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ERP Adoption Using Technology Acceptance Model: Case of Bosnia and Herzegovina

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Abstract

Even though the Enterprise Resource Planning (ERP) technologies have been significantly addressed in managerial literature, few studies investigated the topic in context of Bosnia and Herzegovina (B&H). This study explores the ERP technologies adoption using a Technology Acceptance Model (TAM). Accordingly, effects of Perceived Ease of Use and Perceived Usefulness on Behavioral Intention and Actual Use of ERP technologies in B&H will be investigated. Valid and reliable structured survey has been prepared and delivered to companies in B&H which are using ERP technologies. Based on the recent literature, first order structural equation model has been proposed and tested. In total, 82 questionnaire responses have been collected from companies in B&H which are using ERP technologies. Factory data analysis has been performed to purify scales through items' loadings and Cronbach's Alpha values. The scales were also tested for Convergent validity through partial least-square path modelling using Smart PLS 3 software. Results indicated that effects of Perceived Ease of Use on Behavioral Intention and Perceived Usefulness are significant and positive. Business Innovativeness has significant effects on Actual ERP System Use while Perceived Usefulness does not appear to be predictor of Behavioral Intention.

Keywords: Technology Acceptance Model (TAM), Enterprise Resource Planning (ERP), Bosnia and Herzegovina (B&H).

1. Introduction

Enterprise Resource Planning (ERP) technologies are becoming increasingly popular among companies in Bosnia and Herzegovina (B&H). However, even though many companies in B&H adopted and are using ERP technologies on a regular basis, official data on the adoption does not exist. Skopak (2016) reported that ERP has become an established phenomenon in B&H, but the investments are still far from fully utilized. His findings revealed that even though most of the companies have started to use ERP, they use it to integrate functional areas, but very few have moved to extended ERP. Furthermore, he found that even though companies in B&H are familiar with ERP knowledge, they are not sufficiently well informed (Skopak, 2016).

Therefore, the primary objective of this study is to measure ERP adoption level in B&H. More precisely, primarily, the study aims to investigate the effects of Perceived Ease of Use (PEoU) and Perceived Usefulness (PU) on Behavioral Intention (BI). Effects of BI on ERP Actual System Use (ERP_ASU) will be investigated as well.

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The information presented above kindled our interest in finding the answers to the following research questions:

(1) What is the level of ERP adoption in B&H?

(2) Are there any direct effects of PEoU on BI?

(3) Are there any direct effects of PU on BI?

(4) Does BI have any direct effects on ERP adoption?

To answer the above-mentioned research questions, a section of Bosnian companies which are using ERP technologies was studied and modelled by deploying the structural equation modelling (SEM) technique. The research was initiated by a piloting literature, developing a structured survey, proceeded with the results and concluded. More details on these undertakings are presented in the later sections of this paper.

2. Literature review

The accompanying literature review is a consequence of the assessment of profoundly ordered textbooks and journals. It gives fundamental data which recognized variables, structure the study model and hypotheses, and distinguish enough items to quantify the variables. The exploration yielded three factors that are analyzed in the accompanying sections, specifically, behavioral intention, and actual system use.

2.1 *Enterprise Resource Planning (ERP)*

Enterprise Resource Planning systems (ERP) gives the spine to a venture wide data system. At the center of this enterprise software is the main database which draws information from and sustains information into secluded applications that work on a typical registering stage, in this way institutionalizing business procedures and information definitions into a bound together condition. With an ERP system, the information should be entered just once. The system gives consistency and visibility or transparency over the whole enterprise. An essential advantage of ERP is simpler access to dependable, coordinated data. A related advantage is the end of repetitive information and the defense of procedures, which bring about considerable expense investment funds (Davenport, 1998).

Implementing ERP systems, a strand of literature on ERP says that organizations (need to) experience an expectation to learn, adapt and afterward investment get benefit from it (Ross & Vitale, 2000).

2.2 *Perceived Ease of Use (PEoU)*

Perceived ease of use determines how much an individual accepts that utilizing a specific system would be liberated from physical and mental exertion. Furthermore, it clarifies the client's impression of the measure of exertion required to use the system or degree to which a client accepts that utilizing a specific innovation will be easy (Davis, 1989).

2.3 *Perceived Usefulness (PU)*

Perceived usefulness has been characterized as an individual's abstract impression of the capacity of a PC to expand the work execution while finishing an errand, which influences their apparent convenience along these lines indirectly affecting client's innovation acknowledgment.

It represents the degree to which an individual accepts that utilizing a specific innovation will upgrade their activity execution (Davis, 1986).

A system high in perceived usefulness is one for which a client has confidence. Individuals will in general use or not to utilize a framework useful to the degree they trust it will help them (Davis, 1989).

2.4 *Behavioral Intention (BI)*

According to Warshaw and Davis (1985) behavioral intention (BI) refers to defined designs to perform or not to perform some predefined future conduct. Therefore, the meaning of (BI) on the standard word reference meaning of "expectation". More precisely, it helps understand if respondent is having something at the top of the priority list that he/she plans to do, use, give, and so on. The reason for embracing this lexicon-based significance is twofold:

(1) Intention has not been plainly, unequivocally characterized in social writing. Or maybe, it is normally left vague, apparently in the light of the fact that its importance is "undeniable" (Ajzen & Fishbein, 1980). At the point, when a definition is proffered, an outcome of having expectation is indicated as opposed to the significance of goal fundamentally, e.g., "Our hypothesis sees an individual's goal to perform (or not play out) conduct as the prompt determinant of the activity" Ajzen and Fishbein (1980). Goal is characterized as self-prediction, e.g., "A proportion of the probability that an individual will take part in given conduct might be named social goal" (Fishbein & Ajzen, 1975).

(2) Studies that have inspired what we translate to be expectation (BI) reactions from subjects have commonly utilized poll wording like "I plan to (do X)" (Ajzen & Fishbein, 1980). Probably, without directions, respondents credit the ordinary significance to the word "plan" while addressing such inquiries, which is reflected in its standard lexicon meaning.

2.5 *Actual System Use (ASU)*

The actual system use alludes to how regularly and the volume of a system used by the client (Davis, 1989). Davis states that one's social goal impact actual system usage. This is because of disguise and distinguishing proof and may impact BI through consistence. It is additionally contended that if end clients of the system are not educated or taught about the need or importance of the framework, this will enormously impact their BI to utilize it, and thus sway on actual use (Nakayima, 2011).

In this study, Actual System Use (ASU) refers to how regularly the user is using an ERP technology in his/her work.

2.6 *Research model & hypotheses*

To investigate ERP adoption level in Bosnia and Herzegovina, we will rely on a widely used Technology Acceptance Model (TAM) developed by Davis (1986). He proposed the Technology Acceptance Model (TAM) in order to explain the adoption and use of information technology. According to TAM, perceived usefulness (PU) and perceived ease of use (PEOU) are the two key determinants of technology adoption. Davis (1986) defined several components of Technology Acceptance Model such are those presented in figure 1.
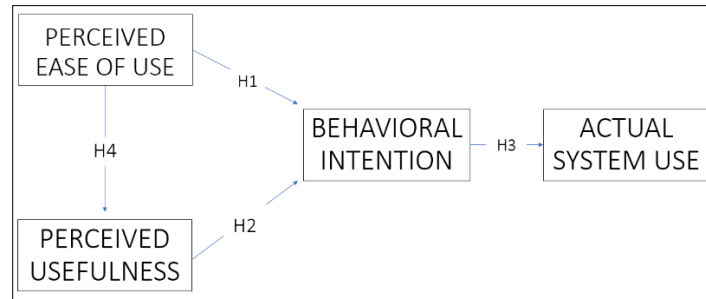
Figure 1. Technology Acceptance Model (Davis, 1986; Davis, 1989)

Accordingly, following hypotheses will be investigated:

H1: Perceived Ease of Use affects Behavioral Intention to use ERP technologies in B&H;

H2: Perceived Usefulness affects Behavioral Intention to use ERP technologies in B&H;

H3: Behavioral Intention affects Actual ERP technologies Use;

H4: Perceived Ease of Use affects Perceived Usefulness of ERP in B&H.

3. Methodology

3.1 *Data collection*

The data used in this survey was collected by distributing a structured survey. Scales used for the preparation of this instrument were previously used by researchers and proven reliable and valid for measuring perceived ease of use, perceived usefulness, behavioral intention, and actual system use. For measurement of Perceived Ease of Use and Perceived Usefulness, the work of Davis (1989) was very useful. Behavioral Intention has been measured using instruments of Callum, Jeffrey and Kinshuk (2014). Finally, the measurement of Actual System Use was created based on the work of Raymond (2019).

Items in the questionnaire for perceived ease of use, perceived usefulness, behavioral intention and actual system usage were measured with a five-point semantic differential scale. Distributed survey contained questions in five diverse classifications as follows:

- Questions 1-7: Demographics;
- Questions 8-14: Perceived Usefulness;
- Questions 15-20: Perceived Ease of Use;
- Questions 21-23: Behavioral Intention;
- Questions 24-26: Actual System Use.

Data was collected using online (digital form), but also by pen and paper approach. The respondents were contacted both via email, but also face to face.

3.2 *Sample*

The sample of this study were employees working in Bosnian companies which are using ERP technology on a regular basis. As the official list of ERP users does not exist in B&H, the only relevant sampling methodology was simple random sampling. Out of 150 contacted companies, 82 responses were collected indicating a response rate of 41%. If we consider that the data was collected at time of COVID 19 which caused many difficulties in the process, the response rate could be labeled as satisfactory.

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3.3 *Data analysis*

Once the data was collected, it was processed using Software Package for Social Sciences and Smart PLS 3 software (a SEM software).

The causal relationships of the hypothetical model shown in Figure 1 were tested by means of the partial least square (PLS) path modelling method. Following instructions of Becker, Klein and Wetzels (2012) the following steps were performed to prepare structural equation model using Smart PLS3: (1) latent variables were created and related measurement items were assigned to them; (2) and the independent variables are related to one dependent variables.
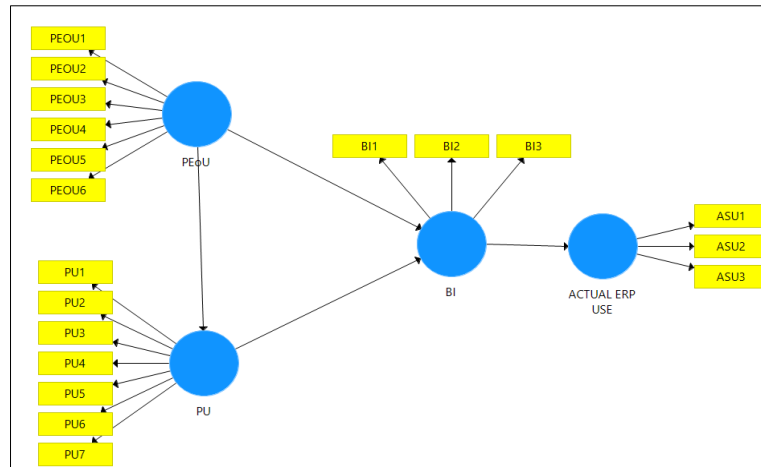

Figure 2. Model in Smart PLS 3

This study relied on Software Package for Social Sciences for descriptive analysis while Smart PLS 3, a SEM program has been used for confirmatory factor analysis, model fit and effects analysis. PLS could be applied in many instances of small samples when other methods fail (Henseler et al., 2014). Regular PLS algorithm and Bootstrapping technique were conducted in Smart PLS 3 to conduct exploratory factor analysis, confirmatory factor analysis and investigate direct effects of variables in the model. To ensure stability of results, following recommendation of Hair, Sarstedt, Ringle and Gudergan (2017), PLS Bootstrapping was completed using 10,000 bootstrap subsamples.

4. Validity, reliability and model fit

To test the construct validity of the instrument, both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were made using Smart PLS 3. The main findings of the two mentioned analyses will be presented in the following paragraphs.

Factor loadings were observed for each item (see Table 1). Items with factor loadings greater than .5 on the factor with which they were hypothesized to correspond were considered adequate indicators of that factor (Hair, Black, Babin & Anderson, 2010).

Figure 3 presents acceptable loading of items on all variables. Accordingly, there was no need for removal of any item(s).
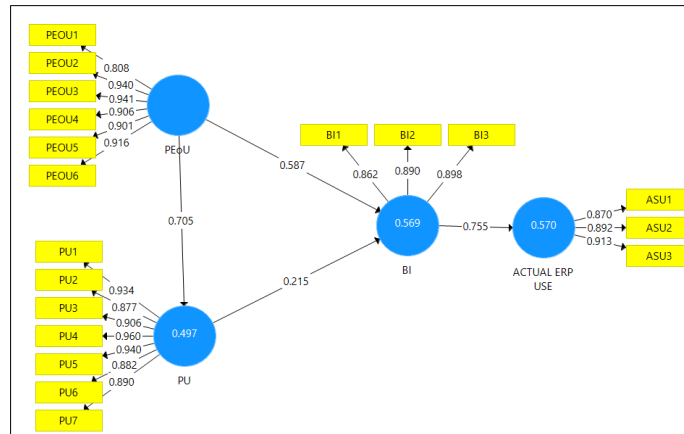
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Figure 3. Loadings of items per factors

Cronbach's (1951) coefficient alpha is widely used to determine the reliability of multi-item scales and assess the internal consistency of model constructs. The reliability of factors in this study has been presented in Table 1 below.

Table 1. Construct validation

Factor	C's ∝ >0.7	CR >0.7	AVE >0.5	ACTUAL ERP USE	BI	PEoU	PU
ACTUAL ERP USE	0.872	0.883	0.795	**0.892**			
BI	0.860	0.863	0.781	0.755	**0.884**		
PEoU	0.954	0.959	0.815	0.699	0.739	**0.903**	
PU	0.967	0.968	0.834	0.699	0.629	0.705	**0.913**
Note 1: The right-hand part of the table displays construct correlations and square roots of AVE on the diagonal). Note 2: C's ∝ = Cronbach's Alpha							

PLS Bootstrapping is completed using 10,000 bootstrap subsamples indicating all AVE values between 0.610 and 0.781 which is above threshold of 0.5 defined by Fornell and Larcker (1981) and Hair, Black, Babin, and Anderson (2010).

Cronbach's Alpha values of all first order latent variables conform to the rule of thumb defined by Cronbach and Richard (2004), and this is confirmed by composite reliability scores which are all higher than the recommended cut-off of 0.7 (Fornell & Larcker, 1981; Hair, Black, Babin & Anderson, 2010).

According to Schmiedel, Brocke and Recker (2014) discriminant validity is ensured once the AVE value for each construct exceeds the squared correlation between that and any other construct in the factor correlation matrix. Table 1 indicates a full compliance to this rule.

Considering factor loadings of all items higher than 0.4, composite reliability scores higher than 0.7, and AVE values higher than 0.5, it could be concluded that all conditions of convergent validity are met in this study.

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5. Results

5.1 *Demographics*

The questionnaire provided 82 valid responses in total. There were 39 male and 43 female respondents, which shows that both genders are equally active ERP users. Most of respondents are graduates with bachelor's degree (41.5%) and master's degree (35.4%). Only 5 respondents are aged 51 years and more, but most of them are adults aged between 31-40 years (40.2%) and young adults aged between 20-30 years (35.4%). Most respondents use ERP technologies monthly 11 times and more, precisely 64 users, while just 2 responded never. More than half respondents (57.3%) uses 5 or more than 5 modules at the company currently, then 3 modules are used by 13 respondents. Most of respondents answered that their company is using local server-based ERP, 61 precisely, while cloud server-based ERP 21 or (25.6%).

Table 2. Sample characteristics

Variable	Demographics	Number	Valid Percent
Gender	Male	39	47.6%
	Female	43	52.4%
	Total	**82**	**100.0%**
Education	High School	18	22.0%
	Bachelor Degree	34	41.5%
	Master Degree	29	35.4%
	PhD Degree	1	1.2%
	Total	**82**	**100.0%**
Age	20-30 years	29	35.4%
	31-40 years	33	40.2%
	41-50 years	15	18.3%
	51 years and more	5	6.1%
	Total	**82**	**100.0%**
ERP Usage Frequency *(Times/month)*	Never	2	2.4%
	1-5 Times/month	11	13.4%
	6-10 Times/month	5	6.1%
	11 times and more	64	78.0%
	Total	**82**	**100.0%**
ERP Modules Used *(number of modules used in a respondents company)*	1	8	9.8%
	2	6	7.3%
	3	13	15.9%
	4	8	9.8%
	5+	47	57.3%
	Total	**82**	**100.0%**
ERP Type Installed *(type of ERP installed on a respondents company)*	Local server based EPR	61	74.4%
	Cloud server based ERP	21	25.6%
	Total	**82**	**100.0%**

5.2 *Empirical findings*

All empirical findings are summarized in the table below.

Table 3. Hypotheses' tests

Hypothesis	Path in the Model	Direct Effects	Hypothesis Status
H1	PEoU -> BI	p = 0.000** t = 6.751	Supported
H2	PU -> BI	p = 0.058 t = 1.895	Not Supported
H3	BI -> ASU	p = 0.000** t = 11.707	Supported
H4	PEoU -> PU	p = 0.000** t = 7.619	Supported
Note 1: * Significant at 95% confidence interval Note 2: ** Significant at 99% confidence interval			

H1: *Perceived Ease of Use affects Behavioral Intention to use ERP technologies in B&H.*

Hypothesis 1 was supported with p value of 0.000, as well as the t value of 6.751. The direct effects are regarded as significant at 99% confidence interval.

H2: *Perceived Usefulness affects Behavioral Intention to use ERP technologies in B&H.*

Hypothesis 2 was not supported with p value of 0.058, as well as the t value of 1.895. The direct effects are regarded as not significant at 95% confidence interval.

H3: *Behavioral Intention affects Actual ERP technologies Use*

Hypothesis 3 was supported with p value of 0.000, as well as the t value of 11.707. The direct effects are regarded as significant at 99% confidence interval.

H4: *Perceived Ease of Use affects Perceived Usefulness of ERP in B&H.*

Hypothesis 4 was supported with p value of 0.000, as well as the t value of 7.619. The direct effects are regarded as significant at 99% confidence interval.

6. Discussion and conclusion

This study empirically explained ERP adoption in B&H through TAM. The findings revealed that PEoU has a significant direct effect on the BI in Bosnia and Herzegovina, while PU is not significant predictor. On the other hand, BI has positive direct effects on ERP adoption, while PEoU has positive direct effects on PU. The results emphasized the crucial role played by PEoU and BI in the ERP adoption by users in Bosnia and Herzegovina.

The one may conclude that Perceived Usefulness is no longer a valid predictor of Behavioral Intention since ERP users in B&H find all ERP systems useful. However, what makes the difference is Perceived Ease of Use, and this appears to be significant predictor of Behavioral Intention to use ERP technologies.

Even though the number of observations was limited (82 responses), exploratory and confirmatory factor analysis conducted using a Smart PLS (a SEM program) indicated high level of validity and reliability. The data collection was done in Bosnia and Herzegovina, and the data gathered is assumed to be the representative for the entire population of Bosnian companies using ERP technologies. Further studies should consider significantly larger samples.

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This research provides supporting evidence to the already existing, yet modest literature on PEoU, PU, BI and ERP Adoption in B&H. All scales used in this study were validated which can be useful for future researchers.

It is recommended to repeat the study at different times, and provide conclusions using data from specific time period. In addition, segmenting the sample according to size and providing specific studies of this type for small, medium and large companies would be another recommendation.

Acknowledgements

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