Table 4 presents the values of descriptive statistical parameters, correlations between dimensions, and dimensional reliability of the final version of the EOQ. The values of skewness and kurtosis parameters indicate the normal distribution of all four dimensions. All correlations between dimensions are moderately high or high, positive, and statistically significant. The dimensional reliability ranges from good to excellent [74,75].

**Table 4.** Descriptive statistics, correlations, and reliability of dimensions of the modified ENTRE-U scale.

	M	SD	Sk	Ku	CP	KF	UC	PN
CP	27.69	5.76	-1.12	1.36	0.877			
KF	27.07	6.64	-0.95	0.39	0.741 **	0.902		
UC	18.67	5.53	-0.35	-0.70	0.576 **	0.635 **	0.792	
PN	21.07	5.14	-0.79	0.36	0.699 **	0.643 **	0.547 **	0.795

Legend: CP: Company Policies; KF: Knowledge Flows; UC: Unconventionality; PN: Partnership Network; Sk: skewness; Ku: kurtosis. The bold values represent Cronbach's  $\alpha$  coefficient. \*\*  $p < 0.01$ .

The original ENTREE-U scale has been proven successful in measuring entrepreneurial orientation at universities. The practical application of the scale has demonstrated its ability to predict the outcomes of commercializing ideas and knowledge within universities. In other words, the scale can differentiate between universities and departments that are entrepreneurially oriented. Although the ENTRE-U scale was developed to provide a reliable instrument for assessing the entrepreneurial orientation of universities, it has been found to be more comprehensive than existing modified versions and is suitable for further improvements and criteria alterations to evaluate the entrepreneurial orientation of small and medium-sized enterprises (SMEs). This paper specifically focuses on this

aspect in comparison to other similar studies. Based on previous research findings, the modified ENTRE-U scale is suitable for assessing entrepreneurial orientation in SMEs in developing countries.

In the section below, we explain how the dimensions of EO identified in this research affect the selection of essential competencies necessary for survival in the age of digital transformation. Additionally, an overview is provided of the characteristics that differentiate entrepreneurial-oriented SMEs from those that are not.

#### *4.2. Discussion on the Dimensions of Modified ENTRE-U Scale for a Specific Sample*

Company employees are the owners of the intellectual capital of the company and therefore they, not the positions they occupy, represent the blood vessels of knowledge [75].

A company can increase its value through knowledge flow management, i.e., making the knowledge more efficient, better connected, and innovative [75]. The key item related to the Knowledge Flows dimension concerns the degree of initiative the employees have in terms of searching for new knowledge and opportunities to realize their ideas in the market, as well as the attitude of the management towards these initiatives. More transparent communication in the company is the main precondition for initiatives to take place and support their implementation with as few obstacles as possible [76]. The company management must take care of the intelligent people and manage the knowledge they possess. It should also be open to smart people working in other companies to include, document, and integrate their knowledge into the company's knowledge base [77]. Companies that successfully connect people with the system for sharing and transferring knowledge achieve better results in terms of research and development and comprehension of the current market needs. Digital technologies such as IoT can significantly improve the management of available knowledge flows and the creation of new flows by accelerating the compiling and processing of available data. The way the data is extracted, analysed, and documented discerns entrepreneurially oriented companies from those that are not.

The Unconventionality of the company implies a set of characteristics that reflect its business philosophy and the characteristics by which the company is recognized on the market. It can also be related to the image or identity of the company in a business environment. One of those characteristics is the unique (essential) skills that the company possesses. Digital skills are essential because by using them, managers are reconfiguring existing company competencies and developing new ones to create value in the form of innovative products, services, or processes. EO encourages combining resources (EO dimensions) in order to create unconventional structures of different resources important for defining and implementing strategies that ensure value creation. EO companies are capable of spotting new opportunities in the market, adapting to them, and activating and developing competencies that are necessary for them to achieve sustainable competitive advantage and improve their performance. Digital skills and entrepreneurial strategic orientation enable companies to establish new and unconventional business models that bring new competitive rules to the market.

The items that best describe this dimension relate to the attitude of management towards alternative sources of funding, the degree of cooperation among employees and professionals from other companies, and research and development activities resulting from cooperation with partners. These activities aim to introduce new products and services, as well as help companies enter new markets, which carries a certain degree of risk [78]. Depending on how a company manages its knowledge resources and risk, it may gain a competitive advantage and profit over a longer period of time or weaken its performance and prospects for future survival. Risk forecasting and management are specific when it comes to developing countries, including the Republic of Serbia [79], and the consequences of either success or failure can lead to the expansion or downfall of a company, respectively, faster and more intensely than in more stable and developed markets. With adequate risk and knowledge management, entrepreneurially oriented companies, i.e., those that do

things in an unconventional and/or innovative way [65], can achieve higher profitability compared with the competition and thus gain a competitive advantage.

Partnership networks between different organizations are a means through which they pool or exchange resources and work together to develop new ideas and capabilities. The cooperation between companies to find innovative solutions can include tasks from the simplest (joint procurement of necessary inputs) to the most complex (cooperation on research and development activities) [80]. The item that best describes the EO dimension, Partnership Network, emphasizes the involvement of the academic community in the innovative activities carried out in the company. In particular, contributions from this networking can be given in the domain of digital transformation and IoT development. In 2000, the South Korean company LG attracted a lot of attention from the world with its smart refrigerators. A team of 55 researchers worked on the development of the product that stirred the world market [8]. It is considered that the key benefits of cooperation between companies and other organizations (faculties, institutes, etc.) are based on overcoming limitations in internal resources or shortcomings in competencies. Other benefits of networking are cost and risk sharing, access to new technologies and markets, accelerated product launch, pooling complementary skills, and access to external knowledge [21]. Companies that are open to cooperation and are a part of partnership networks have the opportunity to apply all the mentioned network advantages and thus achieve better performance compared to the competition.

Company policies are the basis for making business decisions that initiate and direct activities in the process of achieving the projected business goals [81]. This means that they have an important role in encouraging the entrepreneurial orientation of companies and developing innovative solutions. The item that best describes this dimension of EO refers to the openness of companies to new ideas and innovative approaches. Company policies influence how companies implement modern digital technologies and develop innovative solutions. On the other hand, innovative solutions can equally influence the company's policies and the way it manifests itself within the company [82]. Modern businesses keep pace with the changes brought about by new technologies, which improve consumer relations and develop a constant learning culture [3]. This includes the perpetual re-examination of the company's purpose and the revision of policies affecting all activities in the company and the results it achieves in relation to the competition.

The aforementioned implies that each EO dimension has a unique influence on the selection of essential competencies, including IoT, that are crucial for the survival, resilience, growth, and development of SMEs under modern digital business conditions.

## 5. Conclusions

Digital technologies such as IoT have been under construction for the past 20 years and will continue to be so for the next 20 years. If we examine its development so far, we can observe a lack of clear direction [8]. Some companies have failed to recognize the potential of digital transformation in a timely manner and they lacked the much-needed assistance to undertake critical development activities [8]. Currently, the scientific and professional community, decision-makers, and end-users have not established clear guidelines and systemic or organized interventions to maximize the potential of digital transformation in global business. The ongoing digitalization should serve the users of products and/or services and create added value by improving their quality of life. This is of great importance as digital technology has transformed the daily lives of individuals worldwide [83] and facilitated the execution of many tasks in novel ways. For companies, the added value is measured by realized profits. Entrepreneurs and entrepreneurially oriented companies were among the first to recognize this and adapt in line with technological developments and the challenges brought by the new industrial revolution [4]. Entrepreneurial strategic orientation enables companies to achieve profits and accelerated growth and together with digital transformation, which involves the use of digital technologies, fundamentally changes the way in which SMEs operate, present their products and/or services, deliver

value to customers, and compete with each other. Therefore, the synergy of both strategic options ensures long-term and sustainable company growth while constantly creating new business opportunities in an environment that is rapidly changing. Creating new opportunities is necessary for the current market conditions of developing countries, and entrepreneurial orientation combined with digital transformation can help create or identify these opportunities. This is an area in which the authors saw an opportunity for new and valuable knowledge.

The choice of strategy and the essential competencies of a company affect the results it achieves. Skills encompassed by the dimensions of Knowledge Management, Unconventionality, Partnership Networks, and Business Policies, together with digital skills (such as data analytics, digital marketing, software development, etc.) are a prerequisite for the success of SMEs. By combining these essential competencies with a clear entrepreneurial orientation and the implementation of a digital transformation strategy, companies can secure a long-term position as market leaders in this exciting digital era of business.

Superior resources and more advanced processes enable a company to outperform its competition. In a world abundant in knowledge, information, and big data, every company must determine what to improve and how to implement it, not only in terms of gradual processual improvement but also through constant assessments of its purpose and performance. Entrepreneurial orientation encourages combining resources (EO dimensions) to create new structures with different resources that are essential for defining and implementing digital transformation strategies, ensuring value creation. Therefore, SMEs can recognize new opportunities in the market, adapt to them, and develop the competencies necessary to achieve a sustainable competitive advantage and improve performance. EO has been designated for the top management team to improve its decision-making, evaluate its performance, adjust business models in line with current digital market demands, and ensure the long-term survival of the company in the new era dominated by digital technologies. Each dimension of entrepreneurial orientation identified in this research has an impact on company performance. Therefore, the functioning of the company within the established dimensions of EO should be one of its strategic options. Based on the authors' findings, this research is the first to identify the four dimensions of EO in the manner described in the paper, and it relates those dimensions to the results achieved by the company in a developing market where technologies such as IoT and digitalization have become dominant success factors. Therefore, it is necessary to apply the given scale to other samples and conduct additional research to improve it as much as possible.

The impact of entrepreneurial orientation (EO) and its dimensions on the success of SMEs in the digital era is the focus of this paper, and it aims to contribute to the international scientific community and professionals in this subject field. The research conducted validated the modified ENTRE-U scale that was adapted for measuring EO in Serbian SMEs. New dimensions of EO, which are essential for implementing digital transformation in SMEs and creating an efficient business model based on new technologies, were also established.

The results show that the modified ENTRE-U questionnaire is effective at measuring the entrepreneurial orientation of SMEs in developing countries such as the Republic of Serbia. IoT technology is an important tool for SMEs in Serbia to improve their operations, gain a competitive advantage, and access new markets. By embracing this main technology of digital transformation, SMEs can increase efficiency, improve customer experience, create new business models, and contribute to a more sustainable future.

However, the research has some limitations. One of the primary limitations was the low response rate of about 12%, which affected the sample size. Another limitation was the complexity of data collection using the questionnaire because many SMEs in Serbia do not have publicly available e-mail addresses for employees in managerial positions. Additionally, the original measurement instrument was designed for EO research in universities in developed countries, whereas the adapted instrument used in this research was for EO investigation in SMEs in developing countries.

Further research can validate and test the questionnaire on a more comprehensive international sample and examine the sustainability of the internal structure of the questionnaire using confirmatory factor analysis. If validated, research on entrepreneurial orientation using such an instrument can be conducted internationally. Researchers should aim to improve the scales for measuring EO to make their application universal to give comparable results.

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