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**INTERNATIONAL MAY CONFERENCE ON
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EXAMINATION OF THE TAM MODEL EXTERNAL FACTORS' INFLUENCE ON THE PERCEIVED EASE OF USE – THE CASE OF SAP ERP SYSTEM

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Abstract: This paper examines the influence of the external factors of the Technology Acceptance Model (TAM) on the perception of SAP system usability. TAM is a theoretical framework often used to analyze technology acceptance, while the SAP system is a complex Enterprise Resource Planning (ERP) system widely used in organizations. The external factors considered in this research are system complexity, system performance, user manual, social impact and work compatibility. A questionnaire was used to analyze the data using the structural equation modeling (SEM) technique. The results show that of the five external factors mentioned, only two factors have a statistically significant influence on perceived ease of use, namely system complexity and system performance. By considering external variables, these results can provide a deeper understanding of users' attitudes towards SAP ERP. This can help to better analyze and interpret the research results and suggest more effective strategies for the implementation and adoption of the system in companies.

Keywords: SAP, ERP, TAM, external factors, survey

1. INTRODUCTION

The development of Internet technologies and information systems (IS) for the needs of organizations has greatly facilitated the management of business processes. The systems used to support the management of an organization have evolved so that modern Enterprise Resource Planning (ERP) systems have become indispensable (Nwankpa, 2015).

ERP systems play a key role in organizations and provide comprehensive support for resource and process management. When implementing ERP systems, it is important to understand how users will accept and use them. Therefore, the Technology Acceptance Model (TAM) provides a theoretical framework for analyzing and predicting the acceptance of new technologies, including ERP systems. The TAM helps organizations understand the factors that influence user acceptance and adoption of ERP systems, which can be critical to the successful implementation and effective use of these systems in a business environment.

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TAM was originally conceptualized by Davis in 1989. The basic idea of this model was to explain how users perceive the adoption of a new technology (Cao et al., 2021). Since its first appearance in the scientific community, the TAM has been improved in terms of increasing the number of constructs. Today, it is considered a TAM I, TAM II and TAM III model.

TAM has found application in many areas. For example, recent researches use this model as a starting point for investigating the adoption of new technologies such as m-learning (Al-Emran et al., 2018), food delivery applications (Song et al., 2021), investigating tea farmers' intention to participate in livestream sales (Doanh et al., 2022), adoption of artificial intelligence applications (Saif et al., 2024), etc. Moreover, the TAM can serve as a starting point for exploring the adoption factors of ERP systems (Sternad & Bobek, 2013; Limantara et al., 2021).

Therefore, this paper aims to investigate the attitude of SAP ERP system users towards the influence of the external variables of the TAM model on perceived ease of use. In this research, the focus is on the users of SAP ERP system as SAP is on the list of leading developers and providers of ERP solutions. Companies that use SAP's ERP system in their organization are highly valued in the global market. According to available data, these companies represent 98% of 100% of the world's most valuable brands. Many of these companies also operate on the territory of Serbia, where the research for this paper was conducted (SAP, 2024).

The contribution of this research lies in a deeper understanding of the attitudes of SAP ERP system users, especially by identifying the most important factors that influence their perceived ease of use (PEOU). The research results obtained provide valuable insights into the way users experience the SAP ERP system and identify key elements that may facilitate or hinder their use. This knowledge can serve as a basis for further improving the SAP ERP system, customizing it to users' needs and enhancing the user experience, which can lead to more efficient and productive operations in companies using this system.

The article is structured as follows. After an introduction, the second part deals with the literature review and the third part with the methodology. The methodology section explains the methods used, followed by a discussion of the results and concluding remarks.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

TAM provides a theoretical framework for analyzing the adoption of new technologies, such as the SAP ERP system, and identifying factors that influence user perceptions (Cheng, 2015). In this research, the external variables of the TAM concept are of key importance. There are several different theories on which technology acceptance is based and therefore there are different views on which external variables should be included in the TAM concept when it comes to ERP systems.

A study by Chang et al. (2008) examined the influence of organizational factors (facilitating conditions and social factors), individual factors (short-term consequences, long-term consequences and affect) and technological factors (complexity and compatibility).

Putri et al. (2020) investigated the influence of three factors on the implementation of an ERP system in a distribution company. The factors related to top management support, training and technological complexity. Other research used other external variables such as factors related to user training, non-technological complexity and trainer support (Limantara et al., 2021).

This paper used external variables for SAP ERP solution adoption proposed by Sternad et al. (2019) related to system complexity, system performance, user guidance, social impact, and system complexity. A more detailed explanation of these variables can be found below.

2.1. System Complexity (SC)

Similar to other information systems, the ERP system has often been perceived as complex to understand and continue to use. System complexity can be defined as the degree to which the new technology is more complicated for the user than the previously used technology to perform the same or similar activities (Rajan & Baral, 2015). It also refers to the degree of complexity of the technology used by the customer and the level of difficulty and volume of transactions processed in information systems (Tahriri & Afsay, 2021). Ghallab et al. (2021) point out that the complexity of ERP systems can negatively influence users' attitudes towards using the system. This can be explained by the fact that the complexity of the SAP ERP system may require more time to master SAP and that the uncertainty and fear of making mistakes when working in SAP can lead to employee frustration. Since IS that are too complex to use are known to be difficult to accept at the same time (Chang et al., 2008), numerous studies have found that this external factor has a negative influence on PEOU. Therefore, this paper posits Hypothesis H₁: System complexity has a negative effect on perceived ease of use.

2.2. System performance (SP)

Marsudi and Pambudi (2021) confirmed that the performance indicators of companies improve after the implementation of IS thanks to the performance of the ERP system. On the other hand, research studies have demonstrated a significant relationship between the successful use of ERP systems and business performance. This means that the performance of the ERP system not only positively influences the perception of the ERP system, but also contributes to the overall efficiency of the company. If the system performs well, i.e. if it responds quickly to the customer's needs and ensures efficient execution of business tasks, users will consider the use of such a system to be meaningful (Al Shbail et al., 2024). Therefore, the following hypothesis is proposed H₂: System performance has a positive effect on perceived ease of use.

2.3. User manual (UM)

This external variable refers to written manuals in printed or electronic form, video manuals or other forms of information designed to help users effectively master the use of the SAP ERP system. An important segment after the implementation of the ERP system is the support provided by the ERP supplier, which is required in the form of guidance when harmonizing with new versions or updating existing functions or additions (Amado & Belfo, 2021). If there is good support in the form of user instructions, the degree of adoption of the ERP system is expected to be higher. Therefore, H₃ is proposed in this thesis: The user manual has a positive effect on perceived ease of use.

2.4. Social Impact (SI)

Social influence refers to the influence of social pressure and the opinions of influential people on a person to accept technology (Afsay et al., 2023). Previous research has shown that this factor plays an important role in the acceptance of new technologies, as the attitudes and values of the reference group to which a person belongs have an influence on the way a technology is accepted. In the research by AlMuhayfith and Shaiti (2020), organizational factors of top management support were found to have a significant impact on the success of ERP system adoption. If the social influence is positively oriented towards the use of the ERP system, then the individual's attitude towards the acceptance of the ERP system will also be positive

(Chang et al., 2008). This statement is followed by hypothesis H₄: Social influence has a positive effect on perceived ease of use.

2.5. Work Compatibility (WC)

This external variable can be explained as the match between people's values, experiences and needs and the new technology. Previous research has confirmed that compatibility has a positive effect on the constructs of the TAM model (Ozturk et al., 2016; Türker et al., 2022). Therefore, the following hypothesis is emphasized in H₅: Work compatibility has a positive effect on perceived ease of use.

Based on the theoretical review of the literature, a conceptual model was developed, which is shown in Figure 1.

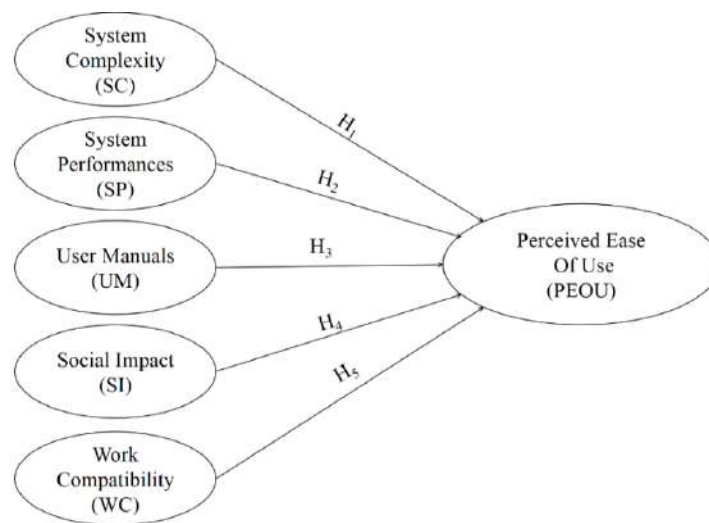


Figure 1. Conceptual model

3. METHODOLOGY

For this research, data was collected using an anonymous questionnaire based on the database of respondents created through the LinkedIn network, selecting respondents who work in the SAP ERP business software field. The survey was conducted in the second half of 2023. Of the 120 respondents to whom the questionnaire was sent, 94 answered all the survey questions in full. Respondents expressed their attitude using a five-point Likert scale, ranging from 1 (completely wrong) to 5 (completely right).

Structural equation modeling (SEM) was used to process the collected data and validate the hypotheses within the defined research model. SEM is a statistical method that can be used to test and analyze complex relationships between variables. SEM combines elements of factor analysis, regression analysis and path analysis to model complex relationships between manifest (directly measured) and latent (unmeasured) variables (Hsu et al., 2006). This methodology comprises two basic models: the measurement model and the structural model. The measurement model is assessed using reliability, convergence and discriminant validity tests (Sternad et al., 2019). The most commonly used reliability measures are Cronbach's alpha test and composite reliability (CR). These indicators should have a value of more than 0.70. The most commonly used measures of convergent validity are the factor loadings, which should have values above 0.70, and the average variance extracted (AVE), which should be above 0.50. The so-called heterotrait-monotrait (HTMT) matrix is used to check the discriminant validity.

For the measurement model to be considered valid, the HTMT values must be below 0.90. When looking at variable measures, the coefficient of determination (R^2) is also considered, which determines the percentage of variance of the dependent variable (Hair et al., 2021). In this case, R^2 explains what percentage of the variance of the dependent variable PEOU is explained by the independent variables SC, SP, UM, SI and WC. The structural model confirms or rejects the hypotheses regarding the path coefficients. Path coefficients represent the standardized beta values (β) of the regression analysis. The SmartPLS ver. 4 software was used to apply the SEM modeling.

4. RESULTS AND DISCUSSION

Of the total number of respondents (94 in total) who participated in the survey and who are familiar with the SAP ERP business software, 60.6% are male and 39.4% are female. The predominant age category among the respondents is the 30-39 age group (50%), while the fewest respondents are 50-59 years old (4.3%). In terms of education level, most respondents have a Master's degree (46.8%) and the fewest respondents have a PhD (3%). The respondents were assigned to different positions, from HR specialists, team leaders, marketing specialists, analysts and the like. In the survey, there were no respondents from micro-organizations, which usually include entrepreneurial activities for which the SAP ERP system is not required.

4.1. Measurement model

The measurement model includes tests of reliability, convergent validity and discriminant validity. The results of the reliability and validity are shown in Table 1.

Table 1. Construct reliability and validity

Construct	Cronbach's alpha	Composite reliability	Average variance extracted (AVE)
PEOU	0.859	0.859	0.877
SC	0.773	0.773	0.688
SI	0.735	0.740	0.655
SP	0.886	0.889	0.689
UM	0.921	0.921	0.863
WC	0.922	0.923	0.865

Considering that all reliability indicators (Cronbach's alpha and CR) are above the recommended value of 0.70 and that the convergent validity indicator of the AVE model is above the recommended value of 0.50, the measurement model is considered suitable for further analysis based on these tests.

Table 2 shows the results of the HTMT matrix. From Table 2 it can be concluded that all values of the HTMT matrix are below 0.90, which is the maximum recommended value.

Table 2. HTMT matrix

	PEOU	SC	SI	SP	UM	WC
PEOU						
SC	0.761					
SI	0.280	0.227				
SP	0.655	0.617	0.320			
UM	0.474	0.362	0.288	0.701		
WC	0.537	0.712	0.429	0.765	0.515	

Given that all indicators for the validity of the measurement model are within the recommended values, it is assumed that the evaluation of the structural model can be tackled.

4.2. Structural model

After the results were obtained using the measurement model, a structural model was applied and the results of the hypothesis tests are shown in Table 3.

Table 3. Results of tested hypotheses

Hypothesis		β	t statistics	p*	Result
H ₁	SC → PEOU	-0.480	3.546	0.000	Supported
H ₂	SP → PEOU	0.312	2.191	0.028	Supported
H ₃	UM → PEOU	0.109	1.323	0.186	Rejected
H ₄	SI → PEOU	0.075	0.926	0.354	Rejected
H ₅	WC → PEOU	-0.104	0.640	0.522	Rejected

*significance level 0.05

Figure 2 shows the results of the structural model. Based on the research results, it can be said that SC has a negative and statistically significant influence on PEOU. Based on these results, hypothesis H₁ ($\beta = -0.480$; $p < 0.05$) was accepted. This was also confirmed by previous studies (Chang et al., 2008; Ghallab et al., 2021). SP has a positive and statistically significant influence on PEOU and thus confirms hypothesis H₂ ($\beta = -0.312$; $p < 0.05$). The constructs UM and SI have a positive but not statistically significant influence on PEOU, which rejects hypotheses H₃ ($\beta = 0.109$; $p > 0.05$) and H₄ ($\beta = 0.075$; $p > 0.05$). The same applies to hypothesis H₅, which was also rejected ($\beta = -0.104$; $p > 0.05$). All external factors mentioned explain a total of 49% (R^2) of the variability of the dependent variable PEOU. In the original study (Sternad et al., 2019), the R^2 indicator was 0.50, which indicates the consistency of the study results.

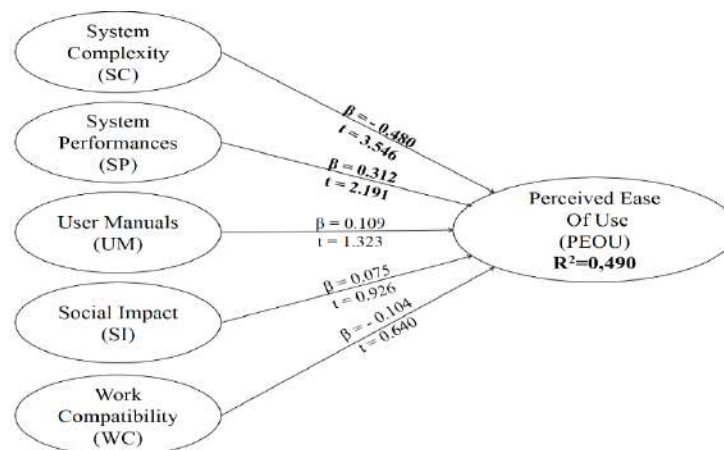


Figure 2. Structural model

5. CONCLUSION

The modern way of doing business is very different from the way organizations used to operate, and it is to be expected that the development of technologies and software engineering will cause such changes to continue. According to the available information, such changes are also taking place in Serbia, and it is not surprising that a large number of both large and small and medium-sized enterprises are switching from the traditional to the modern way of doing business due to the numerous advantages of using the ERP system. This paper presents the

results of an empirical study of a sample of SAP ERP system users from Serbia. The model examines the influence of external factors SC, SP, UM, SI and WC on PEOU as one of the basic constructs of the TAM model.

The research model was validated using the PLS structural modeling technique. The results show that out of the five external factors considered, only two factors have a statistically significant impact on PEOU, namely system complexity and system performance. When it comes to SAP ERP software, which includes complex information systems for enterprise resource planning, the complexity of the system can be an indicator of the richness of the functions that the software provides. If the software can perform a variety of complex tasks and processes, users may see this complexity as an indicator of powerful tools and features available to them. In this regard, users may perceive the software as user-friendly as they can perform a variety of tasks in one place. In addition, respondents believe that the high performance of the SAP ERP system, such as responsiveness, reliability and efficiency, contributes to its use. When a system responds quickly to user requests and performs tasks reliably, users view this efficiency as an indicator of ease of use. Faster and more efficient completion of user requests can make users' work easier, which also contributes to a positive perception of the software's usability. Understanding these external variables can help researchers to analyze and interpret the research findings on SAP ERP system users' attitudes more accurately and suggest more effective strategies for the implementation and adoption of this system in organizations. Despite some contribution, this research has its limitations. The first limitation relates to the sample size, which is insufficient to draw general conclusions. Therefore, a larger number of users of the SAP ERP system will be included in future research. The next limitation refers to the fact that only respondents from Serbia were included, as well as the fact that the respondents come from different fields of activity and different sizes of organizations in which they work. To overcome this limitation in future research, the sample should be expanded to other countries that have similar socio-cultural characteristics and the research should focus on only one type of industry to gain a more detailed insight into users' attitudes. In addition, the agenda of future research should aim to broaden the base of respondents, i.e. increase the sample size and test other ERP solutions available on the market.

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