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МЕЂУНАРОДНИ ЧАСОПИС
ЗА ЕКОНОМСКУ ТЕОРИЈУ И ПРАКСУ И ДРУШТВЕНА ПИТАЊА

ЕКОНОМИКА

Часопис излази четири пута годишње Година LXVIII, X-XII 2022, број 4

ИЗДАВАЧ: Друштво економиста "Економика" Ниш
СУИЗДАВАЧИ: Институт за економику пољопривреде - Београд, Економски факултет у Суботици, Друштво економиста Ниша, Факултет за примењени менаџмент економију и финансије МЕФ - Београд

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EVALUATION OF ASPECTS OF COGNITIVE SKILLS USING THE PIPRECIA METHOD

Abstract

Human resources, as a sector of great importance for the successful operation of an organization, is always a current topic that needs to be researched and studied. The application of multi-criteria decision-making methods in assessing the importance of factors that have an impact on the selection of candidates in various sectors is one of the ways to improve and make a more authoritative and precise decision. In this paper, a multi-criteria approach based on the PIvot Pairwise Relative Criteria Importance Assessment - PIPRECIA method was applied. A detailed review of the literature defined a list of aspects and corresponding factors that were evaluated by four sectors from each sector by three decision makers, more precisely by the twelfth decision maker. The obtained results are relevant and authoritative, and thus the usefulness and applicability of the proposed approach, in evaluating the mentioned aspects of cognitive skills and their importance, have been unequivocally confirmed. The main goal of this paper is to indicate the usefulness of the application of multi-criteria decision-making methods (MCDM) in the implementation of this type of analysis.

Key words: *PIPRECIA, MDCM, human resources, management, communication skills*

JEL classification: C44, M12

ЕВАЛУАЦИЈА АПСЕКАТА КОГНИТИВНИХ ВЕШТИНА ПРИМЕНОМ ПИПРЕЦИА МЕТОДЕ

Апстакт

Људски ресурси као сектор од великог значаја за успешно пословање организације, увек су актуелна тема коју је потребно истраживати и проучавати. Примена метода вишекритеријумског одлучивања у оцени значајности фактора који имају утицаја на избор кандидата у различитим

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секторима представља један од начина да се унапреде, и донесе меродавнија и прецизнија одлука. У овом раду је примењен вишекритеријумски приступ заснован на примени PIvot Pairvise Relative Criteria Importance Assessment – PIPRECIA метода. Детаљним прегледом литературе дефинисана је листа аспеката и одговарајућих фактора који су оцењени од стране четири сектора из сваког сектора по три доносиоца одлука тачније дванаеста доносиоца одлука,. Добијени резултати су релевантни и меродавни, а самим тим недвосмислено је потврђена корисност и применљивост предложеног приступа, при евалуацији наведених апсеката когнитивних вештина као и њихов значај. Основни циљ овог рада је да укаже на корисност примене вишекритеријумских метода одлучивања (MCDM) у имплементацији ове врсте анализе.

Кључне речи: PIPRECIA, VKO, људски ресурси, менаџмент,комуникационе вештине

Introduction

Human resource management is important to create a stimulating environment for acquiring knowledge and personal development (Mirčetić et al., 2022; Grmuša, 2021; Popović et al., 2021; Karabašević et al., 2018; Karabašević et al., 2016a; 2016b; Karabašević et al., 2015).

Due to increased competitive pressure, employers in all sectors recognize and demonstrate a strong need for non-technical skills, including problem-solving skills, teamwork skills, communication skills, time management and cultural adaptability (Bailey, 2014). Interpersonal and communication skills, particularly listening skills, are particularly prominent in the recruitment and promotion of employees across industries, suggesting that these skills are highly valued by employers (Gillard, 2009).

Because cognitive skills are actually critical to product performance in today's workplace, current and future business leaders are emphasizing the importance of developing cognitive skills. They are defined as a combination of skills, attitudes, behavior, personal qualities, and opinions that individuals use in order to be successful in various situations in work and life. Recent research suggests that cognitive skill development focuses on the following five skill sets: self-confidence, self-control, communication, social skills, and higher-order thinking (which includes problem-solving, critical thinking, and decision-making) (Lippman, 2015). Different researchers and scholars have created their lists of cognitive skills according to different contexts. However, what is valid for all cognitive skills is a common outcome - helping in the development of personal growth, learning, and success in employment. (Gibb, 2014). Author Remedios, stated that there are two categories of cognitive skills: skills that an individual "must have" and skills that are "good to have" (Remedios, 2012).

In their research, authors Lim et al. identified a set of cognitive skills that employers value highly (Lim et al., 2016):

a) analytical skills,

b) decision-making skills,

c) oral and written communication skills,

d) problem-solving skills,
e) teamwork skills,
f) ability to collect information i
g) ability to work under pressure.

Among all these skills, oral and written communication skills are the highest rated skills that employers have identified as necessary for any new hire to be successful. Desirable skills related to oral communication are listening attentively and presenting well in interviews or a well-prepared presentation or speech. Written communication skills are including the ability to create clear and useful reports, memos and business correspondence. Based on the definitions of cognitive skills, we understand that they are of key importance for business and the selection of human resources. Their research must be done continuously because there are changes in the market and there is a generational gap between the generations that are already working and those that are yet to come. We must explore their needs and somehow influence their cognitive skills.

In this sense, multi-criteria decision-making methods (MCDM methods) can be useful and helpful. The application of MCDM methods helps decision makers in objective and systematic evaluation of alternatives based on multiple criteria (Petrović et al. 2019). MCDM methodology provides a simple way to observe and evaluate a wide range of possible alternative solutions (different aspects of smart tourism types) in relation to several defined factors (Ćirić et al., 2020). The authors recognized the usefulness of MCDM methods and applied them in solving different types of problems in the field of tourism (Lin, 2020; Lin et al., 2020; Yang et al., 2020).

For the purposes of this work will be applied, a relatively new MCDM method called the PIvot Pairwise Relative Criteria Importance Assessment (PIPRECIA) proposed by Stanujkić et al., (2017). This method is primarily intended for defining the importance (weight) of evaluation criteria, but it can be equally successfully applied for solving MCDM problems, that is, for evaluating alternatives and choosing the best criteria for decision-making (Stanujkić et al., 2021). So far, the authors have used the PIPRECIA method to facilitate decision-making in various fields, such as: the hotel industry and tourism (Popović et al., 2019; Karabašević et al., 2019; Popović et al., 2021), information technology (Stević et al., 2018; Stanujkić et al., 2021), evaluation of customer satisfaction (Stanujkić et al., 2019), quality assessment of e-learning materials (Jauković-Jocić et al., 2020), staff selection (Ulutas et al. ., 2020), employee motivation (Đukić, 2022), aviation industry (Bakir et al., 2020; Stanujkić et al., 2021), solving problems when choosing a transport company (Ulutas et al., 2021; Biswas, 2020; Vesković et al., 2020; Memis et al., 2020), and others. In this paper, with the help of the PIPRECIA method, the aspects and factors that are significant in the selection of human resources will be defined.

Method

The PIPRECIA method (Stanujkic et al., 2017) is very suitable for defining the meaning of criteria, especially in the conditions of group decision-making. The idea for the development of the PIPRECIA method originated from the Step-Wise Weight Assessment Ratio Analysis - SWARA method (Kersuliene et al., 2020), or, more

precisely, from the perceived lack of the SWARA method related to the need to pre-sort criteria according to expected importance. This initial step of the SWARA method automatically disqualifies it as a technique suitable for use in group decision-making conditions. The authors of the PIPRECIA method have made some adjustments, so it does not require prior sorting of criteria and allows the definition of importance simply and understandably.

PIRECIA method can be illustrated by the following series of steps:

***Step* 1** . Selection of the evaluation criteria where presorting is not mandatory.

***Step* 2** . Determination of the relative importance that begins from the second criterion as follows: s_j : $s_j = \begin{Bmatrix} >1 & when & C_j \succ C_{j-1} \\ 1 & when & C_j = C_{j-1} \\ <1 & when & C_j \prec C_{j-1} \end{Bmatrix}$ (1)

***Step* 3** . Definition of the coefficient in the following way: k_j

$$k_j = \begin{Bmatrix} 1 & j=1 \\ 2-s_j & j>1 \end{Bmatrix} \qquad (2)$$

***Step* 4** . Detection of the recalculated value as follows: q_j

$$q_j = \begin{Bmatrix} 1 & j=1 \\ \dfrac{q_{j-1}}{k_j} & j>1 \end{Bmatrix} \qquad (3)$$

***Step* 5** . Determination of the relative weights of the estimated criteria by using the following Eq.:

$$w_j = \frac{q_j}{\sum_{k=1}^{n} q_k} \qquad (4)$$

where *wj* represents the relative weight of the criterion. j .

Step 6. In the case of a larger number of decision-makers, the mean value is taken out of the account using the formula:

$$wj = \frac{\Sigma w_j}{n} \qquad (5)$$

When w_j * is the average value of w_j of decision-makers, n is the number of decision-makers.

Research results and discussion

As already stated, the aim of the paper is to define the importance of aspects and factors that indicate the ranking of cognitive skills by executive managers and the very application of the method that indicates the most important factors. In this sense, Table 1 presents a list of aspects and factors relevant to cognitive skills.

Table 1. Overview of cognitive skills categorized by the executive managers

Aspects		Factors	
$C1$	Communication Skills	C_{11}	Public speaking
		C_{12}	Listening
		C_{13}	Business writing
		C_{14}	Articulate
		C_{15}	Body language
		C_{16}	Business innovation
		C_{17}	Email etiquette
		C_{18}	Presentation skills
		C_{19}	Language skills
C_2	Teamwork & Leadership Qualities	C_{21}	Cooperative
		C_{22}	Supportive
		C_{23}	Helpful
		C_{24}	Coordination
		C_{25}	Working well with people
$C3$	Positive Attitude	C_{31}	Genuine
		C_{32}	Commitment
		C_{33}	Honest
		C_{34}	Sincerely
		C_{35}	Hardworking
		C_{36}	Following rules
$C4$	Integrity & Work Ethics	C_{41}	Dependable
		C_{42}	Reliable
		C_{43}	Accountable
		C_{44}	Self-disciplined
C_5	Fast problem solving	C_{51}	Meditation
		C_{52}	Dialogue
		C_{53}	Negotiation
		C_{54}	Without provocations and causing conflicts
$C6$	Interpersonal Skills	C_{61}	Patience
		C_{62}	Friendly
		C_{63}	Empathetic
		C_{64}	People skills
C_7	Stress & Time Management	C_{71}	Punctual
		C_{72}	Work-life balance
		C_{73}	Relaxed
		C_{74}	Meeting deadlines
		C_{75}	Never late

C_8	Flexibility & Responsibility	C_{81}	Adaptability
		C_{82}	Agility
		C_{83}	Quick learner
		C_{84}	Willing to change
		C_{85}	Open to ideas and views
		C_{86}	Dependable
		C_{87}	Reliable
		C_{88}	Accountable
C_9	Professionalism & Courtesy	C_{91}	Polite
		C_{92}	Mannerisms
		C_{93}	Well-groomed
		C_{94}	Image projection
		C_{95}	Workplace & social etiquette
		C_{96}	Regards,
		C_{97}	Humility
		C_{98}	Well behaved

Source: Deepa S. (2014). Executive perceptions of top ten soft skills at work: Developing these through SAIF. Indian Institute of Management Kozhikode

In order to obtain the most reliable results, three decision-makers from four different sectors were included in the decision-making process. The first sector J - information and communication and includes the domain of publishing activities, telecommunications activities, information service activities as well as a wide range of other activities, but only those from which the decision-makers were, as with other sectors, are listed. The second sector M includes professional, scientific and innovative activities, which include scientific research and development, advertising and other professional, scientific and technical activities, and market research. The fourth sector of P education, is higher education, art education, and auxiliary educational activities. First, the importance of basic aspects of cognitive skills will be determined by applying formulas (1)-(6). Table 2 shows the obtained results.

Table 2. The relative importance of indicators group

Sector J	w_j*	Sector M	w_j*	Sector N	w_j*	Sector P	w_j*
C_{1j}	0.108	C_{1m}	0.066	C_{1n}	0.082	C_{1p}	0.113
C_{2j}	0.119	C_{2m}	0.083	C_{2n}	0.079	C_{2p}	0.094
C_{3j}	0.109	C_{3m}	0.119	C_{3n}	0.083	C_{3p}	0.093
C_{4j}	0.101	C_{4m}	0.099	C_{4n}	0.078	C_{4p}	0.085
C_{5j}	0.100	C_{5m}	0.132	C_{5n}	0.112	C_{5p}	0.116
C_{6j}	0.090	C_{6m}	0.142	C_{6n}	0.127	C_{6p}	0.122
C_{7j}	0.112	C_{7m}	0.140	C_{7n}	0.135	C_{7}p	0.146
C_{8j}	0.133	C_{8m}	0.122	C_{8n}	0.151	C_{8p}	0.123
C_{9j}	0.129	C_{9m}	0.093	C_{9n}	0.151	C_{9p}	0.109

Source: Author's research

In order to minimize the subjectivity of decision-makers and determine the most relevant results, the mean value of the received weights was calculated using the formula (5).

According to the first decision-makers from sector J - information and communication, the most important aspect of cognitive skills is C_{8j} - Flexibility & Responsibility, while decision-makers from sector M - professional, scientific, innovative and technical activities believe that the most important aspect of cognitive skills is C_{6m} - Interpersonal Skills. The third sector N - administrative and auxiliary service activities decision makers consider the most important aspects of cognitive skills to be C_{8n} - Flexibility & Responsibility and C_{9n} - Professionalism & Courtesy. Decision-makers from the fourth sector P - education, believe that the most important aspect is cognitive skills C_{7p} - Stress & Time Management.

Based on table 1, we could notice that each of the aspects includes several factors, ie the next stage of the analysis will be the relative importance of the respective factors determined in tables 3 - 11.

Table 3. *Weights of the factors of communication skills*

Sector J	w_j*	Sector M	w_j*	Sector N	w_j*	Sector P	w_j*
$C_{11}j$	0.139	C_{11m}	0.131	C_{11n}	0.107	C_{11p}	0.106
C_{12j}	0.134	C_{12m}	0.143	C_{12n}	0.126	C_{12p}	0.133
C_{13j}	0.122	C_{13m}	0.132	$C_{13}n$	0.128	C_{13p}	0.143
C_{14j}	0.098	C_{14m}	0.097	C_{14n}	0.117	C_{14p}	0.127
C_{15j}	0.106	C_{15m}	0.074	C_{15n}	0.093	C_{15p}	0.109
C_{16j}	0.104	C_{16m}	0.102	C_{16n}	0.090	C_{16p}	0.083
C_{17j}	0.101	C_{17m}	0.109	C_{17n}	0.098	C_{17p}	0.083
C_{18j}	0.098	C_{18m}	0.122	C_{18n}	0.126	C_{18p}	0.107
C_{19j}	0.098	C_{19m}	0.109	C_{19n}	0.116	C_{19p}	0.109

Source: Author's research

According to the first sector J, the most important factor is C_{11j} - Public speaking because it is a sector dealing with information and communications. According to the decision-makers from the second sector M, the most important factor is C_{12m} - Listening because it is a sector of innovation and technical deltas where it is of great importance to conveying information in the right way. According to the decision-makers from sector N and sector P, the most important factor is C_{13n} - Business writing, because these are sectors dealing with administrative and educational activities.

Table 4. Weights of the factors of teamwork & leadership qualities

Sector J	w_j*	Sector M	w_j*	Sector N	w_j*	Sector P	w_j*
C_{21j}	0.182	C_{21m}	0.172	C_{21n}	0.204	C_{21p}	0.178
C_{22j}	0.199	C_{22m}	0.194	C_{22n}	0.176	C_{22p}	0.178

C_{23j}	0.199	C_{23m}	0.198	C_{23n}	0.200	C_{23p}	0.193
C_{24j}	0.200	C_{24m}	0.197	C_{24n}	0.211	C_{24p}	0.200
C_{25}j	0.219	C_{25m}	0.239	C_{25n}	0.208	C_{25p}	0.251

Source: Author's research

In this case, in all sectors we have complete agreement with the decision makers from the aspect of teamwork & leadership qualities when it comes to factor C_{25} - Working well with people that it is the most significant, because after all we are talking about sectors where good communication with people comes first.

Table 5. Weights of the factors of positive attitude

Sector J	w_j*	Sector M	w_j*	Sector N	w_j*	Sector P	w_j*
C_{31j}	0.188	C_{31m}	0.135	C_{31n}	0.192	C_{31p}	0.142
C_{32j}	0.154	C_{32m}	0.147	C_{32n}	0.169	C_{32p}	0.147
C_{33j}	0.165	C_{33m}	0.152	C_{33n}	0.151	C_{33p}	0.150
C_{34j}	0.138	C_{34m}	0.143	C_{34n}	0.138	C_{34p}	0.161
C_{35j}	0.163	C_{35m}	0.191	C_{35n}	0.163	C_{35p}	0.197
C_{36j}	0.192	C_{36m}	0.231	C_{36n}	0.188	C_{36p}	0.202

Source: Author's research

According to the first J, the second M and the fourth O sector, the most important factor is C_{36} – Following rules because these are the sectors that are engaged in such type of activity for which it is of great importance for good business to follow and respect certain rules. According to decision-makers from the third sector N, the most important factor is C_{31n} – Genuine.

Table 6. Weights of the factors integrity & work ethics

Sector J	w_j*	Sector M	w_j*	Sector N	w_j*	Sector P	w_j*
C_{41j}	0.273	C_{41m}	0.223	C_{41n}	0.205	C_{41p}	0.212
C_{42j}	0.257	C_{42m}	0.239	C_{42n}	0.251	C_{42p}	0.241
C_{43j}	0.253	C_{43m}	0.262	C_{43n}	0.264	C_{43p}	0.264
C_{44}j	0.217	C_{44m}	0.276	C_{44}n	0.280	C_{44p}	0.283

Source: Author's research

According to the first sector J, the most important factor is C_{41j} - Dependable. According to decision makers from other sectors, the most important factor is C_{44} - Self-disciplined.

Table 7. Weights of the factors of fast problem solving

Sector J	w_j*	Sector M	w_j*	Sector N	w_j*	Sector P	w_j*
C_{51j}	0.232	C_{51m}	0.238	C_{51n}	0.209	C_{51p}	0.176
C_{52j}	0.253	C_{52m}	0.213	C_{52n}	0.237	C_{52p}	0.241
C_{53j}	0.250	C_{53m}	0.256	C_{53n}	0.272	C_{53p}	0.272
C_{54}j	0.264	C_{54m}	0.293	C_{54n}	0.311	C_{54p}	0.311

Source: Author's research

In this case, decision makers from different sectors made the same decision that the most significant factor is C_{54j} - Without provocations and causing conflicts .

Table 8. Weights of the factors of interpersonal skills

Sector J	w_j*	Sector M	w_j*	Sector N	w_j*	Sector P	w_j*
C_{61j}	0.243	C_{61m}	0.242	C_{61}n	0.288	C_{61p}	0.255
C_{62j}	0.251	C_{62m}	0.254	C_{62n}	0.275	C_{62p}	0.238
C_{63j}	0.237	C_{63m}	0.231	C_{63n}	0.229	C_{63p}	0.254
C_{64j}	0.269	C_{64m}	0.273	C_{64n}	0.208	C_{64p}	0.283

Source: Author's research

In this case, according to the first sector J, the second M and the fourth P sector, the most important factor is C_{64} - People skills, while for the decision-makers from the third sector N the most important factor is C_{61} - Patience.

Table 9. Weights of the factors of stress & time management

Sector J	w_j*	Sector M	w_j*	Sector N	w_j*	Sector P	w_j*
C_{71j}	0.184	C_{71m}	0.205	C_{71n}	0.212	C_{71p}	0.204
C_{72j}	0.169	C_{72m}	0.189	C_{72n}	0.188	C_{72p}	0.208
C_{73j}	0.167	C_{73m}	0.166	C_{73n}	0.180	C_{73}p	0.209
C_{74j}	0.205	C_{74m}	0.192	C_{74n}	0.186	C_{74p}	0.188
C_{75j}	0.275	C_{75m}	0.247	C_{75n}	0.233	C_{75p}	0.191

Source: Author's research

According to the decision-makers from the first J, second M and third N sectors, the most important factor is C_{75} - never late, while for the decision-makers of the P sector, the most important factor is C_{73} - relaxed.

Table 10. Weights of the factors of flexibility & responsibility

Sector J	w_j*	Sector M	w_j*	Sector N	w_j*	Sector P	w_j*
C_{81j}	0.097	C_{81m}	0.091	C_{81n}	0.142	C_{81p}	0.130
C_{82j}	0.105	C_{82m}	0.105	C_{82n}	0.115	C_{82p}	0.118
C_{83j}	0.128	C_{83m}	0.111	C_{83n}	0.110	C_{83p}	0.110
C_{84j}	0.115	C_{84m}	0.137	C_{84n}	0.113	C_{84p}	0.123
C_{85j}	0.140	C_{85m}	0.137	C_{85n}	0.142	C_{85p}	0.161
C_{86j}	0.153	C_{86m}	0.149	C_{86n}	0.107	C_{86p}	0.119
C_{87j}	0.138	C_{87m}	0.143	C_{87n}	0.118	C_{87p}	0.116
C_{88j}	0.131	C_{88m}	0.126	C_{88n}	0.154	C_{88p}	0.123

Source: Author's research

According to decision-makers from the first J and second M sectors, the factor that has the greatest importance is C_{86} - Dependable. According to the decision makers from sector N, the factor that is of greatest importance is C_{88} - Accountable. The most important factor according to decision-makers from the O sector is C_{85} - Open to ideas and views.

Table 11. Weights of the factors of professionalism & courtesy

Sector J	w_j*	Sector M	w_j*	Sector N	w_j*	Sector P	w_j*
C_{91j}	0.088	C_{91m}	0.109	C_{91n}	0.114	C_{91p}	0.118
C_{92j}	0.104	C_{92m}	0.086	C_{92n}	0.104	C_{92p}	0.103
C_{93j}	0.118	C_{93m}	0.109	C_{93n}	0.109	C_{93p}	0.105
C_{94j}	0.127	C_{94m}	0.135	C_{94n}	0.086	C_{94p}	0.112
C_{95j}	0.173	C_{95m}	0.158	C_{95n}	0.105	C_{95p}	0.157
C_{96j}	0.145	C_{96m}	0.151	C_{96n}	0.140	C_{96p}	0.150
C_{97j}	0.120	C_{97m}	0.127	C_{97n}	0.148	C_{97p}	0.119
C_{98j}	0.124	C_{98m}	0.126	C_{98n}	0.193	C_{98p}	0.137

Source: Author's research

According to the decision-makers from the first J, second M sector , as well as the fourth P sector, the factor that has the greatest importance, is C_{95} - Workplace & social etiquette. According to the decision makers from sector N, the most important factor is C_{98} - Well behaved.

Conclusion

Although many scientists have conducted their research to understand the importance of cognitive skills in an individual's performance, it is incorrect to assume that everything related to cognitive skills is stated and concluded. In modern business, the rules of work are changing dramatically, and employees are measured not only by their knowledge or expertise but also by their emotional intelligence, as well as by cognitive skills or personal

competencies. Today's organizations face several challenges. This development has an impact on employees as well as managers. That's why managers need to be aware of the differences and similarities between the generational cohorts currently in the workplace. These differences and similarities have several effects on organizations as well as managers.

For the development of the human resources sector, a good selection of personnel as well as the necessary cognitive skills for various fields of activity, it is necessary to determine the factors that have the greatest impact. Therefore, in this paper, the PIPRECIA method was applied in the conditions of group decision-making.

Based on the literature review, nine key aspects of cognitive skills have been identified that include an appropriate number of factors to be assessed. The final results show that the key factors of aspects of cognitive skills are C_{8j} - Flexibility & Responsibility , C_{6m} - Interpersonal Skills , C_{9n} - Professionalism & Courtesy, Stress & Time Management. We must mention that a large number of decision-makers from different industries were involved here. As well as the fact that some results for the outcomes had the same most significant factor. The consequence of that is that all sectors deal with service activities basically and accordingly factors like C_{54} - Without provocations and causing conflicts is significant because every organization strives to have a harmonious team and to have good communication. Or when we talk about the aspect *of integrity & work ethics* the factor that has the greatest importance according to sector J is C_{41j} - Dependable. According to decision makers from other sectors, the most important factor is C_{44} - Self-disciplined. The reason for this result is that the J sector deals with information and reliability is a cognitive skill that is essential for someone who deals with this type of work. While in other sectors, Self-disciplined is important because such activities are in which such an aspect of cognitive skills is of crucial importance for personnel selection.

The obtained results would be more authoritative if more decision-makers were involved in the decision-making process, as well as if the evaluation process itself was related to a certain type of organization or a specific type of work. Nevertheless, the proposed methodology has confirmed its usefulness and applicability in decision-making in this area. The recommendation for future work includes the evaluation and ranking of certain factors that influence the selection of personnel in a certain activity, specifically on the list of previously defined aspects as well as factors using the PIPRECIA method.

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ECONOMIC PERFORMANCE OF SPECIALIZED FIELD CROPS FARMS PRODUCING SWEET CORN

Abstract

Sweet corn is not commonly produced at Serbian family farms, although it has a significant economic potential. Besides, there is a lack of research related to economic performance of the sweet corn production. Therefore, the goal of this research was to determine economic effects of introducing sweet corn in the sowing structure of specialized field crops farms in Serbia. The analysis was performed on the model of family farm specialized in the field crops production. Determination of average gross margin for appropriate field crops was followed by the optimization of farms' sowing structure (by applying linear programming approach). Authors analyzed three variants depending on sweet corn participation in the sowing structure. It was determined that the optimization itself increases the use of labor force and positively influences the level of farm gross margin. By combining the optimization with the introduction of sweet corn in the sowing structure even better results are achieved. Therefore, family farms specialized in the field crops production should be encouraged to extend their sowing structure by producing sweet corn. The paper offers an important insight into the combination of crops which can improve an overall economic performance of family farms.

Key words: *sweet corn, specialized field crops farms, sowing structure, labor productivity, gross margin*

JEL classification: *Q12, J53*

ЕКОНОМСКЕ ПЕРФОРМАНСЕ СПЕЦИЈАЛИЗОВАНИХ РАТАРСКИХ ГАЗДИНСТАВА КОЈА ПРОИЗВОДЕ КУКУРУЗ ШЕЋЕРАЦ

Апстракт

На породичним газдинствима у Србији производња кукуруза шећерца није уобичајена, иако он има велики економски потенцијал. Поред тога, не постоји

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довољан број истраживања која се баве економским перформансама производње кукуруза шећерца. Због тога је циљ овог истраживања утврђивање економских ефеката увођења кукуруза шећерца у сетвену структуру специјализованих ратарских газдинстава у Србији. Анализа је спроведена на моделу породичног газдинства специјализованог за ратарску производњу. Након утврђивања просечне бруто марже за одговарајуће ратарске усеве, извршена је оптимизација сетвене структуре газдинстава (применом линеарног програмирања). Аутори су анализирали три варијанте, зависно од учешћа кукуруза шећерца у сетвеној структури. Утврђено је да се оптимизацијом увећава употреба радне снаге и да се позитивно утиче на висину бруто марже газдинства. Још бољи резултати су остварени комбиновањем оптимизације са увођењем кукуруза шећерца у сетвену структуру. Због тога је потребно охрабрити породична газдинства специјализована за ратарску производњу да прошире своју сетвену структуру преко увођења кукуруза шећерца. Ово истраживање пружа важан увид у комбинацију усева која може унапредити укупне економске перформансе породичних газдинстава.

Кључне речи: кукуруз шећерац, специјализована ратарска газдинства, сетвена структура, продуктивност рада, бруто маржа

Introduction

Sweet corn, as well as other types of corn, originates from Central America (Latković et al., 2012, p. 91). In comparison to wheat or rice, corn does not have an obvious wild relative (Babić et al., 2012, p. 92). Besides, sweet corn does not have a long history of breeding, and it is considered that this type of corn is generated by genes mutations (Gadžo et al., 2017, p. 45). According to the authors, its sweetness is caused by a recessive gene, which slows down the transformation of sugar into starch. Sweet corn is rich in fibers, minerals and vitamins, having at the same time antioxidant effects.

Sweet corn is "a high input, high value seasonal vegetable crop that can command high prices, especially when produced under organic conditions" (Revilla et al., 2021, pp. 25-26). Above authors also stated that it is necessary to apply "high levels of fertility, irrigation, and intensive pest management techniques" in the production of sweet corn, while it could be produced in different cropping systems (as the main crop, catch crop or in intercropping systems). Sweet corn is a type of corn which does not tolerate low temperatures or high soil humidity (Bekavac, 2012, pp. 9-10). On the other hand, availability of sufficient amounts of water during some development phases significantly influences the level of yield, as well as its quality. According to the author, one of the most important challenges in the sweet corn production is the harvest (the optimal time frame for successful harvest is only 4 to 5 days), while harvested sweet corn should be immediately stored in adequate cooling facilities (which prevents the loss of quality).

Analyzing industrial production and processing of peas and sweet corn in Serbia, Marković et al. (2003) determined that there are several reasons for a decrease in such a production, such as the lack of modern harvesters, small areas which are irrigated, inappropriate equipment used in processing and freezing facilities, etc. Therefore, authors assume that the most important factor for the improvement of the peas and sweet corn

production is modernization of equipment and technology (not only in the agricultural production but also in industrial processing), increasing capacity levels at the same time. It was suggested that the reconstruction of existing processing facilities is preferred comparing to the investments in new premises. Vešnik (1997) states that sweet corn is a valuable product for industrial processing, while positively influencing the agricultural production in many ways. This author mentioned various ways of sweet corn processing, discussing, in more details, processing by deep freezing using temperatures of -18 °C and -21 °C (which provides that its sensory characteristic will not change during the period of 12 months i.e. 24 months). Some of the conclusions in this research indicated that the production process of sweet corn is very similar to the production of mercantile corn, while the sweet corn production should lead to a higher profit comparing to the usual corn production practices.

As mentioned earlier, there are various ways of sweet corn use. It could be used for consumption as a fresh product, but also for industrial based processing – by conservation or freezing. Therefore, Pajić et al. (2008) suggested that various uses of sweet corn require different quality measures. This is why breeding of sweet corn for different consumption purposes should be based on an adequate selection process. Authors also stated that the selection process of sweet corn is primarily performed in private companies, while the production of sweet corn seed is one of the most profitable enterprises. According to Srdić at al. (2016), it is not only important to have high sweet corn ear yields, but also to provide other important traits. Analyzing eight sweet corn hybrids (two commercial and six experimental hybrids), authors determined that their ear yields are "significantly influenced by genotype, meteorological conditions in different years and the interaction of those two factors", while analyzed hybrids "had nice physical appearances, such as uniformity of shape and size of the ear". Similar research was conducted by Srdić at al. (2019). The analysis included 12 sweet corn hybrids; three of them were commercial, while the other nine hybrids were experimental. The results indicated that the level of correlation between yield and quality of sweet corn hybrids was mainly low. On the other hand, both of the mentioned traits are important. So, authors concluded that "through the breeding process, both of those characteristics need to be improved".

There is also research oriented towards some issues of the sweet corn production technology. Bajkin and Žigmanov (2000) analyzed effects of seeding cucumber and sweet corn over foil. It was determined that such a way of production leads to earlier harvesting, higher yields and higher quality. Authors discovered that the use of degradable foil proves more effective in the sweet corn production. Šimić et al. (2010) accented an importance of sweet corn fertilization for some of its production characteristics. It is especially important for the sweet corn production technology to apply an adequate amount of potassium fertilizers. On the basis of results of their research, authors determined that (comparing to control level of fertilization) an increase in potassium application resulted in bigger diameter of cobs (20%) and cob weight (11%). The analysis revealed that the differences are statistically significant.

There is small number of research dealing with economic aspects of the sweet corn production, not only in Serbia, but also on the international level. Potkonjak and Mačkić (2010, pp. 258-259) analyzed economic efficiency of irrigation on small scale areas. Authors determined certain economic indicators for sweet corn, as well as for 23 other agricultural products. The production value of sweet corn was calculated, as well as the production costs and profit. Subić et al. (2021, pp. 105-109) determined that material costs

dominate within variable costs of the sweet corn production, while majority of labor costs are related to harvesting process. Authors also determined that gross margin in the sweet corn production is very sensitive to changes in sweet corn yield or its market price.

Williams (2012, pp. 55-61) tried to determine an effect of sweet corn plant population density on various agronomic and economic indicators. Author determined that the plant population for maximal sweet corn yield depended on the hybrid to a large extent. The use of certain hybrids and their adequate population densities could improve economic performance of sweet corn producers and processors. Similar research which tackled processors profit and grower returns conducted by Dhaliwal and Williams (2020, p. 12) concluded that "processors should decide plant densities tailored to the local growing conditions".

Having above mentioned in mind, the goal of this paper is to determine economic performance on introducing sweet corn in the sowing structure of specialized field crops farms in Serbia. The following hypothesis will be tested in this research: Introduction of the sweet corn production in the sowing structure of specialized field crops farms could increase gross margin of the farms, as well as improve the level of employment of available labor force.

Material and method

Economic performance of introducing sweet corn into the sowing structure of specialized field crops farms is examined on the model of family farm situated in the Autonomous Province of Vojvodina (which is primarily lowland region). The model is based on data from researchers' database which has been created as a result of an annual survey on a representative sample of farms in that region. It is assumed that:

- utilized agricultural area is 12.9 hectares (the farmer is owner of the entire cultivated land),
- there are three family members, while two of them are active family members,
- only one active family member works exclusively on the farm and
- the analysis is performed on the basis of data covering a five year period (from the production year 2016/2017 to the production year 2020/2021) – the goal of such an approach is to avoid the influence of significant price fluctuations (of inputs and outputs) and various weather conditions on the results of the analysis.

The main criteria for economic evaluation of the sweet corn production are the level of gross margin of the entire family farm. The following options (variants) are discussed and compared in the research:

- variant 1 – the optimization of existing (usual, the most common) sowing structure (without the introduction of the sweet corn production),
- variant 2 – the introduction of sweet corn (while optimizing the existing production structure at the same time) and
- variant 3 – the introduction of sweet corn (while optimizing the existing production structure at the same time), assuming that sweet corn is limited to a maximal area of 0.25 hectares (due to market and organizational challenges).

To perform the optimization of the sowing structure (which leads to the maximization of gross margin at the farm level), authors used a linear programming method (Microsoft Excel Solver is used to solve formulated linear programming problems). Gross margin maximization is an equivalent to profit maximization (or minimization of potential losses). Having in mind that fixed costs are constant, every change of gross margin at the farm level in short term directly influences the level of profit (Ivkov et al., 2008, p. 237). When it comes to the specialized field crops farms, linear programming method is used to – increase the existing capacity use of family farms (family labor and machinery) (Munćan et al., 2008), as well as to optimize the sowing structure of family farms in unstable business conditions (Todorović and Munćan, 2009).

Results and discussion

Variations of gross margin are a solid base for the estimation of present and future economic status of family farms. Therefore, an average gross margin (representing 5-year period) for crops involved in usual sowing structure (corn, winter wheat, sunflower and soybean) and sweet corn as optional crop are presented in table 1.

Table 1: Gross margin for the observed crops (an average for the period from 2016/2017 to 2020/2021)

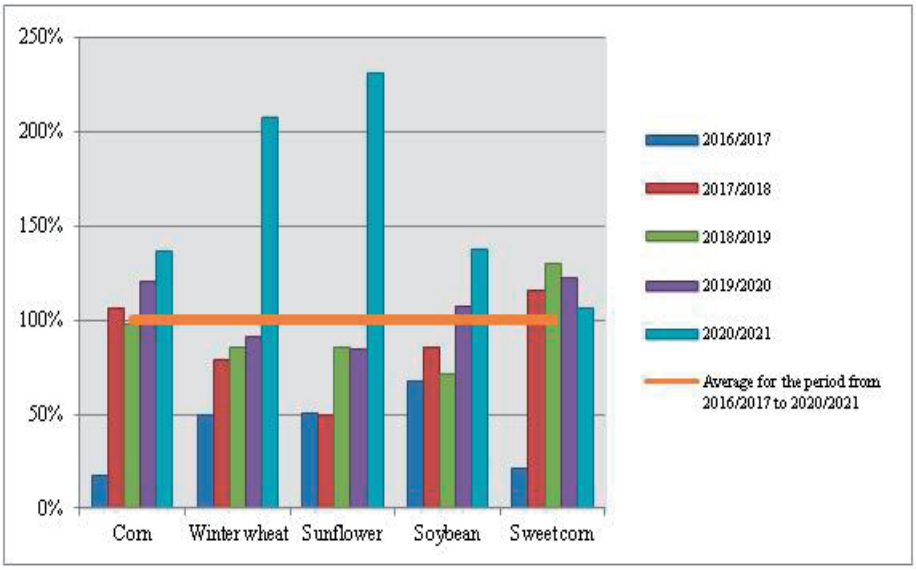
Crop	Amount (RSD per ha)	Index (Corn gross margin=100)
Corn	56,780.85	100.00%
Winter wheat	34,601.19	60.94%
Sunflower	34,230.38	60.29%
Soybean	64,122.43	112.93%
Sweet corn	327,109.20	576.09%

Source: Authors' calculation

While sweet corn had the highest average gross margin, the lowest value of this indicator was recorded for winter wheat and sunflower.

Nevertheless, the value of gross margin varied during the observed period (Graph 1). The reasons for such variations are not only market conditions (considering the observed commodities, as well as inputs necessary for the crop production) but also weather conditions influencing the crop production. The biggest gross margin variations are determined for the sunflower production, while the most stable gross margins are recorded in the soybean production. Each gross margin increase is perceived as a positive change, while its decrease indicates negative tendencies and an indication of a possible crisis.

Graph 1: Indexes of gross margin during the observed period



Source: Authors' calculation

When creating the model of the family farm, it is assumed that there is one annual work unit available (1,800 working hours). In that regard, the average number of AWU for the entire Republic of Serbia (if family farms are cultivating 10 to 50 hectares) is presented in Table 2.

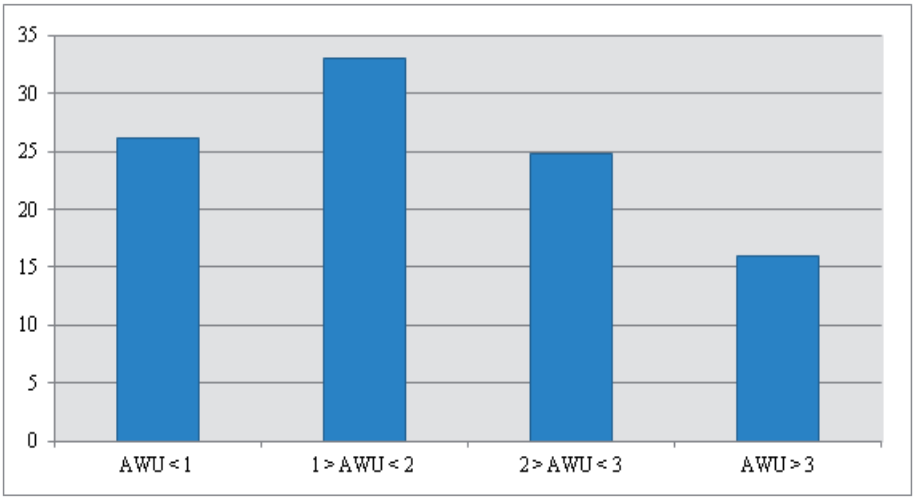
Table 2: An average number of AWU depending on the size of family farms in Serbia

UAA per holding (ha)	**Average number of AWU per family holding**	**Index (Holdings with UAA from 10.01 to 50 ha=100)**
< 1	0.6	33.33%
1.01 to 2	0.8	44.44%
2.01 to 5	1.2	66.67%
5.01 to 10	1.5	83.33%
10.01 to 50	1.8	100.00%
50<	2.2	122.22%

Source: Statistical Yearbook of the Republic of Serbia, RZS, 2021, p. 234, (based on census 2018)

On the other hand, there is a significant percentage (26.1%) of farms (having size 10 to 50 hectares) with less than one AWU (Graph 2).

Graph 2: The structure of farms cultivating 10 to 50 hectares by number of AWU (%)



Source: Statistical Yearbook of the Republic of Serbia, RZS, 2021, p. 234 (based on census 2018)

Data concerning the year 2020 (dealing with the farms involved in Serbian FADN sample) indicate the following facts – 1.3 AWU per farm is used in the region Serbia North, which is less than an average for the region Serbia South (1.9 AWU per farm). There are a few reasons for this situation, such as bigger farms, higher level of mechanization and lower presence of the livestock production in the region Serbia North (MPŠV, 2022, p. 42). According to the same source (MPŠV, 2022, p. 43), specialized crop farms and specialized swine farms have the lowest level of the used AWU among Serbian farms involved in FADN sample (in 2020)

Based on the data from Census (2018), 14% of agricultural labor force in Serbia is engaged on specialized crops farms (Bogdanov and Babović, 2019, p. 33). According to the authors (Bogdanov and Babović, 2019, p. 33), specialized crops farms are dominant in the AP Vojvodina concerning agricultural employment (specialized crops farms use 45% of the total AWU in the region).

a) Changes of the sowing structure

The optimization process (performed in variants 1, 2 and 3) and the introduction of sweet corn (in variants 2 and 3) caused changes in the sowing structure (Table 3). In Variant 1, the optimization caused a decrease of an area used for winter wheat production, while all other crops increased its participation in the sowing structure. The introduction of sweet corn in Variant 2, led to a decrease of areas used for corn and winter wheat production, while areas under sunflower and soybean enlarged. Variant 3 was characterized by a decrease of winter wheat area, while an area under other production activities increased.

Table 3: The sowing structure before and after the optimization

Crop	Sowing structure before the optimization (%)	After the optimization					
		Sowing structure (%)			Change in relation to sowing structure before the optimization		
		Variant 1	Variant 2	Variant 3	Var. 1	Var. 2	Var. 3
Corn	47.58%	50.00%	43.11%	48.06%	↑	↓	↑
Winter wheat	33.33%	20.00%	20.00%	20.00%	↓	↓	↓
Sunflower	1.64%	5.00%	5.00%	5.00%	↑	↑	↑
Soybean	17.45%	25.00%	25.00%	25.00%	↑	↑	↑
Sweet corn	-	-	6.89%	1.94%	-	↑	↑
TOTAL	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**-**	**-**	**-**

Note: ↑ - increasing the share of crops in the sowing structure after the optimization; ↓ - decreasing the share of crops in the sowing structure after the optimization. Source: Authors' calculation

When determining an optimal sowing structure, the priority has been given to the production activities whose minimal participation should satisfy limitations imposed by the crop rotation. Therefore, wheat participates with 20% in an optimal sowing structure (in Variant 1, 2 and 3), although it has a rather low level of gross margin. On the other hand, participation in an optimal sowing structure of the crops having the highest gross margin is restricted by some factors such as availability of labor force (for sweet corn in Variant 2) or market and organizational challenges (for sweet corn in Variant 3). Generally, higher participation of sweet corn in the sowing structure (Variant 2) led to a decrease of mercantile corn production area.

b) Changes of working hours

The optimization did not only change the production structure, but also a number of working hours necessary for the production process (Table 4). A detailed analysis revealed that, after the optimization (Variant 1), the total number of working hours spent at the farm increased for 4.39 hours per year (by 3.59%). Somewhat bigger increase of the used working hours is recorded in Variant 3 because the total number of working hours increased for 44.51 hours per year (by 36.39%). The most significant improvement of labor force use is related to Variant 2 which is characterized by the biggest area utilized for the sweet corn production. Comparing to the state before the optimization and without the sweet corn production, Variant 2 used 147.12 working hours more, which represents 120.26% improvement.

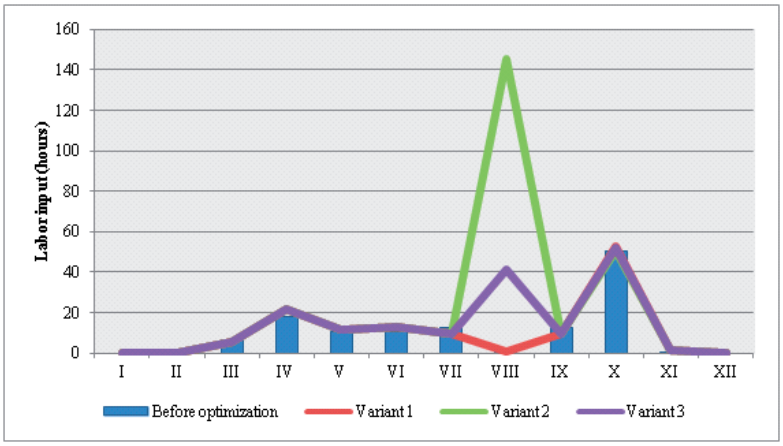
Table 4: The change of working hours per months after the optimization

Month	Variant 1		Variant 2		Variant 3	
	Change (hours)	Change (%)	Change (hours)	Change (%)	Change (hours)	Change (%)
I	0.00	/	0.00	/	0.00	/
II	0.00	/	0.00	/	0.00	/
III	-1.17	-17.15%	-1.17	-17.15%	-1.17	-17.15%
IV	3.54	19.53%	3.57	19.72%	3.55	19.58%
V	1.56	15.10%	1.56	15.10%	1.56	15.10%
VI	2.38	22.39%	2.38	22.39%	2.38	22.39%
VII	-2.81	-22.33%	-2.81	-22.33%	-2.81	-22.33%
VIII	0.36	201.00%	145.42	80,788.89%	41.14	22,856.56%
IX	-2.91	-23.63%	-2.91	-23.63%	-2.91	-23.63%
X	2.22	4.38%	-0.14	-0.28%	1.56	3.07%
XI	1.22	206.10%	1.22	206.10%	1.22	206.10%
XII	0.00	/	0.00	/	0.00	/
TOTAL	**4.39**	**3.59%**	**147.12**	**120.26%**	**44.51**	**36.39%**

Source: Authors' calculation

If the analysis is performed per months, the results indicate the decrease of labor force use in March, July, September (for all the observed variants), and in October (only for Variant 2). The highest increase of labor force use could be noted in August (for all three variants), while the highest use of labor force during August is recorded for Variant 2 (because of the highest participation of sweet corn in the sowing structure of that variant) (Table 4 and Graph 3).

Graph 3: Working hours per months (before and after the optimization)



Source: Authors' calculation

Increasing the share of sweet corn (which requires a greater engagement of the labor force compared to other crops present in the crop production due to hand picking and packing) in the sowing structure contributes to the increase in employment of labor force on the family farm especially in the case of Variant 2.

c) Changes of gross margin

Very important conclusions (concerning economic performance after the optimization and introducing sweet corn in the sowing structure) could be made by calculating various indicators based on gross margin (Table 5). Positive effects of the optimization in Variant 1 are recorded concerning all economic indicators. However, the inclusion of sweet corn in the sowing structure combined with the optimization improved two of the three observed indicators (while better results for both of these indicators were achieved using Variant 2).

Table 5: Economic effects of the optimization and change in the sowing structure

Economic indicator	Value before the optimization (RSD)	After optimization					
		Value (RSD)			Change in relation to value before the optimization		
		Variant 1	Variant 2	Variant 3	Var. 1	Var. 2	Var. 3
Gross margin	648,871.99	684,381.01	924,776.69	751,963.09	↑	↑	↑
Gross margin per used labor hour	5,304.28	5,400.87	3,432.15	4,507.05	↑	↓	↓
Gross margin per available labor hour	359.60	379.28	512.51	416.74	↑	↑	↑

Note: ↑ - increasing the value of economic indicator after the optimization; ↓ - decreasing the value of economic indicator after the optimization
Source: Authors' calculation

As a result of the optimization, gross margin on the farm level increased by 5.47% (Variant 1), causing at the same time an improvement of gross margin per used labor hour and per available labor hour (Table 6).

Generally, an increase of gross margin at the farm level means an improvement of its capacity to cover fixed costs. Therefore, short term variations of gross margin at the farm level directly influence the level of profit. The highest increase of gross margin was recorded for Variant 2, while, at the same time, the application of Variant 2 decreased gross margin per used labor hour the most (35.29%). Nevertheless, Variant 2 improves gross margin at the farm level (at the same time increasing the farm profit) and gross margin per available labor hour by 42.52%.

Table 6: Changes in economic indicators after the optimization

Economic indicator	Variant 1		Variant 2		Variant 3	
	Change (RSD)	Change (%)	Change (RSD)	Change (%)	Change (RSD)	Change (%)
Gross margin	35,509.02	5.47%	275,904.70	42.52%	103,091.11	15.89%
Gross margin per used labor hour	96.60	1.82%	-1,872.12	-35.29%	-797.23	-15.03%
Gross margin per available labor hour	19.68	5.47%	152.91	42.52%	57.13	15.89%

Source: Authors' calculation

Therefore, managerial decision of introducing sweet corn in the sowing structure is economically expectable. The same conclusion is made when market and organizational challenges are taken into account (Variant 3) although economic effects of such a decision are less significant.

Conclusion

Introducing sweet corn in the sowing structure of specialized field crops family farms results in an increase of gross margin as well as an increase of number of working hours spent on the farm (which proves the initial hypothesis). The highest gross margin is determined for Variant 2 because this variant is not related to any market limitations or organizational challenges. The sweet corn production leads to a better use of available labor force, especially during August (when it comes to the usual sowing structure, labor force in August is mostly unutilized). Having in mind that (even with the sweet corn production) capacity of labor force at family farms is not fully used, there are possibilities for family members' engagement outside the farm (or engagement related to other gainful activities at the farm).

There are not big differences between mercantile corn and the sweet corn production technologies on family farms, except for the sweet corn harvesting (sweet corn produced on family farm is handpicked, due to the lack of combine harvesters). Therefore, the results obtained in this research indicate possible directions of the sowing structure diversification (concerning specialized field crops farms). Such diversification should improve the use of available labor force, without a significant change of common production practice.

Nevertheless, it is needed to discuss some additional issues in order to reach a final decision on the sweet corn production. Some of the factors requiring further discussion are: capability of the market to absorb sweet corn quantities produced at the farm, quality of the sweet corn, premises available to store sweet corn (if the entire production cannot be sold immediately after harvest), etc. Therefore, the key challenge is how to improve and strengthen connections between sweet corn producers and processors.

There are some issues concerning the sweet corn irrigation, as well. It is impossible (in Serbian agro-ecological conditions) to produce sweet corn of satisfying quality without irrigation. Therefore, presence or absence of the irrigation system on the farm could be of the utmost importance for economic effects of the sweet corn production. If irrigation system is not already present on the farm, additional investments would increase fixed costs and possibly compromise an overall economic performance.

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ИЗВЕШТАЈ О СТАЊУ У ПОЉОПРИВРЕДИ У РЕПУБЛИЦИ СРБИЈИ У 2021. ГОДИНИ, КЊИГА I Хоризонтални преглед, Република Србија Министарство пољопривреде, шумарства и водопривреде, 2022.

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AFTER ACTION REVIEW AS A TOOL FOR IMPLEMENTATION OF THE KNOWLEDGE MANAGEMENT PROGRAM

Abstract

The lack of practical tools enabling the effective management of knowledge flows usually leads to business failures. It is common for organizations to face challenges, but it is also quite reasonable to expect that they will encounter the same problems unless the time is invested in problem analysis and lessons learned are developed. This paper investigates the capabilities of the After-Action Review, a tool designed to systematically manage the knowledge gained from experience as an extremely valuable source. We believe that the knowledge derived from experience becomes a compass that helps organizations understand everything that has happened, anticipate the challenges ahead and prepare their response. Literature review confirmed that After Action Review tool provides support to organizations in their efforts to transform their strategy and make it knowledge oriented. A primary research conducted as part of this paper confirmed that capturing, documenting, and sharing of lessons learned plays a significant role in identifying learning potentials and using experience, while maintaining the focus towards the future.

Key words: *Knowledge management, Knowledge transfer, After Action Review, Learning Organization*

JEL classification: *D83, L29. M11, O31*

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AFTER ACTION REVIEW КАО АЛАТ ЗА ИМПЛЕМЕНТАЦИЈУ ПРОГРАМА МЕНАЏМЕНТА ЗНАЊА

Апстракт

Непостојање практичних алата који омогућавају ефикасно управљање токовима знања евидентно резултује појавом пословних неуспеха. Сасвим је уобичајено да се организације сусрећу са разним изазовима, али је исто тако сасвим оправдано очекивати да ће се са истим проблемима сусрести уколико се не инвестира време у анализу истих и науче лекције. У раду су представљене могућности Афтер Ацтион Ревиеw алата, осмишљеног с циљем да се на систематичан начин управља знањем које је стечено из изузетно драгоценог извора, а то је искуство. Верујемо да знање које доводимо у везу са искуством постаје компас који организацијама помаже да разумеју све оно што се већ десило, да предвиде изазове који су испред њих и спреме свој одговор на исте. Детаљни преглед литературе потврђује ставове да Афтер Ацтион Ревиеw алат обезбеђује подршку организацијама у настојању да трансформису своју стратегију, на начин да иста буде окренута ка знању као вредности. Примарно истраживање спроведено у оквиру овог рада потврдило је да прикупљање, документовање и размена научених лекција игра игра значајну улогу у идентификовању потенцијала за учење, користећи се прошлим искуствима, а задржавајући фокус ка будућности.

Кључне речи: Менаџмент знања, Токови знања, Афтер Ацтион Ревиеw, Организационо учење

Introduction

As Albert Einstein once said: "We cannot solve the problem by thinking the same way we thought when we created it." Following this in a business environment, there is the question: Why do organizations learn? They learn because a challenging and dynamic market leaves a little choice and force the organizations to change, adapt and always be ready to accept something new and different. One of the superior values for an organization is the knowledge it possesses, and its ability to apply this knowledge to its business decision making processes (Đorđević Boljanović and Stanković, 2012; Marčetić et al. 2020; Petrov et al. 2020). One of the most actual challenges in the knowledge economy, which preoccupies the attention of authors is the question: How do organizations learn? As the awareness of knowledge as the most valuable resource is increasing, the analysis of tools from the knowledge management program is becoming more relevant (Massingham, 2014; Cerchione and Esposito, 2017).

Only the most experienced sailors sail the most turbulent seas. In modern business it is rare to find an excellent strategy, product or service without initial successes, failures and knowledge learned. Experience is an extremely powerful source of the organizational knowledge. However, unless there is a system in place that enables some knowledge to be discovered, transferred, disseminated, enriched and preserved, it will hardly get a chance to find a useful purpose.

If there is anything more harmful than a mistake, it is certainly a repeated mistake (Ackoff, 2016). The importance of learning from the experience can be depicted by the challenge that Boeing company faced launching its 737 and 747 aircrafts. Fires, fuel leaks and mechanical problems are certainly not something that has been associated with Boeing. However, mistakes were made also by market leaders and the most experienced ones. The company soon formed a team which compared the development of 737 and 747 aircrafts to 707 and 727 aircrafts, which were the most profitable at the time. The result of three year's long work was a special manual with 'lessons learned' to guide the development of 757 and 767 aircrafts. The 757 and 767 aircrafts have been launched with the least errors and achieved the greatest success in Boeing history (Baum, Dahlin, 2007).

After Action Review tool has been developed as one of the most effective tools to help organizations discover the knowledge from the most valuable source - experience. The tool was first introduced back in 1970 and was developed for the needs of the military, with the aim of systematizing learning and observing each activity as an opportunity to learn something new (Dunphy, 1996). After Action Review is a tool that can substantially create the ideal basis for successful implementation of the knowledge management programs in different areas, from profit oriented organizations to policy making sector (Savoia, Agboola, and Biddinger, 2012; Parker, 2020). First of all, it is a tool that aims to shape the organizational culture and provide a set of values that will have a strong message: our strength is knowledge.

A common question encountered in practice relates to whether the After-Action Review is a report, a meeting, or some form of evaluation. We would rather agree with the view that this is a process that certainly involves a meeting, which follows a certain type of evaluation, and results in some type of report. However, the form itself is not of crucial importance, as it is a purpose. That is why we emphasize the substantial value of the mentioned tool, as a great opportunity to create a learning organization, an organization that understands the challenge of putting knowledge in the service of development. That challenge has probably never been greater. Let us take, for example, the number of consulting companies in various fields, from financial consulting, marketing, risk assessment to the information technology. Consulting is present in almost all areas of business, and the reason is in particular the fact that the knowledge becomes significant, and the organizations are willing to allocate significant financial resources for the purposes of acquiring specific knowledge.

The structure of the paper is organized as follows. The first part describes factors and conditions required for the successful implementation of the After-Action Review. This is followed by the purpose and the application of the tool. Third part includes the presentation and illustration of the After-Action Review tool model. To explore potential benefits, a primary research was conducted, and the results are presented in part four. The last two parts of the paper describe the process of organizing After Action Review meeting and highlights the importance of learning from success and failure.

Prerequisites for implementing the After-Action Review tool

To successfully implement After Action Review tool, it is first and foremost necessary for the organization to be aware of all the potential benefits. If we had to enlist the changes that are necessary before the implementation of the tool itself, it would look as follows:

1. Initiative - it is necessary to recognize the need for this tool, and that need should be clearly communicated and promoted throughout the organization. An initiative often occurs after a particular problem or omission is identified, which in the context of knowledge management, may be the constant recurrence of mistakes caused by poor collaboration within the organization. Organizations should be proactive in implementing the tools of the knowledge management program, as it is one of the pillars of the organizations' success.
2. Leadership - as in all domains of business, implementation of something new often takes time and a lot of efforts and dedication. If the question 'Who?' rather than 'Why?' is asked, new knowledge will not be generated, and new ideas and creativity will not be developed. As pointed out by Mayo (1998) and Riege (2007), managers who implement the change in their team, play a major role and should act as leaders in implementation, not just the tool mentioned above, but anything that has elements of the new and the unknown. Resistance is expected because anything new at the beginning can be observed as uneasy. We generally accept with discomfort what we do not understand and what is unknown to us. That is why it is necessary, before the implementation itself, that everyone realizes the purpose and all the positive effects that can be expected after the implementation of the After-Action Review tool.
3. Belief - The moment in which the implementation of the After-Action Review tool gets its purpose, and moment in which everyone creates a vision of their role in the process, is the moment in which the organization is ready to move on. What really matters most is the awareness of the common goal and the sense of belonging to the team and the organization, as only this can be a good enough driver for all good initiatives within the organization.
4. The presence of the above-mentioned items is crucial when it comes to implementing this tool and any other. We can observe that the changes do not originate from business processes or procedures, but rather from a person or a team in whose mental part accepts the change or not.

There are several different views when it comes to the most desirable approach for the implementation of a particular change. In the context of the implementation of the knowledge management tool, author Zimmerman (1995) emphasizes that employees are the key to successful implementation, and it is necessary put them in position to actively participate in definition of the process in which the tool will be implemented. This further contributes to the point shared by Robbins (1990) and Dunphy (1996), who state that everything new must be planned, and not spontaneously implemented.

The essence of After-Action Review tool

To understand the After-Action Review tool, it is initially important to emphasize the idea that underlies development of the tool: Spending time analyzing daily activities or projects, those less and more important, does not mean time wasting, but time investing. Why is the time we use to analyze past events considered the investment? Time used for the analysis involves talking, exchanging opinions, attitudes, and as such provides the

opportunity to gain valuable knowledge, which is later materialized in profit and value. This view was confirmed by the famous scientist Albert Einstein, saying, "If I had 1 hour to solve the problem, I would spend 55 minutes analyzing the problem, and 5 minutes to think about the solution". Everyday business activities involve problems, bad decisions, and mistakes, and if we do not dedicate time to analyze the causes of their occurrence, we make the decision to repeat them. Any failure is an opportunity for an organization to learn something new, about its strategy, processes, employees, competitors, and customers, and not just a threat and an indicator of weakness.

Innovation is a value that is directly related to organizational knowledge and thus can be the outcome of an analysis of business success and failure. Parlby and Taylor (2000) state that the knowledge management is an extremely important element in supporting the development of innovations, ideas, and the ability of the organization to 'think'. Whether organization has launched an attractive product, a new service, or implemented a new strategy, it is important to keep in mind that a competitive market requires an innovative approach 365 days a year.

Very often, big ideas are generated from the simplest questions which inspire curiosity, such as: 'What could we do better?', 'What contributed to the success?', 'What are the weak points of our project?' And similar. Often, big mistakes are the biggest and most important lessons that organizations can take, and thanks to which they achieve even greater results (for example, Coca-Cola New Coke from 1985, Apple-Lisa from 1983). The After-Action Review tool promotes an organizational culture that looks at mistakes and sees the room for progress, whether through success or failure. It can be used as a single tool or in combination with other approaches (Aguinis, Ramani and Cascio, 2020).

The After-Action Review Tool Model

The After-Action Review tool is designed to preserve in a systematic and simple way the knowledge gained through the past experiences. The purpose of the implementation of this tool is to create and document new knowledge through a specific analysis of activities, events or projects in which employees actively participated.

Thus, the subject of analysis may be a project of greater importance, such as the launch of a new product on the market. It is also not common and advisable to analyze the daily business activities, such as sales team coordination, team efficiency, performance, teleshopping activities and similar with After Action Review tools. However, the subject of analysis could be a project that required months of planning, but also an activity that lasted only 2 minutes (for example, a sales discussion). The implementation of the tool is most often referred to in the context of project management in the literature, where it is referred to as Post Project Review. A model illustrating the tool implementation is shown in Figure 1.

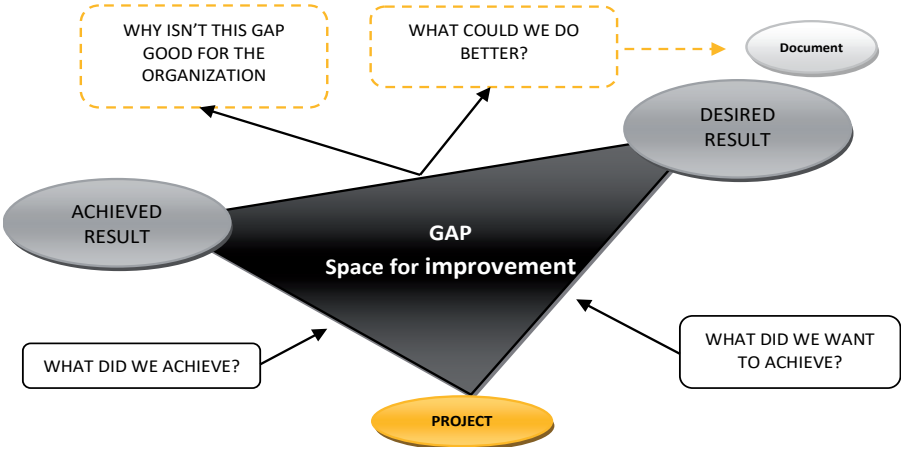

Figure 1 After Action Review Tool Model

After Action Review tool involves organizing a meeting and the analysis upon nearly completed project or activity. The meeting is attended by everyone who directly (sometimes indirectly) participated in the project or activity, usually led by the facilitator or the organizer of the meeting. The facilitator determines the timeframe, venue and topic of the meeting and informs the participants in a timely manner accordingly. Before analyzing the project or activity itself, the facilitator presents a set of rules that everyone is bound to follow (not required to repeat every time, except when everyone is not familiar with the rules).

As shown in the model (Figure 1), the task is to determine the deviation of what has been realized from what has been the expected, and to come up with the new conclusions, ideas, and knowledge by asking 3 key questions:

1. What is it that we wanted to achieve with the project/activity?
   - Determine whether all employees were aware of the project/activity objective and whether they had a clear picture of their role in the implementation.
   - Determine whether, in the opinion of the employees, the necessary resources were allocated in time, whether there was support from the managers, whether the planning process could have been more thorough, etc.

2. What have we achieved, what results have we accomplished?
   - Determine the result the team has achieved while emphasizing success.
   - Motivate the team so they understand the result accomplished, regardless of deviation from the desired, which is a product of the dedicated teamwork.
   - Determine how the process was going on.

3. What caused this deviation (gap)?
   - Determine the deviation from the desired result (target).
   - Determine the cause of the deviation by sending the following questions: what we performed right, what could have we done better and what difficulties we encounter during the process?

4. What can we do in a different way the second time, what have we learned?
   - Determine what is the key - what have we learned from this project/activity?
   - Brainstorm ideas and suggestions for improving processes related to project/activity, team relationships.
   - Identify and document lessons learned and knowledge.

The basic purpose of the process is to identify the potential for learning, space for advancement, and therefore use past experiences, while maintaining a focus on the future. What is very important is the continuity in implementation of the After-Action Review tool, because only in this way the values that this tool supports can be accepted and become part of the organizational culture. Some of the numerous benefits of implementation of the After-Action Review tool are:

- Creating a Learning Organization.
- Providing basis for innovation and continuous process improvement.
- Shaping organizational culture around knowledge.
- Discovering, sharing, and preserving tacit knowledge.
- Creating a sense of team and team values.
- Improving team relationships, managing teams effectively.
- Documenting and storing key knowledge and lessons.
- Basis for creating and evaluating action plans.

Research on After-Action Review Application

In order to quantify and measure the above-mentioned benefits of After-Action Review tool, a primary research was concluded among the students of Singidunum University in Belgrade. The primary goal of this short experiment was to determine the general efficiency of lessons learned based on After Action Review tool in teaching process.

A simulation project, which is part of a regular exercises in Project Management course, was given to a total number of 95 students. The simulation software deals with schedule and cost related inputs, and for each student it provides an overall score based on several variables, using a normalized scale 10-100. After their first simulation the average score for all 95 students was 65.43 points, with standard deviation of 16.32. Once they completed their first simulation run, students were divided in two groups (41 and 54 students).

The first group of students (41) had an After-Action Review meeting where lessons learned were defined, documented, and exchanged between participants. The second group of students (54) was used as a control group and did not have any interaction between each other before taking a second try. These were relying solely on their individual experience gained in their first try. For the second run a similar project simulation was given to all students and their performance was measured once again. Table 1. provides the descriptive statistics of the results gained from the second run for both data sets. The average score for the group of students that had AAR meeting increased to 82.80 in comparison to the average score of the control group of 68.35.

Table 1. Descriptive statistics of both groups

	ARR Group	*Control Group*
Mean	82.80487805	68.35185185
Standard Error	1.906413921	1.87617327
Median	85	67.5
Standard Deviation	12.20700519	13.78700154
Range	47	45
Minimum	53	47
Maximum	100	92
Count	41	54

Source: Authors calculation

To examine the significance of the difference between the mean performance values of both groups obtained results were tested using t-test statistics. Before using t-test statistics, normality test (Shapiro-Wilk test) and test of equality of variances (F-test) were executed. The main statistical analysis confirmed that there is a significant difference in performance of two groups. The results of t-test provided in Table 2, confirmed that there is a statistically significant difference ($p=0.000<0.05$) in the mean scores of students that used after-action review (82.8) and the control group of students (68.35). Generally, students that participated in lessons learned session recorded significant improvement in relation to the first simulation try.

Table 2. Two-sample t-test assuming equal variances

	ARR Group	*Control Group*
Mean	82.80487805	68.35185185
Variance	149.0109756	190.0814116
Observations	41	54
Hypothesized Mean Difference	0	
df	93	
t Stat	5.313688863	
P(T<=t) two-tail	7.3232E-07	
t Critical two-tail	1.985801814	

Source: Authors calculation

Primary research illustrated the value of using lessons learned, knowledge definition, information exchange, and proper documentation. As one of the key preconditions of using the acquired knowledge students defined an adequate presentation, documentation, and structure (Keiser and Arthur, 2020). Only this way a tacit knowledge that was acquired within the first simulation by every single student could be transformed to a more explicit form and used by other students. This certainly implies a good organization of the After-Action Review meeting which will be discussed in more detail within the following section.

Analysis and organization of the After-Action Review meeting

Before implementing the After-Action Review tool, it is necessary to define and adopt the rules that are crucial and a prerequisite for the success of this process. Research shows that behavior in meetings significantly impacts meeting outcomes (Allen, 2010, 2014; Kauffeld and Lehmann-Willenbrock, 2012; Scott ,2013). Regardless of whether the subject is one of the organization's key projects or an activity at the operational level, an identical set of rules applies:

1. All employees involved in the project or activity are invited to participate in the After-Action Review analysis.
2. All participants are encouraged to actively participate in the analysis. They should be objective, creative and open to new ideas.
3. There is no wrong opinion, attitude, and personal attachment. Everyone is free to express their views.
4. It is not allowed to criticize others or to make mistakes in the context of individual responsibility.
5. The goal is to learn something new, not to define who is to blame.
6. The subject of the analysis is the team, not the individual.

The analysis of the subject matter of the After-Action Review meeting should be approached with objectivity and an effort to observe the project or activity from multiple angles, giving everyone an opportunity to present their opinion and point of view. Participation in conversation and decision making relates to increased levels of engagement (Yoerger, 2015). Also, it is of great importance for all employees to feel free to express the attitude that is different from majority, which can lead to an innovative approach.

The analysis includes a structured meeting, where all employees who directly participated in the activity, event or project that is the subject of the analysis are invited. When it comes to organizing a After Action Review meeting, the following dilemmas can arise:

– How often to organize a meeting?

Formal meetings are approached somehow more profoundly in terms of planning and implementation because the key strategic issues, important projects and decisions are usually the subject of analysis. Therefore, formal meetings of this type are much less frequently organized. On the other hand, informal meetings where the subject matter is generally operational usually allows for daily or weekly analyzes. Basically, there is no single and common rule (Miami University, 2020). It is recommended that the organizations rely on their needs and adjust the meeting plan. Ideally, organizations should organize the After-Action Review meeting daily, with the aim to analyze the key activities, adopt new conclusions, knowledge and identify the areas where improvements are possible and desirable.

No matter how innovative presented ideas are, meetings are an opportunity for teams to connect, motivate and serve as reminder of a common mission and vision. It seems logical that revolutionary changes do not occur every day, but incremental ones will certainly showcase their development potential. When the approach to business becomes multidimensional, success is not only related to the increased productivity, efficiency, and planning. The focus is rather on a need to develop employees' awareness and commitment to a common goal

(Komazec, 2012). Finally, we can conclude that every meeting of this type is valuable and unique opportunity to create and maintain a sense of organizational value.

– What is the optimal time for the meeting?

The time required for an After-Action Review meeting depends primarily on the subject of the analysis. If it is a formal meeting, analysis itself will be deeper and more time consuming. Of course, this does not mean that meetings of a more informal type are characterized by superficiality.

– Is it advisable for the meeting to be attended by a facilitator?

A meeting facilitator or organizer ensures that the time allocated for the meeting is well-invested. The role of the facilitator is to maintain focus on the subject matter of the analysis, while remaining completely neutral. The facilitator must have a 'soft skill' in terms of communication management and human relations. Resistance and discomfort are expected to occur as employees are encouraged to discuss objectively pros and cons related to the subject matter of the analysis. This is where the key role of the facilitator becomes significant, for both those who 'talk too much' and those who need time to adjust. If needed the facilitator must be skilled in preventing and managing conflicts.

The importance of learning from success and failure

When it comes to implementing the After-Action Review tool, there are certain expectations, in terms of the goals that organizations want to achieve, values they want to adopt and changes they want to accept. Therefore, organizations expect a certain result from the implementation process. The existing literature on the effects of After-Action Review tool is not unanimous. While Yourdon (1998) strongly believes that the tool rarely succeeds in fulfilling its purpose, Highsmith (2009) believes that it can contribute to the success of any future project in the organization.

Some research tried to prove that learning from success has a more significant effect than learning from failure (Baum and Dahlin, 2007), while there are also analyzes that show the opposite (Li and Rajagopalan, 1997; Madsen and Desai, 2010). However, it is certain that past successes, as well as failures can serve as a landmark for all future activities of the organization. The value is related to the possibility to point out and record valuable lessons that will allow good practices to be repeated, and those not so bright to be improved.

According to Bill Gates, celebrating success is fine, but learning from mistakes and failure is much more meaningful. Success and failure provide equal opportunities for learning, although learning from failure is a somewhat unpopular approach. For the implementation of the After-Action Review tool, both learning sources are equally important, as the whole mechanism and model relies upon the analysis of past events. Of course, there is no room for criticism.

Very often, organizations repeat mistakes, failures, and the express the syndrome that Schindler and Eppler (2003) defined as project amnesia. Establishing a system where everything learned will be documented and available in form of a knowledge base is not an easy task. The need to have a system for documenting this type of knowledge is emphasized,

as it comes from the experience, not only of individuals, but of teams who work together on projects or activities. However, it is advisable to implement a documentation system only after it has started implementing some of the tools of the knowledge management program.

Conclusion

One of the biggest challenges of contemporary organizations is the conversion of knowledge, as an intangible, imaginary, and hard-to-acquire resource, into the intellectual property of an organization. Intellectual property and knowledge have become more valuable than any kind of material and perceived. Knowledge flow management is a process that many authors in the field of management are trying to unravel, so we believe that this paper has makes additional step in that direction and provides a valuable contribution.

With the aim of creating a knowledge-based strategy, paper first described the environment that is necessary to implement the tools of a knowledge management program. As a tool that fully supports all processes related to knowledge flows in an organization, the paper defined possible implementation model of the After-Action Review tool. The value of the lessons learned, and After-Action Review was tested in research conducted among students, and the obtained results quantify and clearly depicts how significant is to collect, document, structure and disseminate acquired knowledge.

At the end question was also raised - whether organizations learn better from success or failure and which knowledge is more valuable for future performance. With an adequate approach, learning from success and learning from failure are equally important, although learning from failure is considered a less 'popular' process. As the first reason for this standpoint, paper identified organizational culture that fails to recognize mistakes as a development potential, but rather as something that necessarily relates to responsibility of an individual or group. In such cases, the knowledge that remains behind such omission stays uncaptured, and very difficult to access.

Therefore, one of the key goals of modern organizations is creation of environment capable of implementing knowledge management program and application of appropriate tools. The first step in this process includes recognition of potential advantages, which is followed by a challenge of finding the best practice for the implementation of such a program and accompanying tools. We hope that following research will provide organizations and practitioners with additional information and guidelines, that will help them to shape their organizational culture around knowledge.

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WEBSITE PROMOTION OF DENTAL INSTITUTIONS: AN EXAMPLE OF SERBIA AS A DENTAL TOURISM DESTINATION

Abstract

Modern means of tourism promotion have become difficult to imagine without the Internet usage. As one of the oldest forms of presentation on the Internet, a website still plays an important role that should not be neglected. In this paper, website is considered as the basis for establishing better promotional activities of the existing dental institutions in health tourism, or dental tourism, to be more specific. Health tourism is one of the potentials for tourism development in the Republic of Serbia, although not exploited in its full potential. The aim of this paper is to contribute to the dental tourism institutions marketing management practice overview in Serbia, indicating the situation in online presence of health institutions highlighted by the Ministry of Health of the Republic of Serbia. Forty dental institutions were analysed from the point of the official website existence as well as their structural and content characteristics.

Key words: *health tourism, dental tourism, online promotion, website, the Republic of Serbia*

JEL classification: *M31, Z33*

ВЕБ-САЈТ ПРОМОЦИЈА СТОМАТОЛОШКИХ УСТАНОВА: ПРИМЕР СРБИЈЕ КАО ДЕСТИНАЦИЈЕ ДЕНТАЛНОГ ТУРИЗМА

Апстракт

Савремени начини туристичке промоције постали су готово незамисливи без употребе Интернета. Веб-сајт као један од најстаријих видова презентација на Интернету и даље има значајну улогу коју не треба занемарити. Веб-

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сајт се у овом раду посматра као основ за остваривање бољих промотивних активности постојећих стоматолошких установа које се баве здравственим туризмом, тј. прецизније денталним туризмом. Здравствени туризам је један од потенцијала за развој туризма у Републици Србији, али тај потенцијал тренутно није у довољној мери искоришћен. Циљ овог рада је да да допринос прегледу праксе маркетинг менаџмента установа денталног туризма у Србији кроз указивање на стање онлајн присутности здравствених установа које су истакнуте од стране Министарства здравља Републике Србије. Четрдесет стоматолошких установа је анализирано са становишта постојања званичног веб-сајта као и структурних и садржајних карактеристика веб-сајта.

Кључне речи: здравствени туризам, дентални туризам, онлајн промоција, веб-сајт, Република Србија

Introduction

The medical form of tourism records a growing tendency, and this is confirmed by the transparent papers on the subject. Habibi et al (2021) established the fact that the papers on medical tourism recorded a considerable increase from 2006 to 2015. According to Zhong et al (2021), the increase in the number of papers on medical, health and wellness tourism has become relevant especially since 2010 (74.9 % of all the papers were published from 2010 to 2020).

The Ministry of Health and the National Tourism Organisation of Serbia emphasises dental services, plastic and reconstructive surgery within the field of health tourism (the Ministry of Health of the Republic of Serbia, n.d.c; Pavlović, Ikić, 2018). Many authors perceive dental tourism as one of the most interesting areas in medical tourism in Serbia (Spasojević, Šušić, 2011; Milicevic et al., 2013; Mihailović et al., 2016; Ignjatijević & Čavlin, 2016; Dašić, 2018; Ljubisavljević & Živanović, 2019). On the other hand, medical tourism marketing, dental tourism included, is not at a very high level (Ignjatijević & Čavlin, 2016; Ljubisavljević & Živanović, 2019).

"The development of digital technologies has fundamentally changed all segments of the functioning of human societies and ways of doing business in all activities" (Krivokuća et al. 2021). They also "provide better opportunities for businesses to establish distinctive strategic positioning" (Angeloska-Dichovska & Petkovska Mirchevska, 2017). The significance of the Internet in promotional activities of health institutions is obvious, based on the fact that 36% of foreign citizens using medical services in Serbia stated Internet as the source of information when deciding on health services usage in Serbia (Ignjatijević et al., 2017).

So far, no paper has been found referring to the analysis of online promotional activities in dental institutions from the territory of the Republic of Serbia, nor the dental tourism websites. Thus, the subject of this paper is the analysis of dental institutions websites in the Republic of Serbia dealing with dental tourism. The aim of this paper is to contribute to the marketing management practice overview in dental tourism institutions in Serbia, pointing out the situation in online presence of medical institutions highlighted by the Ministry of Health of the Republic of Serbia (n.d.a). The following tasks ensue from this aim: (1) establishing the

existence of the official websites in the institutions analysed and (2) establishing structural and content characteristics of the existing websites in the analysed institutions. The significance of this paper ensues from the first overview of website characteristics in the dental tourism institutions in the Republic of Serbia.

Research methodology

The criteria for dental tourism institutions website evaluation in the Republic of Serbia have been determined as follows. First, the criteria used in the papers by Martinovic et al. (2010), Poorterman et al. (2014), Constantin & Kavoura (2016), Jurišić (2018), Chongthanavanit & Kheokao (2019) (based on Moghavvemi et al. (2017), which is based on Maifredi et al. (2010)), Kopmaz et al. (2019) (based on Mira et al. (2006) and Llinás et al. (2008)) and Constantin & Kavoura (2019) were selected, as well as the items from the "Code of ethics for dentists for electronic commerce in the EU" (Council of European Dentists, 2017). Since we speak of a large number of criteria, the selection of the most suitable ones followed (in the authors' opinions), as well as their modification with the aim of preparing as suitable evaluation of websites as possible. In accordance with the topic of this paper, the importance of health (including dental) tourism is especially emphasized. The total of 70 criteria was selected, grouped into 12 categories to provide transparency (Tables 1-12).

The website analysis was conducted in August 2021. The evaluation of the presence of the chosen criteria was conducted in the selection of one of the evaluation possibilities – Exists / Yes, Does Not Exist / No. This method was frequently used in the above stated papers. Each author evaluated the websites individually, so that the authors' evaluation of each criterion and website was compared afterwards in order to perform a joint check and decide on the final evaluation in case of disparity. The same principle of website evaluation was applied in case of Ćuruvija et al. (2021), with the aim of obtaining the most accurate results.

The sample for dental tourism institutions was established in three steps. The first one implies establishing the preliminary list of dental tourism institutions on the basis of the information available on the Ministry of Health of the Republic of Serbia website (n.d.a) (44 institutions). The second one refers to the accurate identification of the dental tourism institutions according to the information available on the Ministry of Health of the Republic of Serbia website, data search of the Serbian Business Registers Agency (n.d.) and the Internet. It also includes establishing the status of business active institutions (42 institutions). The third step implies establishing identified business active institutions in dental tourism with active/functional websites (40 institutions).

When it comes to step 3, it is necessary to highlight that there was no attempt at establishing other potential (alternative) dental institutions websites (other than the ones listed by the Ministry). The reason is that a list of dental tourism institutions already exists on the Ministry of Health of the Republic of Serbia website as a form of joint promotion. According to the data of the Ministry of Health of the Republic of Serbia, 40 out of 44 institutions met the required conditions (90.91%). We need to highlight once again that one of the general requirements for involvement with the development of dental tourism programme is "the existence of the appropriate website presentation

according to the regulations governing health advertising" (the Ministry of Health of the Republic of Serbia, n.d.b). These information point to the conclusion that the Ministry of Health website in dental tourism should be updated (accurate name, functional website address), as well as completed with additional data (such as the address of the institution).

Research results and Discussion

Table 1 provides an overview of criteria realisation related to general information in a dental institution. "General information on a dental institution" realisation of five criteria (62.50%) is present in over a half of the website in the analysis. The name of the dental institution is the only one present in all the websites. The average criteria representation percentage is 68.43%. It is obvious that logo is much more present than slogan – with the worst position among the criteria.

Table 1: General information on a dental institution

Criteria	No.	%
Name of the dental institution	40	100.00
Dental specialties (areas of excellence) and number of dental offices / separated wards (if any)	39	97.50
Presence of logo	38	95.00
History of the dental office (eg year of construction)	32	80.00
Working hours	29	72.50
Licenses and information about registration with address and other contact details of competent authorities or links to their websites; including the existence of a certificates relating to the practice,	16	40.00
Statement of purpose (mission and/or vision of the dental institution)	14	35.00
Presence of slogan	11	27.50

Source: the authors' research

Table 2 provides an overview of criteria realisation related to health tourism (dental tourism included). It is interesting that less than a half of the analysed subjects provide information on health or dental tourism on their websites, although these dental institutions possess the Ministry of Health of the Republic of Serbia certificate, therefore they are included in the health tourism development programme in Serbia. The recommendation would be to include this type of information in the website content (separate section would be the best) because they provide the information to potential patients-tourists, and reflect true commitment to tourism, promoting tourist destination as well as other factors in tourist offer.

Table 2: Health tourism (dental tourism included)

Criteria	No.	%
Health tourism (dental tourism included)	19	47.50

Source: the authors' research

Table 3 provides criteria realisation related to the rules governing dental practice. All four criteria related to the rules governing dental practice are met in a very low percentage of the analysed websites. This is best reflected in the information that the average criteria representation is only 6.90%, while the presence of one of the criteria (manner of filing a complaint) is noticed in none of the websites. As we can see, not even *COVID-19* pandemics (in terms of protection measures) could affect the increase in information and regulation presence necessary to observe during patient admission, treatment and discharge, as well as those related to the person accompanying the patient.

Table 3: The rules governing dental practice

Criteria	No.	%
Information and rules to be followed when admitting a patient, dental intervention and discharging patient, as well as the information and rules to be followed by people which are accompanied by the patient, visiting the patient etc.	5	12.50
Patient privacy information	4	10.00
The professional rules governing dental practice or address and other contact details of competent authorities dealing with the above rules	2	5.00
Manner of filing a complaint	0	0.00

Source: the authors' research

Table 4 shows an overview of criteria realisation related to the information on services. The criteria related to the information on services are present on most websites to a large extent. This is supported by the fact that 3 out of 4 criteria (75%) are present on most of the analysed websites, and the average criteria representation percent is 70.62%.

If we compare the presence of pictures and video materials on dental and other services, we can observe that pictures are mainly present. The videos matching the descriptions could be observed in about a quarter of the analysed websites. For example, in case of two websites there are pictures before and after the treatment, where you can compare the tooth by moving the cursor.

The suggestion in this case is that dental institutions should add some information about whether they provide services for patients even after the working hours. The information could be presented as a note (for example, within the information on working hours), or a specific type of services (so called emergencies).

Table 4: Information on services

Criteria	No.	%
List of dental and/or other treatments / services	39	97.50
Description of dental and/or other treatments (materials, equipment...)	35	87.50
Image (photo/video) of dental and/or other treatments (before-after)	28	70.00
Information services available outside opening hours (emergency)	11	27.50

Source: the authors' research

Table 5 provides an overview of criteria realisation related to the information about prices and method of payment. None of the three criteria related to the information about the prices and method of payment is present in most of the analysed websites. It is interesting that the realisation of these criteria is almost balanced, with the average realisation of 42.50%. We should also emphasise that the existence of the information about the cooperation with certain insurance companies is especially important for foreign citizens, as well as the possibilities of refunds afterwards.

When it comes to price list availability, we should emphasise that three interesting cases were noticed (not included in the previous table). One of the cases asked for an email in order to receive pro forma invoice. In the other case, it was necessary to fill in the form for price list download. Both of these cases are examples of non-transparent price list display. The third case provided the price list only for education area (eg courses, study visit, etc), but not for dental services.

Another aspect of price list observation is the currency (note – one website could provide multilingual options). Most of the cases offer the price list in euros (9), less often in dinars (4). In cases of two websites the prices are in both euros and dinars. It is interesting that in one of the websites the prices are in euros and points, while in the other one they are in dinars and points, and it may be rather confusing.

Table 5: Information about prices and method of payment

Criteria	No.	%
Information about guarantees and insurance policies	18	45.00
Availability of price list on website	17	42.50
Information about payment options are available (cash, credit cards...)	16	40.00

Source: the authors' research

Table 6 provides an overview of criteria realisation related to the information about location and accessibility. Most criteria (75%) related to the information about location and accessibility are not present in majority of the analysed websites. The information about address is available on all websites, integrated maps are highly represented leading to a higher average of criteria representation in percentages (43.44%), higher than it would be without these two items. The information about how to reach the practice, possibility of reaching a dental institution through cooperation with travel agents or hotels, pictures/videos, location description as well the information about car parks are the information particularly important for foreign tourists – there is a lack of the aforementioned information. For example, the reason for the absence of the information about possible cooperation with travel agents and hotels could be no cooperation, as well as no promotion of the existing cooperation on the website.

Comparing the existing pictures and videos/virtual tours, we reach the conclusion that there are only pictures on most websites (7), only videos/virtual tours (3) or both pictures and videos/virtual tours (3) on a few websites.

Table 6: The information about location and accessibility

Criteria	No.	%
The address of the practice is available	40	100.00
Presence of integrated maps (eg GoogleMaps)	38	95.00
Description how to reach dental institution (eg mode of transport)	14	35.00
Possibilities of getting to the dental institution in cooperation / partnership with travel agents or hotels	14	35.00
Images (photo/video) of the location and position of the dental institution, the institution surroundings etc.	13	32.50
Textual description of the location	12	30.00
Information about parking possibilities on the site	6	15.00
Information about persons with disabilities (eg. wheelchair) accessibility	2	5.00

Source: the authors' research

Table 7 provides an overview of criteria realisation related to the information about the physical environment inside a dental institution. Only two of the criteria related to the information about physical environment inside a dental institution are realised on more than a half of the websites, while one of the criteria (textual description of the admission/reception area) is not represented in any of the websites. The average criteria representation in the aforementioned category is 45.50%.

It is interesting that practice/admission/reception area pictures and videos criteria are much more present on most websites, rather than the criteria related to textual descriptions. Most of the websites (23) contain only pictures, out of the total number with available images of admission/reception area (30). There are a few with a combination of pictures and videos (5). The least present are videos/virtual tours (2). In the total of websites with dental practice images available (36), most contain only pictures (27), while a small number contain a combination of pictures and videos/virtual tours.

Table 7: The information about the physical environment inside a dental institution

Criteria	No.	%
Image (photo/video) of the dental office	36	90.00
Image (photo/video) of the admission/reception area	30	75.00
General overview of facilities	16	40.00
General overview (virtual tour / video)	9	22.50
Textual description of the admission/reception area	0	0.00

Source: the authors' research

Table 8 provides an overview of criteria realisation related to the information about staff. The criteria included in the category of information about staff are significantly present on the analysed websites (4 criteria, ie, 57.14% present on most of the websites). The average representation is 58.57%. The list of staff is in a high position, as well as the criteria related to the dentists employed (except foreign languages and licence

information). The lists of staff are better positioned compared to the staff photos, indicating that dental institutions pay more attention to the textual descriptions. Poor representation of information about languages staff use in communication with patients (possibility of interpreter included) is a disadvantage for foreign tourists who cannot speak Serbian well, and makes it difficult for them to choose the appropriate practice. On the other hand, since dentists are people with higher education, we can assume that they should master the basics of at least one foreign language.

Table 8: The information on staff

Criteria	No.	%
List of staff (dentists)	37	92.50
Qualification(s) / professional titles / information about trainings / programs completed by each dentist	33	82.50
List of other staff (job description)	28	70.00
Photo of the employee (dentists)	27	67.50
Photo of other employees	20	50.00
Languages staff use in communication with patients (and/or possibility of interpreter included)	12	30.00
Licenses and information about registration of dentists with address and other contact details of competent authorities or links to their websites; including the existence of a certificates relating to the dentists	7	17.50

Source: the authors' research

Table 9 provides an overview of criteria realisation related to the information on contact and interaction possibility.

Table 9: Information on contact and interaction possibility

Criteria	No.	%
Phone number / fax	40	100.00
E-mail address	37	92.50
Possibility to contact the dental institution via the website (QA option)	30	75.00
Links to online forums for patient feedback, social networks, blogs etc.	29	72.50
Online appointment system is available (examination / therapy / consultation)	21	52.50
FAQ (frequently asked questions)	17	42.50
Possibility to write comments / reviews / testimonials and guestbooks	6	15.00
Possibility to add files on the contact	6	15.00
Possibility to subscribe to the newsletter	5	12.50

Source: the authors' research

Most of the criteria in the category information on contact and interaction possibility are present on most of the analysed websites (55.56%), and therefore the average criteria representation percentage is 53.06%. It is clear from the available data that dental practices are mainly focused on providing the information such as phone number/fax and email addresses.

When it comes to phone number information, it is necessary to emphasise that both landline and mobile numbers are present on most analysed websites (31; 77.50%). Only mobile number is less frequent (4; 10.00%), landline/mobile/fax combination (3; 7.50%), only landline (1; 2.50%) and landline/fax combination (1; 2.50%). It is interesting that Viber and/or WhatsApp is also available (on the website included) in case of 7 websites (17.50%). There are certain cases where more than one landline and/or mobile phone number is offered, as well as agent/manager number abroad.

When it comes to email addresses, most websites contain professional/official email address (18; 45.00% of websites, ie, 48.65% of websites containing the information on email addresses). Sixteen websites contain general email address (40.00% of websites, ie, 43.24% of the websites containing the information on email address), while in case of 3 websites both professional and general email address is provided (7.50% of websites, ie, 8.11% of websites containing the information on email address). Among the general/unofficial/unprofessional email addresses available, domain @gmail.com is the most frequent (13 websites), followed by @hotmail.com, @hotmail.rs, @open.telekom.rs/@mts.rs, @eunet.rs and @yahoo.com (1 website each). On the basis of the data listed so far, we can reach the conclusion that the information about professional email address is available on a half of the analysed websites, but since its presence is desirable according to Knott (2015), we would suggest further increase in its representation.

When we speak of connections to social networks, most websites include the link to Facebook (28), 18 to Instagram, 12 to You-Tube, 7 to Google+, 7 to LinkedIn, 7 to Twitter. In addition to that, it is necessary to indicate that a link to social networks for doctors are also provided in one of the cases.

Table 10 provides an overview on criteria realisation related to the information on the website and its technical characteristics.

Table 10: The information on the website and its technical characteristics

Criteria	No.	%
Presence of images which improve website design	40	100.00
Live (no broken) links (links point to the specified files)	39	97.50
Text is legible (font size, font type, good contrast with background)	36	90.00
Multilingual website options exist	28	70.00
Website search tool is available	16	40.00
Website map present	12	30.00
Website accessibility for people with sensorial disabilities (eyesight, sense of hearing)	0	0.00
Website creation date	0	0.00
The date of the last update	0	0.00
Smartphone app is available	0	0.00

Source: the authors' research

Less than a half of the criteria is present on most of the analysed websites (40.00%). Four of the criteria (40.00%) is not present on any of the websites, so it affected the average of criteria representation within this category to be 42.75%. All websites contain images, but on 60.00% of websites there are only pictures (slideshow included), while

videos are also present in 40.00% of the websites, in addition to the pictures. No sounds are noticed (except in case of the videos), which is in line with the lack of options for website access for the people with hearing or sight problems.

It is also necessary to emphasise the absence of the latest page update, and it may urge the visitors to question the currency of information provided on the website. The only way to check whether the website is up-to-date is to follow the dates in blog posts or news (if the website contains the elements stated).

When it comes to multilingual websites, 28 of the websites provide the English language option. German language is present on 10 websites, Italian on 7 websites, French on 3 websites, Russian and Hungarian on 2 websites, Slovakian, Greek and Spanish on one website each. We should point out that although the icons for certain languages are provided, they do not work. In some of the websites we can also observe that only a part of the website is translated into the chosen language, not the complete website.

Table 11 provides an overview of the criteria realisation related to the promotional activities.

Table 11: Promotional activities

Criteria	No.	%
Lack of comparison with other same or similar institutions	40	100.00
Promotional materials are available (eg video, brochures etc.)	11	27.50
News about dental institution (eg innovative treatments, equipment, conferences, seminars etc.)	9	22.50
Media reports about dental institution or links to them are available	6	15.00

Source: the authors' research

Most of the criteria related to the promotional activities are absent on most of the analysed websites, which is best indicated by the average realisation percentage of 41.25%. The only criterion present on most of the websites (all websites) is the absence of comparison to other institutions of the same or similar type, such as required according to the "Code of ethics for dentists for electronic commerce in the EU" (Council of European Dentists, 2017). The absence of the media reports on a dental institution could be justified by the fact that no reports exist, but the lack of promotional activities and news about a dental institution (generated by the institution) is extremely unjustified.

Table 12 provides an overview of the criteria realisation related to the cooperation with other institutions.

Table 12: Cooperation with other institutions

Criteria	No.	%
Links to suppliers (eg materials, equipment etc.)	10	25.00
Links to transport service providers	10	25.00
Links to hotels, restaurants, entertainment etc. in the destination	8	20.00
Links to relevant agencies / tourist attractions	5	12.50
Links to professional associations and relevant institutions	2	5.00
Links to other health / medical / scientific institutions	2	5.00

Source: the authors' research

The criteria for cooperation with other institutions are present on a small number of the analysed websites. This is best illustrated by the fact that maximum representation of a criteria is 25.00%, average criteria representation percentage is 15.42%. Tourism is a very complex business activity which involves various services, inevitably those related to accommodation, food/drinks and transport. If dental institutions desire to provide the experience of true dental tourism it is necessary to: 1) establish the cooperation with the corresponding institutions; 2) highlight (promote) the cooperation with those institutions; 3) enable the connections among partner institutions websites.

Of the total number of criteria, 26 (37.14%) are present on more than a half of the analysed websites, while only 1 criterion is present on half of the websites. Based on the aforementioned, it can be concluded that most of the criteria (61.43%) are present on less than a half of the analysed websites. To be more specific, most of the criteria (6; ie 8.57%) are not present on any of the websites, while 5 criteria (5; ie 7.14%) are present on all of the websites.

Conclusion

The Republic of Serbia has a potential for dental tourism development, but promotional activity improvement is necessary. First, it is necessary to update the segment of the Ministry of Health website related to the list of dental institutions within health tourism in terms of stating only the active institutions, their accurate business names and active website addresses. The data about the institutions should preferably be added (eg address). Dental institutions without websites should start using one. When it comes to website content, information on services, general information on a dental institution, information on staff, contact and interaction possibilities - they are all represented on most of the dental tourism institutions websites in the Republic of Serbia. On the other hand, 75% of the analysed categories are present on less than a half of the analysed websites. Only 7.14% of the criteria is present in all websites, while 8.57% of the criteria is present on none of the websites. The missing criteria should be included on the website, while the existing ones should be completed.

The significance of this paper is in the first analysis of online promotion of dental tourism institutions in the territory of the Republic of Serbia. A combination of various criteria in the dental tourism website analysis defined by other authors is also significant. The disadvantages of this research are the sample of the dental institutions highlighted by the Ministry of Health of the Republic of Serbia, as well as the choice of the relevant criteria according to the author's opinion (due to a large number of criteria). The directions of the further research should be towards expanding the analysis sample in the Republic of Serbia, conducting the analysis in other countries in order to compare the results obtained, as well as establishing the significance of certain categories and criteria within, based on the dental tourists' opinions.

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SINERGY MONETARY AND FISCAL POLICY IN THE FUNCTION ECONOMIC GROWTH REPUBLIC OF SERBIA

Apstract

The paper points to the interaction and mutual connection of monetary and fiscal policy and their synergetic effect on economic growth. Regardless of the fact that both policies are independent in the implementation of their goals and apply different measures and instruments, they are not at odds in shaping economic policy, on the contrary, they complement each other and jointly contribute to ensuring macroeconomic stability and economic growth. In the Republic of Serbia, the joint effect of monetary and fiscal policy measures is reflected in the provision of macroeconomic and price stability and the reduction of public debt and a stable budget, which are key prerequisites for long-term economic growth.

Key words: *monetary policy, fiscal policy, macroeconomic stability, economic growth*

JEL classification:*E60, E63, G28*

СИНЕРГИЈА МОНЕТАРНЕ И ФИСКАЛНЕ ПОЛИТИКЕ У ФУНКЦИЈИ ПРИВРЕДНОГ РАСТА РЕПУБЛИКЕ СРБИЈЕ

Сажетак

У раду се указује на интракцију и међусобну повезаност монетарне и фискалне политике и њихов синергетски ефекат на привредни раст. Без обзира што су обе политике независне у спровођењу својих циљева и примењују различите мере и инструменте, оне нису у супротности у обликовању економске политике, напротив оне допуњују једна другу и заједнички доприносе обезбеђењу макроекономске стабилности и привредном расту. У Р. Србији заједнички ефекат мера монетарне и фискалне политике,

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се огледа у обезбеђењу макроеконмске и ценовне стабилности и смањење јавног дуга и стабилног буџета, што су клучни предуслови за дугорочни привредни раст.

Кључне речи: монетарна политика, фискална политика, макроекономска стабилност, привредни раст

Introduction

Every economic crisis indicates the necessity to review the basic postulates on which the management of monetary and fiscal policy is based. The development of monetary policy is mostly based on the modification of the strategic framework, i.e. flexible inflation targeting, through the active role of the central bank. Negative externalities, which are more and more pronounced after every economic crisis, represent one of the reasons for establishing the coordination of monetary and fiscal policy. „Coordination between monetary and fiscal authorities leads to better performance. One of the most important goals of macroeconomic policy is the achievement of sustainable economic growth, with the existence of price stability and foreign trade balance" (Laurens & Piedra 1998). In conducting economic, and therefore monetary and fiscal policy, a very important issue is the relationship to the public debt of the national economy. Public debt, in addition to being used to finance the budget deficit, is also an instrument that has its own monetary and fiscal function with a strong impact on the country's economic development. The objectives of monetary policy as an instrument of economic policy are short-term or current monetary objectives, and long-term or strategic monetary objectives, which are also basic objectives.

„Monetary policy measures had a primary role related to the correction of interest rates. Given that the coordination of fiscal and monetary measures is very important for macroeconomic stability, instead of economic policy makers using monetary policy to achieve price stability and fight inflation, Wrey starts from the position that the role of monetary policy is to determine short-term interest rates, while fiscal policy is expected to stabilize the value of the currency, which is important for maintaining a competitive advantage in the foreign market" (Wrey, 1998).

The development fiscal policy with numerous measures and instruments available to the holders of this policy represents a significant mechanism for encouraging economic development. The theoretical explanation of the impact of fiscal and monetary policy on the stimulation of economic activity depends on the model taken into consideration, which depends on the theoretical direction on the basis of which it was developed. „One of the most important goals of macroeconomic policy is the achievement of sustainable economic growth, with the existence of price stability and foreign trade balance" (Laurens & Piedra, 1998).

Economic growth and macroeconomic stability

Macroeconomic stability is a significant prerequisite for stable long-term economic growth. The key policies of macroeconomic stability are monetary and fiscal policies whose goals and activities are interconnected and conditioned by a synergistic

effect on economic growth. In fact, it can be said that both policies, regardless of their different goals and the different instruments they use, are not in conflict, on the contrary, they complement each other, especially in the implementation of the adopted economic policy. In particular, their synergetic effect is reflected in the realization of fundamental economic and political goals, whose coordinated activity has a positive impact on economic growth.

Although monetary and fiscal policy are conducted by independent bodies, they are interdependent, so it is crucial to achieve a consistent framework to avoid inconsistency. Lack of coordination between monetary and fiscal authorities leads to poor economic results. Inadequate direction of one policy is a limitation for another policy and is unsustainable in the long term.

„Monetary policy measures have a primary role related to the correction of interest rates. Given that the coordination of fiscal and monetary measures is very important for macroeconomic stability, instead of economic policy makers using monetary policy to achieve price stability and fight inflation, Wrey starts from the position that the role of monetary policy is to determine short-term interest rates, while fiscal policy is expected to stabilize the value of the currency, which is important for maintaining a competitive advantage in the foreign market" (Wrey, 1998).

„Fiscal policy, through its transmission mechanism, transmits impulses in the economy that cause discretionary government measures aimed at increasing or contracting economic activity" (Gnjatović, Grbić, 2009). By means of its instruments, collecting public revenues (taxes) and executing public expenditures, fiscal policy acts through transmission channels on changes in the relations of basic macroeconomic aggregates and on the behavior of economic entities. The effect of the transmission mechanism of fiscal policy is manifested through the reduction of tax rates as a measure of restrictive economic policy, which the government wants to influence by curbing excessive demand and consumption.

Synergy of monetary and fiscal policies in the Republic of Serbia and their effect on economic growth

The success of the monetary policy, which is based on the independence of the central bank, is the coordination with the fiscal authorities. Sustainable economic growth, price stability and foreign trade balance are the most important goals of macroeconomic policy. In order to achieve economic growth, it is necessary to harmonize monetary and fiscal policies. The lack of coordination between the monetary and fixed authorities leads to an increase in interest rates, encourages inflation and ultimately threatens economic growth. The issue of public debt is of great importance for conducting economic policy. In addition to financing the budget deficit, public debt has a fiscal and monetary impact on the overall economic development of the national economy.

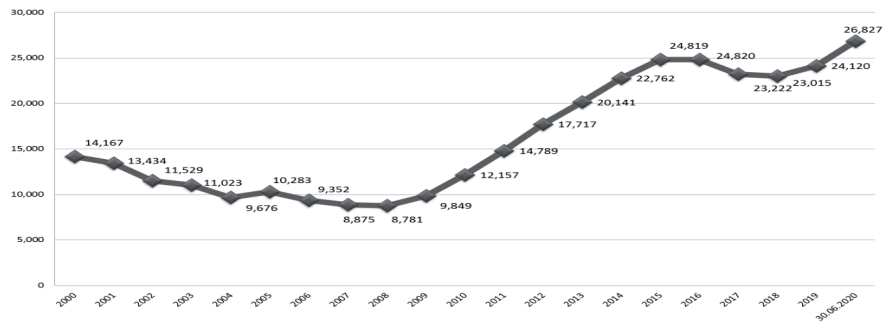
The presence and increase of public debt are not only the result of financial difficulties but also often occur as a consequence of the extraordinary needs of the state and due to changes like sources of public revenue. As an instrument of economic policy, public debt has both monetary and fiscal functions. "Depending on whether it is the borrowing of the state in domestic or foreign currency, financial or non-financial sector,

public debt directly affects monetary aggregates, the amount of money in circulation and the value of the national currency." It should be emphasized that one of the most important instruments of monetary policy is based on the public debt, i.e. on the purchase and sale of government bonds, which are open market operations used by central banks to regulate the amount of money in circulation" (Kvrgić, Ćolić, Vujović, 2011).

Financing of the state on the domestic market has a disadvantage compared to the foreign market because it is crowding out private investments, the so-called crowding out effect. If there is a large increase in public debt, the demand for loans also increases, which ultimately increases interest rates. The rise in interest rates affects the fall in the prices of securities, which reduces private investment. Borrowing of the state by the private sector or companies leads only to the effect of crowding out investments, while if the state borrows abroad, it puts pressure on the exchange rate of the domestic currency. In such a situation, the Central Bank, through its monetary policy, takes measures to sterilize foreign currency inflows to prevent price increases and the appearance of illiquidity. State borrowing by commercial banks has no significant impact on monetary policy, because in this case there is a redistribution of funds in the bank's portfolio, as they will lend less to the population, and direct more of the money to loans to the state.

Fiscal policy affects monetary policy, directly and indirectly. Financing the budget deficit exclusively through market instruments leads to crowding out of the private sector. Expansive fiscal policy undermines price stability and neutralizes the effects of monetary policy. A more direct influence of fiscal policy on monetary policy is through the influence of indirect taxes on the price level and inflation. If indirect taxes (sales tax, value added tax) are increased, an inflationary spiral is triggered through the rise in prices, which encourages the growth of inflation and inflationary expectations. This further destabilizes movements in the bond market and the foreign exchange market, leading to the collapse of monetary policy. Monetary and fiscal policies have a positive effect on each other, if they reduce the risk premium found in the structure of long-term interest rates. Monetary authorities should inform fiscal authorities about the effects of government borrowing on the achievement of monetary goals.

Graph no. 1: Growth dynamics of the public debt of the Republic of Serbia



Processing by the author based on data from the National Bank of the Republic of Serbia

Chart 1 shows three periods in the growth dynamics of the public debt of the Republic of Serbia. The first period from 2001-2008 consists of three short sub-periods,

the first of which covers the period 2001-2002. which is characterized by the negative value of the public debt, which amounted to as much as -30% of GDP, primarily due to the write-off of debts by the London and Paris Club of Creditors. At the beginning of 2003, there is a slight stabilization, which is also reflected in the further period until 2005, so that during 2006 and 2007 there will be an increase in the structural fiscal deficit by about 1.7% of GDP due to the increase in wages in the public sector and the reduction of taxes on earnings. Period 2008-2014. characterized by accelerated growth of public debt. The 2014-2017 period includes fiscal consolidation, which was based on the reduction of nominal pensions (5%) and salaries in the public sector (10%). Graph 1 shows that changes in public debt are characterized by a slight negative linear trend, which implies that the Government of the Republic of Serbia managed to stop the further growth of public debt, stabilize its level below 70% of GDP, and ensure a gradual reduction of public debt. Noticeable decrease in performances during 2017. At the end of that calendar year, the public debt fell to 57.9%, in contrast to the previous year, when it amounted to 67.8%. of GDP. The downward trend continues in the next two years, at the end of 2018 it amounted to 53.7% and in the following year 2019 it was only 52.8% of the total GDP of the Republic of Serbia. In 2020, the positive trend is interrupted and the public debt begins to grow again, so that on 30.06. In 2020, it amounted to 57.3% of GDP or 26.827 billion euros in absolute terms.

The conclusion that emerges is that public debt cannot establish a positive or negative correlation with development, because public debt cannot be an instrument to stimulate economic growth. The aspiration of monetary and fiscal policy makers is to encourage economic activity. There is no universal model for the application of measures and instruments of monetary and fiscal policy, which will ensure macroeconomic stability. The creators of the economic policy of each national economy should define the individual directions of movement of the transmission channels of monetary and fiscal policy depending on the disturbances the economy is facing. An adequately formed fiscal-monetary model should be harmonized with other specific goals of economic policy in terms of balance sheet balance, stability of the national currency, and all with the aim of establishing a general balance. Due to the fact that monetary policy measures cannot independently act on the financial sector, just as fiscal policy measures cannot ensure a complete effect on the real sector, their coordination is necessary.

Conclusion

In the modern economy, which is burdened with many problems, in order to achieve and maintain macroeconomic stability and discipline, adequate synchronization of monetary and fiscal policy measures and their implementation in the entire economic policy management system is necessary. Due to the existence of unproductive economies, unemployment, and the increase in the public debt rate, great attention is paid to the interaction of monetary and fiscal policy measures. As in countries all over the world, there is no universal model of conducting economic policy in the Serbian economy.

A significant problem of underdeveloped economies is excessive consumption, which generates an increase in imports, inflation, balance of payments deficit, debt and low investment rate. In such conditions, insisting on short-term stability (inflation

and exchange rate) would only increase the risks of collapse of the economic system. Coordination and cooperation of monetary and fiscal policy, in the direction of forming a more efficient and export-oriented economy, is a prerequisite for growth and establishing balance. Fiscal policy can help the recovery of the economy, but to overcome all problems, budgetary discipline is necessary, which will control public finances. Monetary policy, on the other hand, gives results through the monitoring of public debt, which manifests itself through inflationary pressure, by limiting available liquid assets.

In the area of economic policy, the transition to a new growth model would motivate economic actors. Investment and export orientation, as well as public debt regulation, should be supported by coordination measures of monetary and fiscal policy and other key sectoral policies. Within the framework of fiscal policy, tax policy reforms are necessary in the direction of encouraging GDP growth and production growth. Mitigating the negative tendencies of macroeconomic variables cannot be achieved with just one measure or just one policy, which is why coordination and cooperation of monetary and fiscal policy is inevitable, in order to act in sync.

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DEVELOPMENT OF A TRADING STRATEGY FOR RISK-AVERSE INVESTORS BASED ON VAR MODELS

Abstract

In this paper various topics related to programming, statistics and financial modelling were addressed with the main idea of establishing a trading strategy. As discussed in the paper, no research has been done on this topic. On the other hand, much research has been done on which model is better, which distribution or confidence level is more appropriate or provides better forecasting capabilities. No one has investigated whether these differences could lead to a development of trading strategy. The paper starts with a definition of the gap in literature and practice. Then the research methodology is outlined in detail. Formulas and parameters are defined and presented. The main conclusion of this paper is the importance of GARCH VaR and the possibility of creating trading strategies. As long as the difference between the GARCH VaR and the other two VaRs does not exceed 1.5%, there is no need to leave the market. Should this situation change, one should leave the market as long as these differences do not fall below 1.50%.

Key words: *Trading strategy, VaR, GARCH, financial crisis, mean-variance analysis*

JEL classification: *G11*

РАЗВОЈ СТРАТЕГИЈЕ ТРГОВАЊА ЗА ИНВЕСТИТОРЕ КОЈИ НИСУ СКЛОНИ РИЗИКУ

Апстракт

Овај рад обрађује различите теме везане за програмирање, статистику и финансијско моделовање са идејом да се успостави стратегија трговања. као што је наведено у раду, до сада није рађено истраживање на ову тему. С друге стране, урађена су многа истраживања на тему који је модел бољи, која дистрибуција или ниво поверења погоднији или који модел пружа боље могућности предвиђања. оно што није истражено, јесте да ли ове разлике могу довести до развоја стратегије трговања. Сам рад почиње дефиницијом јаза у литератури и пракси. затим се детаљно описује коришћена методологија

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истраживања. Формуле и параметри су јасно дефинисани и приказани. Главни закључак овог рада јесте значај гарцх вар-а као и на то да постоји могућност креирања стратегија трговања. Све док разлика између гарцх вар-а и друга два вар-а не прелази 1,5%, нема потребе да инвеститор напушта тржиште. Уколико се ова ситуација промени, требало би напустити тржиште све док ове разлике не би пале испод 1,50%.

Кључне речи: стратегија трговања, вар, гарцх, финансијска криза, анализа средње варијансе

Introduction

Historically, traders have tried to develop an optimal trading strategy that they can apply. One of the problems that they are confronted with is that a strategy that has worked well in the past does not mean that it will work in the future. Moreover, the main question that arises is whether it is profitable to apply any trading strategy or to take a hold-and-buy approach. This paper attempts to answer this question by developing a trading strategy using value at risk (VaR) models. On the one hand, some investors are risk-averse and unwilling to take additional exposure to achieve higher returns, while on the other hand, there are investors who are willing to take higher risks. The assessment of these two categories is therefore of paramount importance, irrespective of the type of investor.

The calculation of the risk and return depends on whether it is an asset class or a portfolio. The portfolio return can be calculated by multiplying the returns of the individual assets by their respective weights, while several different calculation methods could be used for portfolio risk. In this paper portfolio risk will be calculated using VaR method, more precisely three different VaR will be further discussed, namely historical VaR, delta-normal VaR and generalized autoregressive conditional heteroskedasticity (GARCH) VaR. The main purpose of using these methods is to observe whether the early signs of a possible crisis in the markets can be detected, or more precisely, when to leave the market and enter it. In addition to these metrics, one can also use liquidity ratios to assess risks in companies (Vesić, Rević, & Đekić, 2019) or Safety-First-Model (SFM) that was used to analyse the risk attitude (Oladipo Akanbi, Adekunle, Mukaila, & Isola, 2022). One underlying assumption is that the investor is risk-averse, so he should choose a specific exit point and use it as soon as the first signs are visible. To create such a strategy, the Sharpe ratio is used as an additional risk measure. Therefore, this paper focuses on developing the trading strategy for the risk-averse investor.

The portfolio will be consisting of four stock indices, whose weights will be assigned according to mean-variance analysis. As soon as the portfolio is created, the VaR is calculated using historical simulation, delta-normal approach and GARCH (1,1). The goal of these calculations is to determine the deviance in the VaR results obtained from GARCH and from the other two methods (historical simulation and delta-normal). Once the differences have been identified, specific points for market entry and exit are determined using the Sharpe ratio. The main assumption is that GARCH VaR results indicate volatility in the market earlier and that deviations of the results from delta-normal VaR and historical VaR signals extreme events in the market. Using this assumption with maximizing the Sharpe ratio should result in finding the exit point. As regards the time frame, the global picture of the financial

world is covered for the period April 2007 to April 2020. This time frame has been chosen to cover the period of one economic cycle. During this period, the focus is on periods where the GARCH VaR is significantly higher than other VaRs to determine what percentage deviation indicates the beginning of periods of higher volatility. For these periods the Sharpe ratio is calculated, and the maximum Sharpe ratio is considered as the optimal point for market exit or entry. Although the main idea is to develop an investment strategy, the knowledge gap will be focused rather on VaR measures than on the trading strategy itself. The main problems encountered in developing a trading strategy are linked to the choice of the optimal time window, the level of trading costs and the timing of switching to a different strategy (Krause, 2009).

There has been little or no research done on the comparison between the results in terms of developing a trading strategy. In this paper, the author intends to do research by creating an optimal portfolio and applying these methods to determine if there is evidence that the market is going through a more volatile period and construct the trading strategy based on the results.

Problem Statement

VaR models are widely used in practice, and the question of which method is best suited to calculate VaR arises repeatedly. Depending on the method chosen, the VaR figure can vary considerably. There has been a lot of research on this topic, but rarely has anyone questioned whether these differences could bring something new into practice. This paper does not attempt to prove which method is better, but to use these differences as an advantage. The aim of this study is to investigate if these differences could help in developing a trading strategy for riskaverse investors.

The main assumption is that the GARCH model shows the earliest signs of higher volatility, followed by other methods. The difference between GARCH VaR on the one hand and deltanormal VaR and historical VaR on the other should indicate changes in the market. If this difference increases, extreme events could occur. Similarly, a decrease in the difference may mean that the extreme events have expired. The main objective is to find two points in time - an optimal exit and entry point. An optimal exit point would be the day on which a certain threshold would be exceeded, for which the Sharpe ratio would be calculated, and an entry point would be the day on which the values would fall below the defined threshold. By calculating both Sharpe ratios on the days with an average Sharpe ratio for this interval, one can decide which threshold would be the most suitable for risk-averse investors to develop a trading strategy. The Sharpe ratio is used to determine these optimal points by calculating it for the different thresholds and selecting the maximum one. A threshold value is an interval of differences.

Theoretical backgrounds of VaR methods

Value at Risk is a risk measure mainly used to measure the risk position of a bank or investment company. The early 1990s brought uncertainty to the financial market (Angelidis, Benos, & Degiannakis, 2004), which led to the development of different models for estimating

market risk. This influenced the creation of VaR in 1995 by JP Morgan, who published a document entitled Risk Metrics (Morgan/Reuters, 1995). The document introduced what VaR is and how it can be calculated. Even before publishing the document, Group of Thirty suggested using VaR as a measure of market risk (Thirty, 1993). Moreover, some authors believe that the origins of VaR stem back to 1922, when capital requirements were first established on the New York Stock Exchange (Wang & Recht, 2012).

According to JP Morgan, VaR is a measure of loss with a given probability over a time horizon. The most important parameter in its formula is the standard deviation as a measure of dispersion. The standard deviation or its squared version variance can be calculated in many ways, e.g. historical volatility, EWMA, GARCH, etc. The VaR itself can be calculated using simulation models such as historical simulation or Monte Carlo simulation. Out of all these methods, the only method which is not being discussed in this paper is VaR calculated using Monte Carlo Simulation. The VaR methods can be classified into three categories: parametric methods - the delta-normal approach, non-parametric methods - historical simulation and Monte Carlo methods (Nabela , Maski, & Wahyudi, 2020).

In the literature there are different views available. For example, the historical simulation model has given better forecasting results than other methods used if the sample size is large enough and if the higher confidence level is included (Jackson, Perraudin, & Maude, 1998), (Kiohos & Dimopoulos, 2004). Furthermore, simulation methods were better than parametric methods when it comes to assessment of the VaR (De Raaji & Raunig, 1998). Nevertheless, drawback is that the historical volatility is too simple method of calculating volatility that is just using the standard deviation formula (Marra, 2015). With this background information, a delta-normal approach was developed including covariance matrix as an additional parameter for the calculation. It belongs to the group of parametric VaR methods, with the main assumption of the normally distributed returns (Kulali, 2016).

The Basel Committee on Banking Supervision published in 1996 a proposal 'Internal proposals recognizing the new quantitative risk estimation techniques used by the banking industry', in which volatility is measured as the standard deviation of the normal distribution for historical observations, using the equal or alternative weighting scheme. If the same weights are given, the delta-normal VaR can be calculated. Further, volatility is calculated as the standard deviation of the normal distribution for exponentially weighted historical observations with a decay factor (Morgan/Reuters, 1995). Many researchers have welcomed this metric (Korkmaz & Aydin, 2002). A statistical method that gives more weight to the more recent data is called EWMA, and in this model the weights decrease exponentially as one goes back in time (Hull, 2018). Whereas some authors suggest measuring and forecasting volatility using the adjusted mean absolute deviation, because this method has provided a better prediction than historical volatility or even GARCH (Ederington & Guan, 2006).

One can go even further and extend the data period to obtain more accurate results. There is a proposal to switch from daily to intraday data. This approach increases accuracy, especially in the GARCH estimate of volatility (Anderson & Bollerslev, 1998). However, when comparing EWMA with the GARCH method, the results have shown that GARCH produces a more thorough analysis than EWMA (Korkmaz & Kazim, 2022). This model has similarities to the model Bollerslev made in 1986, namely GARCH. On the other side, GARCH is an extension of the autoregressive conditional heteroskedasticity (ARCH) model introduced by Engle in 1982. He added a new parameter to the formula for measuring variance, namely the lagged weighted variance.

Engle published a paper demonstrating the usefulness of the ARCH and GARCH models for portfolio risk where he was highlighting their good forecasting capabilities (Engle, 2001). In this paper, Engle reviewed models that preceded the ARCH model, citing rolling standard deviation as a precursor. In this paper researchers have used the 12-month rolling standard deviation as a volatility estimate (Fama, 1976). The rolling standard deviation takes a fixed number of days and calculates the standard deviation. The standard deviation for the next day is calculated taking into account, for example, the last 30 days and thus each subsequent day. The disadvantage of this model is that all events are weighted equally. Another disadvantage of the rolling standard deviation is solved by the GARCH model by giving decreasing weights to events that never go to zero.

The GARCH model represents a more general class of processes that allow more flexible lag structures (Bollerslev, 1985). Bollerslev uses the empirical example of the inflation rate to prove that GARCH is more suitable than the ARCH model. Furthermore, Korkmaz and Aydin have shown in their paper that the GARCH model provides a more precise analysis than the EWMA model in the case of volatility of the ISE-30 index return and the stock return (Korkmaz & Kazim, 2022).

As mentioned above, the aim of this paper is to identify early signs of anomalies in the market and to choose an exit point by comparing different VaR results, which was not covered by literature so far. By calculating three different VaR and comparing its difference threshold with the maximisation of the Sharpe ratio will enable one to determine the signs for exiting and entering the market, which will be further discussed in the next chapters.

Methodology overview of the used metrics

This paper uses a diverse set of statistical methods, which will be described in this chapter. First, the data is imported into Python, followed by a chronological set of analyses.. When an optimal portfolio is created, methods such as historical VaR, delta-normal VaR and GARCH VaR will be conducted. Addressing the subject of VaR, the main intention is to calculate the loss on a portfolio with a given probability over a given period (Jorion, 2007). In this manner, the potential portfolio loss is calculated using three methods which are in more details explained below. There will be periods of time when the models are consistent and periods of time when they are not. If GARCH VaR does not deviate by a lot from other VaRs, it can be assumed that the market is normal. If GARCH VAR is higher than historical VaR and delta-normal VaR, one can assume that it can be a signal for extreme events. The main idea is to observe these signals and quantify them in order to create a trading strategy. Once quantified on the training data set, the strategy can be tested on the test data set. A divestment is proposed when signals of higher volatility are shown, which will be quantified, and the reinvestment is proposed when these signals disappear.

In this chapter the research methodology will be described in detail, with step-by-step instructions on how and what is calculated. By reading this chapter, one becomes familiar with all the formulas necessary to carry out this research. From the modern portfolio theory to three different types of VaR calculation. The data set used is explained in short sentences.

Value-at-risk is a statistical measure generally used to analyze market risk associated with financial assets or portfolios. It dates back to 1995, when JP Morgan published a RiskMetrics document, which explained VaR as a model. It was not defined under that name

until 1995, but as a metric itself it was already in use (Kondapaneni, 2005). Following its introduction by JP Morgan, it became a widely used measure of exposure to market risk. It provides a simple and readily applicable quantitative measure for assessing the overall market risk one is exposed to. It is also used by many risk managers to estimate the potential loss of the portfolio over a period of time and at a certain confidence level.

There are two key elements to describe VaR (Carol, 2008):

1. Time horizon - the bigger the horizon, the greater the VaR. Once the daily VaR is calculated, it can be extended to more days by multiplying the square root of time. This is the case when the returns are independently and identically distributed (i.i.d) with a normal distribution (Jorion, 2007);

2. Confidence level - the higher the confidence level, the greater the VaR and the more scenarios are covered. The commonly used probabilities are those of 95% and 99%.

These elements can be described in one sentence: "We are X percent certain that we will not lose more than V dollars in time T" (Hull, 2018). VaR is therefore defined as an amount of money that can be lost over a period of time at a certain confidence level.

$$VaR = \mu + \sigma N^{-1}(X) \tag{1}$$

Where μ is a mean, σ is a standard deviation of the portfolio, $N^{-1}(X)$is the inverse cumulative normal distribution (Hull, 2018).

It can be said that if the VaR of the portfolio is one million per day with 95% certainty, there is only a 5% chance that the loss will be greater than one million. The disadvantage of VaR is expressed here, as it does not say anything about the amount of loss if this 5% occurs. There are many ways to calculate VaR, and three of them will be discussed in this paper and the following subchapters. The focus will be on historical simulation, delta-normal and GARCH VaR.

Sharpe Ratio

The Sharpe ratio is known in the literature as a risk-adjusted risk measure developed by William Sharpe. It is based on the same assumption as the MPT that risk corresponds to volatility, and as diversification increases, risk exposure under the MPT should decrease and the Sharpe ratio should be increasing. It calculates the excess return over a given risk free rate and can be calculated ex post or ex ante. The ex post calculation uses historical returns and standard deviation, whereas the ex ante calculation uses expected returns and projected risk (Sharpe, 1996). This paper uses the ex-post Sharpe ratio as calculated on the basis of historical data. Where R is the portfolio return, Rfr is the risk-free rate and σ is the portfolio standard deviation. Since the risk-free rate is riskless, its standard deviation is assumed to be zero and only the standard deviation of the portfolio is included in the calculation (Sharpe, 1994). The excess return would be the return above the risk-free interest rate, and therefore every investor has the goal of achieving a higher excess return. The higher the Sharpe ratio, the better the chosen portfolio. On the other hand, it can also be negative, which is caused by the negative return or the high risk-free interest rate, and it might not be rational to invest in a selected portfolio if the risk-free interest rate is higher than the portfolio return. Moreover, the negative risk-free rates in the 21st century have shown that they bear part of the risk and that they do not necessarily offer a safe return. So even if the Sharpe ratio is negative, this does

not necessarily mean that one should rule out the possibility of investing in such a portfolio. Together with the VaR measure, the Sharpe ratio is used as a measure of risk to estimate the optimal time to exit and enter the market. One of the benefits that modern portfolio theory (MPT) has brought is the influence on traders to diversify their portfolios rather than concentrating on one asset class. Although it is based on many restrictive assumptions, it has allowed portfolio risk and return to be assessed. Some of the main assumptions are the normal distribution of returns and the rational behavior of investors (Rice, 2017).

Historical VaR

The historical VaR model assumes that all possible future fluctuations have occurred in the past and that the historically simulated distribution is identical to the distribution of returns over the future risk horizon (Carol, 2008). The model is developed shortly after the publication of RiskMetrics (Boudoukh, Richardson, & Whitelaw, 1998). It is renowned for being the most easy-to-follow method. This methodology calculates VaR in such a manner that all calculated returns are sorted once from positive to negative and the quantile is calculated on the loss side.

When creating possible scenarios, the following formula can be used (Mausser & Rosen, 1998):

$$\Delta vij = vi0 - vij \tag{2}$$

Where $vi0$ is the base scenario and vij is the value of one unit in future. With the use of this formula the value of the portfolio in the first scenario can be calculated. Comparing the ending or calculated value with the initial value of the portfolio, either a portfolio loss or a portfolio gain can be observed. The portfolio losses are sorted from the highest to the lowest losses. A quantile is then calculated, usually the first or fifth quantile, depending on whether one calculates 99% VaR or 95% VaR. One of the advantages of this model is its easy calculation and interpretation (Korkmaz & Aydin, 2002). Once all portfolio losses have been calculated, one only needs to sort them and calculate a quantile of them to determine the historical VaR for that day. If the VaR for one day has to be calculated for several days, this value should then be multiplied by the square root of the number of days for which one would like to obtain the VaR. The second advantage, mentioned above, is that this model does not make assumptions distribution (Carol, 2008), which is very important because returns are rarely normally distributed, which in some models are assumptions. The disadvantages start with the fact that all earlier observations are equally weighted and it may happen that not all earlier distributions have been captured because the data set is not large enough (Hull, 2018). Moreover, there are limitations inherent in the sample size, as the sample size should be as large as possible. The best option would be to use daily data and a span of many years to capture all past distributions. Many authors also mention the slow speed of adaptation to market situations labeling it as a sluggish model.

Delta Normal VaR

This method exists in the literature under various names such as variance-covariance VaR, delta-normal VaR or normal-linear VaR. It is grounded on modern portfolio theory (Hull, 2018). This method is based on the assumption that the returns are normally distributed and that their common distribution is normal, thus the covariance matrix is all that is needed to capture the interdependence between the returns (Carol, 2008). Volatility is calculated as the standard deviation of logarithmic returns. This approach uses the same assumptions as the portfolio theory (Wang & Recht, 2012). The most common method is to take daily closing prices and calculate the volatility of the returns, and then calculate the returns on an annual basis. It takes only a few steps to calculate volatility in this way.

Delta-normal VaR can be calculated as following.

$$X \sim N(\mu\sigma^2) \tag{3}$$

Where X is return that is normally distributed and i.i.d.

$$VaR_{\alpha} = \Phi^{-1}(1-\alpha)\sigma \tag{4}$$

Where α is the quantile return, Φ^{-1} is the inverse cumulative normal distribution function and σ is the standard deviation (Carol, 2008). The main advantage of this model is that it is easy to create and adapt (Marra, 2015). Its calculation is transparent because it is based on modern portfolio theory. However, by weighting all events equally, it reduces the impact of the recent past and makes it as important as an event that took place a long time ago. If this iss the case, then the VaR would be underestimated. Linked to this, the long-term volatility tends to over- or underestimate volatility and, in this context, meaning to over- or underestimates VaR (Marra, 2015).

GARCH (1,1) VaR

GARCH or Generalized Autoregressive Conditional Heteroskedasticity Model was introduced by Bollerslev in 1986. It is an extension of the ARCH process developed by Robert Engle in 1982, which allows the estimation of weighting parameters (Engle, 2001). This model allows past conditional variance to change over time (Bollerslev, 1985).

Key aspects of its definition are the following:

General: it is a generalized ARCH method in the sense that the squared volatility may depend on previous squared volatilities (McNeil, Frey, & Embrecht, 2005);

Autoregressive (AR): The variance of tomorrow is a regressive function of the variance of today - it regresses to itself (Heuermann, 2010);

Conditional (C): Tomorrow's variance is conditionally (dependent) on the most recent variance. The conditional variance varies over time as a function of past errors, while the unconditional variance remains constant (Bollerslev, 1985);

Heteroskedastic (H): Heteroskedasticity is the assumption that the expected value of error terms is not constant when squared and that they fluctuate over time. These observations do not tend to scatter randomly across the data, but rather to cluster (Engle R. F., 2001). Cluster formation is mainly influenced by the behavior of investors towards the new information (Marra, 2015). One of the reasons why GARCH is well suited for forecasts is the volatility clustering (Banulescu, Hansen, Huang, & Matei, 2015).

The GARCH regresses to the squared return (p) and the squared variance (q) of the last period and this (1,1) represents one lag back in time. The GARCH (1,1) is given by the following equations (Angelidis, Benos, & Degiannakis, 2004)

$$un = \sigma n\, Zn$$
$$Z_n \sim N(0,1)$$
$$\sigma_n^{\,2} = \omega + \alpha un2{-}1 + \beta\sigma t2{-}1 \quad (5)$$

Where $\sigma_n^{\,2}$ is the variance that should be calculated. The ω , α, β are weights that should be estimated. The weights are (1- α -β, β, α). β can be interpreted as a decay rate and is similar to lambda in the EWMA model (Hull, 2018). Two conditions must be fulfilled: α >0; β >0; ω>0 and α +β <1 (Engle, 2001).

There are many advantages to using GARCH for volatility estimation, some of which are:

1. The parameters are not chosen subjectively, but are estimated from the sample data (Carol, 2008).

2. Share prices fluctuate more in times of crisis than in quieter times. GARCH models are therefore particularly suitable for modeling financial market time series (Heuermannn, 2010).

3. Captures long-term reversion and short-term volatility fluctuations (Marra, 2015).

The disadvantages are based on the complexity and difficulty of implementation. There are times when the GARCH is unstable, if the sum of the weights is higher than one, then it is not recommended to use it (Korkmaz & Aydin, 2002). Furthermore, there are more advanced GARCH methods such as TGARCH, EGARCH, but they failed to assess VaR when dealing with emerging markets (Smolovic, Bozovic, & Vujosevic, 2017).

Research results and Discussion

The three different VaRs are calculated and graphically displayed: historical VaR, delta-normal VaR and GARCH VaR. Each calculation is based on a rolling window of 300 days. The historical VaR shows values ranging from 0.40% to 1.40% portfolio loss for one day, with the highest values being shown at the end of 2008. The lines are constant, as the historical VaR changes whenever an extreme event occurs in the market. Similarly, the historical VaR changes when an old extreme event falls outside the observed time series.

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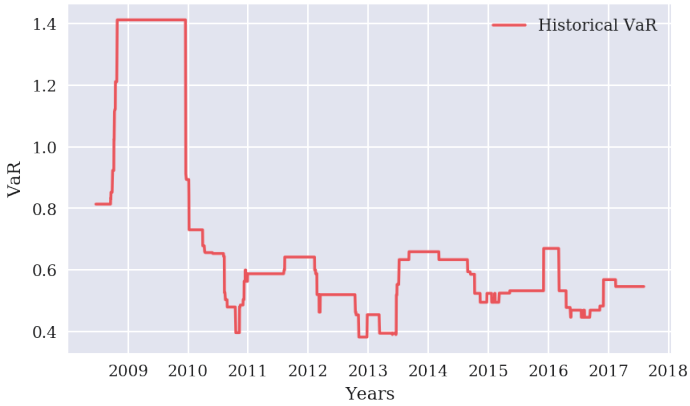
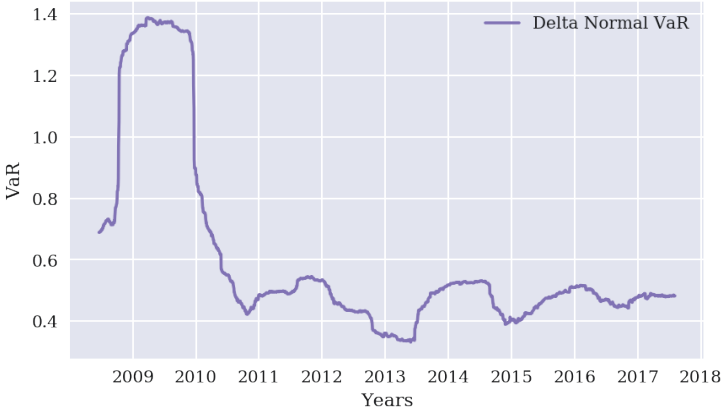
Figure 2: Historical VaR from 2007-2017



Source: Authors calculation based on data from investing.com

Delta-normal VaR shows more or less similar pattern as historical VaR, with the difference that the lines are not as strict and strong. This method is based on the assumption of the normal distribution, which was already neglected in the previous part. At the next step, the GARCH VaR is calculated.

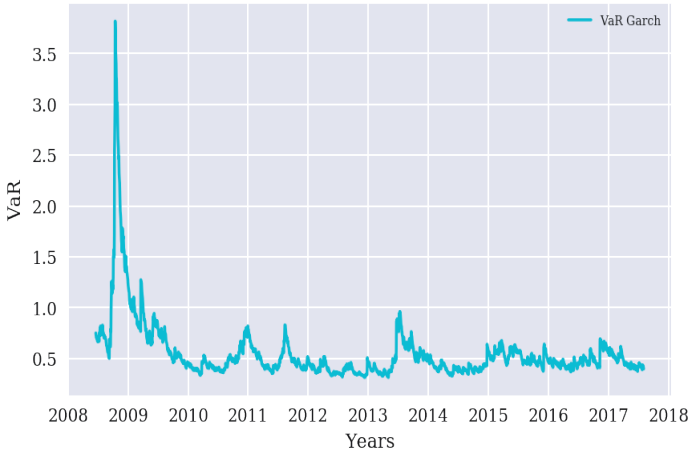
Figure 3: Delta Normal VaR from 2007-2017



Source: Authors calculation based on data from investing.com

As can be seen in the graph, the GARCH VaR shows different results compared to the previous two methods, while the VaR reaches values of 3.50%, which is more than double, compared to the other two VaRs.

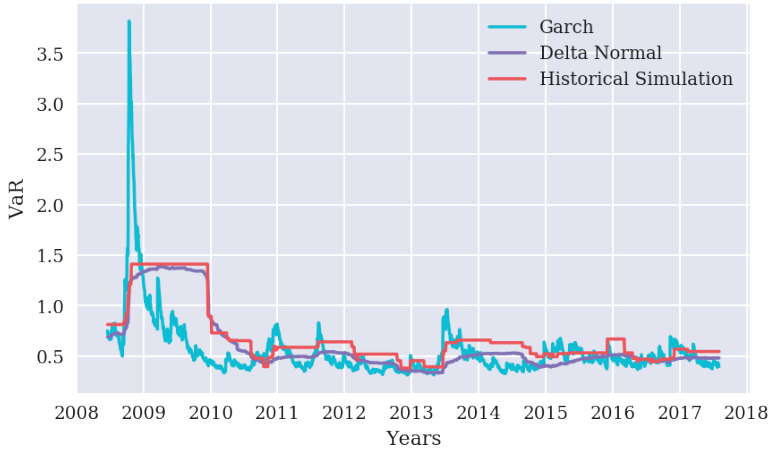
Figure 4: GARCH VaR from 2007-2017



Source: Authors calculation based on data from investing.com

The best way to spot the differences is to plot them all on the graph and then delve deeper into these differences.

Figure 1: Comparison between three VaRs



Source: Authors calculation based on data from investing.com

The following is used to create a trading strategy:

1. The differences are divided into six thresholds: a) higher than 2.50 %; b) higher than 2.00 %; c) higher than 1.50 %; d) higher than 1.00 %; e) higher than 0.50 %; f) higher than 0.00%
2. For each threshold, the Sharpe ratio at the beginning and end of the period is calculated.
3. The highest Sharpe ratio is taken as a measure of the best threshold.

4. Once the maximum Sharpe ratio is found for one of the thresholds, it is used as a market exit signal and tested on the test data set.

As the results that the paper has shown, GARCH VaR should produce different results than historical VaR and delta-normal VaR during periods of higher volatility. Furthermore, the results of the analysis have shown that the threshold that should be considered is the one with the difference of 1.50%. Therefore, an investor should leave the market when the differences exceed 1.50% and return to the market when they fall below 1.50%. Trading costs are excluded from this consideration. In this way, an investor should benefit from exiting the market before the higher volatility occurs and avoid large losses that could result from market instability. This could be especially advantageous for risk averse investors. Moreover, the difference between historical VaR and delta-normal VaR are minor.

A risk-averse investor would be therefore advised to perform the following steps:

1. To calculate GARCH
2. To calculate the historical VaR and/or delta-normal VaR
3. Monitor the difference between the VaRs and exit the market if the differences exceed 1.50% and return to the market if they fall below 1.50%.

The previous part gave a broad overview of the results, which are summarized here with recommendations for further actions. Defined problem descriptions were directly incorporated into the development of a trading strategy and the question was posed. The aim was to develop a trading strategy based on the differences in the results of VaRs using the GARCH VaR scale. What made this approach feasible is the reliability of GARCH VaR. It is shown that the GARCH VaR tracks the returns.

Several types of analysis were carried out when the research gap has been identified. The investor should first define his preferences in terms of risk/return position. Once this has been defined, he should think about which stocks he wants in his portfolio. The top-down approach could be useful here, or even investing in indices or etfs. It can lead to a reduction in the time needed to create a portfolio. For the selected stocks, one should take advantage of modern portfolio theory in order to assign weights to these stocks. Now, one can include risk measures. As the results of the paper indicate, GARCH VaR should produce contrasting results compared to the historical VaR and delta-normal VaR during periods of higher volatility. Furthermore, the results of the analysis have shown that the threshold, that should be considered, is the one with the difference of 1.50%. Therefore, an investor should leave the market when the differences exceed 1.50% and return to the market when they fall below 1.50%. Trading and transaction costs are excluded from this consideration. In this way, an investor should benefit from exiting the market before the higher volatility occurs and avoid large losses that could result from market instability. This could be especially advantageous for risk averse investors.

Moreover, the difference between historical VaR and delta-normal VaR are minor. A risk-averse investor would be therefore advised to perform the following steps:

1. To calculate GARCH;
2. To calculate the historical VaR and/or delta-normal VaR; and
3. Monitor the difference between the VaRs and exit the market if the differences exceed

1.50% and return to the market if they fall below 1.50%.

One should use a code that signals when this threshold is exceeded. Changing the weights also changes the VaR figure and one can adjust it according to one's preferences. Finally, the paper managed to answer the question:

1. It is possible to create a trading strategy with GARCH VaR.

Conclusion

This paper dealt with various issues related to programming, statistics and financial modelling, with the main idea being to implement a trading and investment strategy. After reading the various available literature, the gap was identified. As discussed in the chapter Problem Statement, no research has been done on this topic. On the other hand, much research has been done on which model is better, which distribution or confidence level is more appropriate or provides better forecasting capabilities. No one has investigated whether these differences could lead to a development of trading strategy. The paper starts with a definition of the gap in literature and practice. Then the research methodology is outlined in detail. Formulas, graphs, parameters are defined and presented, as well as the sources used, so that the reader has an entire and transparent overview available. The implementation in the software is briefly described, as the entire research methodology has already been described. Calculation results and analysis cover the major part of the master thesis and all results are described in the chapters that follow.

The main conclusion of this thesis is the importance and usefulness of GARCH VaR and the possibility of creating trading strategies. As long as the difference between the GARCH VaR and the historical VaR and delta-normal VaR does not exceed 1.50%, there is no need to leave the market. Should this situation change, one should leave the market as long as these differences do not fall below 1.50%.

Some of the additional research opportunities could go in the direction of extending the data set, as only a 13-year period is used here. It would be interesting to see whether the same solution would be chosen if the period of 20 years or more were used. Second, it would be interesting to compare different GARCH models, as they might give different results compared to the normal GARCH(1,1), but at the moment this is only an assumption. Third, the same analysis can be performed at the lower confidence level or using the maximum Sharpe ratio instead of the minimum volatility with different weights assigned to the shares. In addition, a strategy for risk-appetite investors can likewise be developed (Devarajan & Jayamohan, 2015).

As one can see, there is still a lot of potential for further research and improvement, and this paper has only considered parts of the impact features.

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COMBATING THE CRIMINAL OFFENSE OF TAX EVASION AS A KEY FACTOR IN THE FIGHT AGAINST THE "GREY" ECONOMY

Abstract

Tax liability, the interest of the social community in order to finance its vital interests, represents a legal obligation and the most important source of budget revenue. Taxpayers, feeling this obligation as a burden on their own economic position, change their economic decisions, which commit criminal acts against the economy, have a negative effect on the economy and harm the social community, affecting the amount of financing of public goods and common needs. The purpose of the article is to highlight the importance of prevention and criminal law repression in order to suppress the criminal offense of tax evasion, and all in the interest of the social community, its economic stability and the economy, by analyzing the form of threats to the fiscal system of violation of tax regulations. To that end, the first part of the article deals with the economic impact of tax evasion, the normative framework of tax evasion and their application in practice, and the second part provides a comparative overview of the causes of tax evasion and measures to combat it. The conclusion of the paper contains de lege ferenda proposals for combating tax evasion, through an institutional, legal and socio-economic framework.

Key words: *tax evasion, tax liability, economic crimes, suppression measures, prevention*

JEL classification: *K140, K1, G190*

СУЗБИЈАЊЕ КРИВИЧНОГ ДЕЛА ПОРЕСКЕ УТАЈЕ КАО КЉУЧНИ ФАКТОР У БОРБИ ПРОТИВ "СИВЕ" ЕКОНОМИЈЕ

Апстракт

Пореска обавеза, интерес друштвене заједнице у циљу финансирања њених виталних интереса, представља законску обавезу и најважнији извор прихода буџета. Порески обвезници, осећајућући ову обавезу као терет сопственог економског положаја, мењају своје економске одлуке чиме чине кривична дела против привреде, дају негативан ефекат у привреди и штете друштвеној заједници утичући на износ финансирања јавних добара и заједничких потреба. Сврха чланка је да се анализом облика угрожавања

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фискалног система кршења пореских прописа истакне значај превенције и кривичноправне репресије у циљу сузбијања кривичног дела пореска утаја, а све у интересу друштвене заједнице, њене економске стабилности и привреде. У том циљу у чланку су првом делу применом анализе и статистичког метода обрађени економски утицај пореске утаје, нормативни оквири пореске утаје и њихова примена у пракси, а у другом делу је дат упоредни преглед узрока пореске утаје и мера за њено сузбијање. Закључак рада садржи предлоге де леге ференда за сузбијање пореске утаје, кроз институционални, правни и социо-економски оквир.

Кључне речи: пореска утаја, пореска обавеза, привредна кривична дела, порески деликти, узроци и мере, финансијски интерес

Introduction

The fiscal system (tax and customs system) in addition to the system of public revenues and expenditures represents a financing system, which can be violated by tax evasion and other economic crimes. Since the harmful consequences of tax evasion and other tax crimes are not immediately visible or transparent, taxation, i.e. tax liability and tax evasion, represent a sensitive and important issue which the author approaches in the article from an economic and legal perspective. Tax evasion, the most difficult form of tax evasion, viewed as socially dangerous and legally prohibited behavior, which harms the interest of the social community (Đerek, 2003), requires special attention and discussion by experts. For this reason, the article pays special attention to the normative framework of the Republic of Serbia and the presence of tax evasion in practice.

We should not ignore the fact that tax evasion produces harmful consequences for the country's fiscal system (Jovašević, 2018), but also the interests of individuals through the financing of public needs. Although the modus operandi of taxpayers who generate income in an illegal manner deserves social condemnation, this does not diminish the fact that the economic power of the taxpayer has increased through the realization of tax offenses and the criminal offense of tax evasion. "Despite the fact that public goods are financed with taxes, a number of taxpayers resort to behaviors that have characteristics of tax avoidance (tax evasion)" (Dimić, 2021, 79), which is one of the reasons for the importance of studying such phenomena.

The impact of tax evasion on the economic system

The reason for the increasing attention paid today to the problem of tax evasion (J. Šimović, Rogić Lugarić, Cindori, 2007) and thus to the gray economy, lies primarily in the possibility of serious consequences for the formation of an appropriate economic policy (Lovrinčević, Marić, Mikulić, 2006). The high level of tax evasion and the low level of processing of this part leads to the achievement of lower state revenues compared to the planned, when the state can choose between reducing expenditures or abandoning the financing of a public good, or to increase tax obligations in order to achieve the

planned financing. In the case of an increase in tax liabilities, the state directly affects the economic strength of "conscientious" taxpayers, reduces competitiveness, increases costs and creates the possibility for the growth of the gray economy. In theory, we come across the opinion that illegal evasion is one of the key examples of the existence of the gray economy (Matković, 2007).

The most important and most elaborate part of the fiscal system is the tax system, where taxes make up the majority of public revenue, or rather 95% of the republic's budget. The purpose of taxes, direct public revenue, is to cover the financial needs of the state and achieve economic and social goals. The same can be achieved through literacy and financial education (Milićević et al. & jovanović, 2022) as prerequisites for using financial opportunities (Barjaktarević Rakočević, Rakić, Ignjatović, Stevanović, 2021). First of all, with a successful tax policy, we can alleviate the macroeconomic imbalance, i.e. reduce the foreign trade deficit, tax evasion and gray economy (Gogić, 2020).

The OECD proclaims the clear definition of tax evasion as a criminal offense and the undertaking of repressive policy measures (OECD, 2017, p. 16) in order to suppress economic crime and tax crimes, given that previous research has shown large losses for state budgets due to the commission of these crimes.

Normative framework of tax evasion in the Republic of Serbia

The legal determination of tax obligations preceded the standardization of tax evasion. We still find the obligation to pay taxes in ancient civilizations (Karličić, 2015), and the provisions about it in the form of payment of imperial income (Novaković, 1870) are found in Dušan's Code (Dušan's Code 1349 and 1354). In order to ensure smooth functioning of tax payment, the same obligation is regulated by the Constitution (Article 91 of the Constitution of the RS), according to which tax payment is based on the ability to pay principle. Normation of tax evasion as a criminal offense is left to criminal legislation, with the fact that individual tax offenses are determined by tax legislation. In the period after the dissolution of the SFRY, the act of tax evasion was stipulated by tax regulations and was called "tax avoidance" (Article 172 of the Law on Tax Procedure and Tax Administration: hereinafter ZPPPA). The regulation of this offense is returned to the criminal legislation and classified as a group of criminal offenses against the country's economy, with the adoption of the Criminal Code in 2005. The goal of prescribing criminal offenses against the economy is to protect the economic system and its functioning (Jovanović, 2022. 249). Tax evasion is a basic fiscal crime in our legal system, systematized as a crime against the economy (Jovanović, 2022, p. 251). Unlike the legal definition of tax evasion in the Republic of Serbia, in some countries this offense is a tax offense, not a criminal offense. There are also differences in the incrimination of the act and the prescribed criminal sanctions.

"Tax evasion is by its very nature a blanket criminal offense, because the provision prescribing it refers to other norms, primarily tax legislation" (Risimović, 2016). It follows that in order to prove the act of tax evasion, we need to consult other regulations that do not belong to the field of criminal law (Mrvić, Petrović, 2018). The act of the criminal offense of tax evasion can be the act of committing, not reporting or omitting, and it is carried out as one of three forms of total or partial avoidance of paying taxes,

contributions or other prescribed duties: 1) providing false information about acquired income, about objects or other facts that are from influencing the determination of such obligations 2) non-declaration of acquired income, i.e. objects or other facts that influence the determination of such obligations, for which reporting is mandatory and 3) concealment of data related to the determination of said obligations, in another way (Article 225, paragraph 1 of the Criminal Code). The obligation to fulfill some of the mentioned actions is determined by the tax law, and it is prescribed for natural and legal persons (Article 12. ZPPPA). Their legal representatives can also be found as perpetrators of tax evasion (Art. 15 ZPPPA). With such a determination of the taxpayer, we reach possible perpetrators of tax evasion.

The condition for the incrimination of this offense as a criminal offense is the amount of the obligation whose payment is avoided, and according to positive regulations, if the amount exceeds a million dinars, it is a criminal offense, while in the case of an obligation below this amount, the offense is a misdemeanor for which misdemeanor penalties and protective measures are provided. The amount of the tax liability affects the distinction between the basic and two more serious forms of the crime, and thus the amount of the criminal sanction. The legislator prescribes a cumulative prison sentence and a fine, which emphasizes the lucrative nature of tax crimes (Kulić, Milošević, 2011, p.323). By imposing these sanctions, special prevention is achieved - influencing the perpetrators not to commit this criminal act in the future. Guilt is one of the mandatory elements of a criminal offense, in terms of culpability, premeditation is required (Jovanović, 2022, p 252). The intention is sufficient in itself, and it is not necessary for the existence of the act to achieve the goal. The absence of the intention to partially or completely avoid the payment of taxes, contributions or other duties does not mean the fulfillment of the subjective element of tax evasion, and therefore there will be no criminal offense of tax evasion (Škulić, Delibašić, 2018. p 71).

The Criminal Code does not provide for a time limit for the execution of this act. The position of the Supreme Court of Cassation was accepted that judicial practice applies a period of one fiscal or calendar year when avoiding payment of income tax, while for value added tax it applies three months. This leads us to assume a lower number of prosecutions of taxpayers for tax evasion because more taxpayers will be below the limit if the fiscal year is taken into account. The inadmissibility of the possibility of collecting unpaid tax for several accounting periods by judicial practice leads to the impossibility of fulfilling the objective condition of incrimination in case of exceeding the prescribed limit. All this leads us to the conclusion that numerous perpetrators of tax evasion will not be prosecuted.

In addition to legal tax avoidance (eng. tax avoidance), tax law science also knows illegal tax evasion (eng. tax evasion) (Lovčević, 1975), which is recognized by tax law and sanctioned by criminal law. The Law on Tax Procedure and Tax Administration prescribes the determination of the tax liability by the Tax Administration using the parification method, in the event that the opposite way was realized income, ie acquired property (Article 9 paragraph 3 ZPPPA). Illegally acquired income due to the taxpayer engaging in unregistered activities will be qualified as other income and taxed at a rate of 20% (Article 85 of the Law on Personal Income Tax). Income obtained by committing a criminal offense is taxed, and property benefits are confiscated in criminal proceedings. This brings us to the issue of criminal law protection of taxes that charge illegally obtained

income through the criminal offense of tax evasion. By amending the provision that excludes the term "legally" acquired income, the problem of the opinion that illegally acquired income cannot be taxed was solved, and the Tax Administration was enabled to tax illegal income. Previously, judicial practice was faced with a paradoxical situation (Đokić, 2016. p. 748) in which the defendant would have to be freed from the accusation if he proved that the income, in relation to which the tax was to be determined, was illegally acquired (Decision of the Court of Appeal in Belgrade KŽ1 1289/2014).

This does not mean that the permissibility of taxing illegal income means its legalization, which leads to the goal of the principle of facticity - to discourage unscrupulous taxpayers from abusing legal solutions to unacceptable tax evasion. Observing judicial practice, the principle of factuality could contribute to the criminal law protection of public revenues in Serbia if its more frequent application were present in judicial practice.

Application of the normative framework in practice

In Serbia, in the period from 2007 to 2010, 384 people were convicted of the crime of tax evasion, of which 133 people were sentenced to prison terms (RZS Bulletin, 2007-2010). Based on the analysis of the data on the number of people convicted of tax evasion, we conclude that a small number of people were sentenced to prison compared to the total number of people convicted. This leads us to the conclusion that in the mentioned period the penal policy is mild. What represents the problem of this period is the wrong qualification of criminal acts.

Table 1: Reported adults by criminal offense, 2002–2011. year, Source: RGZ Bulletin, 2011.

year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Criminal acts against the economy	2957	3221	3397	3347	2868	3333	2939	2767	2461	1814
Tax evasion	938	1132	1051	712	715	734	649	967	777	574

Analyzing statistical data for the period from 2011 to 2020, and in connection with the number of registered adults according to the group of criminal offenses - economic crimes and the criminal offense of tax evasion that belongs to this group, we see: 1) a tendency of growth until 2014, and then decrease in the number of reported criminal offenses against the economy, except in 2016 and 2) fluctuations in the number of reported criminal offenses of tax evasion, with the highest number recorded in 2012 and the lowest in 2020.

Table 2: Accused and convicted adults by criminal offense, Source: Bulletins of the RGZ, 2012-2020. year

year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Criminal acts against the economy - accusation	1499	1589	2240	2748	2570	2375	2015	1683	1345	1166
Tax evasion - accusation	449	499	705	788	778	643	551	417	392	326
Tax evasion - condemnation	262	246	290	400	449	419	392	266	274	194

Looking at the number of accused people in the period from 2011 to 2020 for criminal offenses against the economy and an individual offense - tax evasion, we see a recorded increase until 2014 and then a decrease until 2020. In relation to the number of indictments for the crime of tax evasion, the number of convictions is proportionally close to the increase or decrease, so in 2014 the highest number of indictments was recorded - 788, and in 2015 the highest number of convictions - 449. The lowest number of indictments and convictions was recorded in 2020 . The causes have not been precisely determined, so it is assumed that the tax discipline of taxpayers was strengthened in 2020.

In 2011, 999 people were convicted of crimes against the economy, of which 520 were employed, which indicates the fact that the economic power of an individual, which is taken into account in the tax system for determining tax obligations and benefits, does not play a decisive role in its influence on the commission of crimes.

In 2011, out of 262 people convicted for the criminal offense of tax evasion, 212 people were given a suspended sentence, 2 people were found guilty and acquitted, and 16 people were given an explicit fine, which indicates mild sanctions in judicial practice. In 2012, compared to the previous year, there was stricter punishment by determining the prison sentence for 54 people, with the fact that only 2 people were sentenced to prison for a duration of 3-5 years. In 2015, 340 people and in 2016, 950 people were sentenced with a suspended sentence. In 2017, 33 people were sanctioned with a people sentence of 6 to 12 months. In 2018, 50 people were sanctioned with a prison sentence, of which the largest number of convicted people were sentenced to a prison sentence of 6 to 12 months. In 2019, 34 people were sentenced to prison, of which 13 convicted people were sentenced to prison for 1 to 2 years, and 11 people to prison for 6 to 12 months. In 2020, 25 people were sanctioned with imprisonment, of which 11 people were sentenced to imprisonment for a period of 6 to 12 months. By looking at the statistical data, we come to the conclusion that the judicial practice of the courts in Serbia regarding the imposition of criminal legal sanctions is mild, that a large number of people were sentenced with a suspended sentence, which would mean that these are people who have been criminally prosecuted for the first time. In the second decade, the suspended sentence is replaced by a prison sentence, and it is generally milder, for a duration of 6 to 12 months, which leads us to the conclusion that there are more perpetrators - returnees. The assumption is that stricter punishment and repressive measures would give more effective results in terms of prevention.

Inadequate and mild punishment sends a negative message to taxpayers. The imposition of adequate penalties is important from the aspect of general prevention for the reason that tax evasion "represents a social danger that is reflected in the damage to fiscal interests because the state budget remains deprived of the evaded tax".

Based on the presented data, we come to the conclusion that dealing with the mentioned data is necessary from the point of view of pointing out the importance of taking appropriate measures and implementing the penal policy in practice, in order to suppress the crime of tax evasion and crimes against the economy in general.

EU directives and the situation in Europe

Directive (EU) 2017/137117 on the fight against fraud to the detriment of the financial interests of the European Union through criminal law measures (henceforth the PFI Directive) adopted by the European Union foresees the obligation for member states to: prescribe as criminal offenses the most serious forms of fraud in connection with value added tax; provide adequate and efficient mechanisms for the detection of tax offenses and appropriate investigative powers of competent authorities for the prosecution of such offences; provide effective powers for confiscation of income obtained from the commission of tax offenses; precisely define the competences of the relevant national authorities; ensure effective international cooperation.

Directive (EU) 2018/84319: prescribes the statute of limitations for criminal prosecution for criminal offenses to the detriment of the financial interests of the European Union for five years and not less than three years, and obliges to take the necessary measures that enable investigation, prosecution, trial and judicial decisions for criminal acts to the detriment of the financial interests of the European Union for which a maximum penalty of at least four years of imprisonment is prescribed (Article 12 of Directive 2018/84319).

According to the report of the European Commission, the fight against tax crime is complex and requires the interaction, cooperation and coordination of the members, as well as the expansion of the powers of the competent authorities. It is demanding considering that despite the stricter sanctioning system, tax crimes are still committed on a large scale and have negative effects on the financial system. A large number of countries, as well as the Republic of Serbia, provide for the cumulative imposition of prison sentences and fines (Macedonia, Bulgaria, France). Macedonia, Germany, Croatia and other countries prescribe harsher sentences - sentences of up to five years in prison, while lighter sentences are prescribed, e.g. Slovenia and Bulgaria.

Figure 1: VAT GAP in 2019, Source: 2021 GAP Report

The importance of the legal regulation of the tax system and the application of adequate measures and criminal protection are indicated by the data on the total income tax in the nominal amount, the gap in the EU, which in 2019 was reduced by almost 6.6 billion euros to 134 billion euros, which represents an improvement compared to the decrease from 2018 of 4.6 billion euros. The question arises of the impact of the corona virus pandemic on this downward trend. In 2019, the largest national gap in VAT compliance was recorded in Romania, with 34.9% of VAT revenue missing in 2019, followed by Greece (25.8%) and Malta (23.5%). The smallest gap was observed in Croatia (1.0%). In absolute terms, the largest VAT deficits were recorded in Italy (€30.1 billion) and Germany (€23.4 billion). Based on the data, we conclude that the share of the VAT Gap decreased in 18 member states, mostly in Croatia and Cyprus, while Greece, Lithuania, Bulgaria and Slovakia recorded a decrease of between -3.2 and -2.2 percent. In Sweden, Finland and Estonia, fiscal authorities limit the loss of VAT revenue to less than 5% of VAT. The experiences and practice of countries that have managed to limit the loss of VAT revenue for years could be guidelines for further action in the Republic of Serbia (GAP Report for 2021).

I conclude that the recommended measures for the purpose of establishing an adequate tax system and its criminal protection, and thus reducing the possibility of tax evasion, would be both in Europe and in Serbia: adequate state strategy (immediate coordination of states; appropriate coordination of tax rules of states strengthened by effective cooperation; application of principles non-discrimination in the jurisprudence of the European Court of Justice that cross-border situations cannot be treated less favorably than comparable domestic situations (COM/2006/823, 2006); harmonization between the taxation systems of countries in order to avoid double taxation and double non-taxation; introduction of minimum standards for cross-border loss relief which includes relief for losses of subsidiaries at the parent company level.

Causes of tax evasion and measures to combat it - results and discussion

It is not possible to predict and enumerate all the causes of tax evasion, which leads us to the conclusion that we cannot completely prevent tax evasion. What is possible is the classification of the causes of tax evasion into three groups: problems of institutional infrastructure, legal system and socio-economic causes. The largest number of causes can be found in the institutional infrastructure.

	CAUSES	MEASURES
INSTITUTIONAL INFRASTRUCTURE	corruption	"honest behavior"
	institutional weaknesses	-appropriate professional education of the official - education and improvement of the knowledge of civil servants -accreditation of Tax Studies within Law Faculties
	number of administrations	an efficient, fast, transparent and cheap tax administration that would collect as much tax revenue as possible
	administrative obstacles	▪ - establishing better understanding and trust between taxpayers and tax authorities; -providing information on taxes and assistance to taxpayers
	government and the ruling structure	trust in the Government and its institutions
LEGAL SYSTEM	unclear and imprecise legal provisions and legal gaps	clarity, precision and completeness of legal provisions
	frequent tax changes	stability of the tax system
	mild punishment	adequate type and severity of punishments
	insufficient supervision	- legal regulation of the institute of inspection supervision - the possibility of systematic monitoring of taxpayers
SOCIO-ECONOMIC	morals of the taxpayer	institutional equipment in raising tax morale
	amount of tax burden	fair distribution of the tax burden
	suspicion of abuse of public revenues	transparency

Research and statistical data related to tax evasion do not provide answers to the question of what are the specific causes of tax evasion, and which would enable its effective suppression.

Measures to combat and prevent tax evasion should be related to its cause and, in general, the extent of its presence in practice. It is necessary to observe the measures in their interdependence, and not individually, because that way they will give positive results. In the future, more attention should be paid to the application of preventive measures in order to make tax control more acceptable as a form of positive cooperation between the Tax Administration and taxpayers (Rapajić, Lapčević & Miladinović, 2021). We should also highlight the importance of cooperation between domestic and international tax authorities and the exchange of information between them. The adoption and implementation of the proposal for the adoption of the institution of crime prevention (Simonović, 2001) would give positive results in the prevention and suppression of the crime of tax evasion.

Conclusion

Due to the dynamism of social relations, tax crimes are subject to changes, which leads us to the need to adapt and change tax and criminal law regulations. In addition to the determination of criminal remedial measures and the pursuit of a just, socially justifiable and efficient criminal policy, engagement in the direction of prevention is necessary, with the aim of suppressing economic and tax crime. At the same time, it is necessary to foresee measures that will protect the object of protection of the criminal offense of tax evasion: the tax liability but also the fiscal system of a country. The reason for determining adequate measures and legal norms lies in the presence of problems during the prosecution of the criminal offense of tax evasion. We encounter problems during the implementation of the financial investigation and further during the process. Based on the presented norms in the Republic of Serbia, the penal policy of Serbia regarding the act of tax evasion is adequate, but despite this, the commission of this delict is present, it can be said due to the mild penal policy of the courts. The milder punishment present in court practice cannot give favorable results in terms of general and special prevention, and may contribute to non-compliance with tax regulations.

There is also the question of the satisfactory level of knowledge of officials in this area. It is necessary to raise the question of the adequacy of the incrimination in view of the harmful consequences of tax evasion for the fiscal system of the state. In order to overcome these issues and achieve prevention, and for the purpose of suppressing tax evasion, the following measures should be applied:

- Institutional measures: improvement of the entire tax administration; building relations with taxpayers; higher education of officials and their further education; building trust in the tax system, the Government and its institutions.
- Legal measures: stability of the tax system; precision of tax and criminal law regulations; review of the system of punishments and the lenient punishment policy of the courts; determination of the time frame for carrying out an action that has the characteristics of the criminal offense of tax evasion; determining the records of the tax administration in order to monitor taxpayers.
- Socio-economic measures: building the morale of taxpayers and transparency of public revenues and their intended spending.
- The experiences and practice of other countries that successfully limit the loss of tax revenue can serve as guidelines in the further actions of authorized state bodies and the legal regulation of their functions and powers.
- Harmonization between the taxation systems of the states, especially in order to avoid double taxation or double non-taxation, which favors the possibility of tax evasion.

The success of preventing tax evasion depends on adequate legal regulations that follow social changes, regulation of the tax system and the system of criminal justice protection, adequate cooperation and exchange of information between authorized state authorities and cross-border cooperation in general. The combination of these preventive and repressive measures can be effective provided that there is no lack of an adequate penal policy and its not mild application in practice. Only in this way, and with the

strengthening of tax discipline, tax evasion can be suppressed, that is, it can be influenced to deter illegal behavior.

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