Impacts of Personal Characteristics of Students on Their Acceptance of ERP Solutions in Learning Process

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Abstract: Enterprise Resource Planning (ERP) solutions are the most frequently used software tool in companies in all industries. The growing body of scientific literature about the acceptance of ERP solutions by users in companies reflects the growing perceived importance of ERP solutions for business management as well. The labour market requires the knowledge and skills for usage of ERP solutions from graduates – future employees. The main objective of our paper is therefore the identification of important factors that contribute to the acceptance of ERP solutions by students in economics and business and that shape their intentions to use this knowledge in the future. The conceptual model of our research is based on the Technology Acceptance Model (TAM), extended by previously identified important multidimensional external factors that refer to students' personal characteristics and information literacy. The conceptual model formed was tested using the structural equation modelling. Research results revealed that only two of external factors play an important role in shaping the attitudes towards acceptance of ERP solutions by students. Results of the study have important implications for higher education institutions, reforming and updating their study programs, as well as for educators in the field of information science.

1 INTRODUCTION

Backbone of every successful business today is integrated information system known as ERP (Enterprise Resource Planning) system. Because of the large number of ERP implementations worldwide, number of the ERP users within organizations is growing very fast as well. Each company strives to have very good ERP based skill worker, and we could say that that become highly demandable prerequisite. But today's business is going much further of just perform every day activities on ERP system.

The turbulent changes that have occurred in the last few years with the emergence of new coins such as Digital Transformation, Internet of Things/Everything, Cloud Computing, Machine Learning, Natural Language Processing, Block Chain, Augmented Reality, Virtual Reality have a strong influence on the operations of each company. The direct consequence of this is the change in knowledge and skills in the labour market. This means that the knowledge and skills required by employers are directed towards the application of these new digital technologies. That reflex to the ERP market where some radical changes in the way that ERP solutions support business are done and currently new technologies are trying to be embedded in new versions of ERP systems.

The gap between industry and the academic is certainly decreasing and these higher education institutions are trying to produce a competitive student for the labour market. Therefore, new curricula are created where courses include models that have just been developed for this purpose like Standards of Profession, Skills Framework for the Information Age, Croatian Qualification Framework and so on.

On the other hand, all leading ERP vendors such as SAP, Microsoft, Oracle etc. have university academic alliances such as SAP University Alliances

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(SAP, 2018), Microsoft Dynamics Academic Alliance (Microsoft, 2018), Oracle University (Oracle, 2018) etc. which help higher education institutions to use their ERP solutions in their curriculum and thus preparing students with hands-on experience in using modern business applications.

All the above, leads to the conclusion that acquiring a set of skills and knowledge of ERP solutions usage are among important competences of graduates in the field of information systems and economics and business, for achieving a competitive position in the labour market. Also, because students have different starting points in knowledge of business and information-comunicaton technology skills and as digital technologies are emerging in business it is necessarily to define a student's profile suitable for the labour market.

The question that arise is: *How to teach student this extensive segment of the whole business of a company that is supported through the information system (ERP system)?*

Despite the recognized importance of the ERP solutions as a business management tool within companies and the importance of this knowledge for graduates, researches aimed at identification of factors shaping students' attitudes towards the acceptance of ERP solutions, are rather scarce (Davis andComeau, 2004; Shivers-Blackwell and Charles, 2006; Scott and Walczak, 2009; Iriberri, 2015).

The main objective of our paper is therefore *the identification of important factors of personal characteristics and information literacy (PCIL) that contribute to the acceptance of ERP solutions* by students in informatics and that shape their intentions to use this knowledge in the future. The conceptual model of our research is based on TAM.

2 LITERATURE REVIEW ON ACCEPTANCE OF ERP SOLUTIONS

Several theoretical models have been used to investigate the determinants of acceptance and the use of new information technology (IT), such as the theory of reasoned action (TRA; Fishbein and Ajzen, 1975), the theory of planned behaviour (TPB; Ajzen, 1991), the theory of the technology acceptance model (TAM; Davis et al., 1989), innovation diffusion theory (IDT; Rogers, 2003), stage model (SM; Poon and Swatman, 1999), technology-environment-organization (T-O-E; Tornatzky and Fleisher, 1990); and others. Compared to competing models, TAM is believed to be more parsimonious, predicative, and robust (Venkatesh and Davis, 2000; Lu et al., 2003; Liu and Ma, 2006), and so among the theoretical models is most widely used by IS/IT researchers (Davis, 1989; Davis et al., 1989; Amoako-Gyampah and Salam, 2004; Lee et al., 2010; Costa et al., 2016) and therefore numerous IS researchers apply this method to ERP research.

Even though TAM can be applied to a variety of technologies, the constructs of TAM need to be extended by customizing factors for specific information systems (Calisir et al., 2009). Few studies, have investigated ERP user acceptance and usage utilizing TAM, and most of them investigate a small number of external factors (for latest researches see Calisir et al., 2009; Shih and Huang, 2009; Sun et al., 2009; Youngberg et al., 2009; Lee et al., 2010; Sternad et al. 2011; Sternad and Bobek, 2013, 2014; Mayeh et al., 2016; Costa et al., 2016). Shivers-Blackwell and Charles (2006) and Scott and Walczak (2009) researched students ERP acceptance through TAM model. But both authors used small numbers of external factors. Shivers-Blackwell and Charles (2006) also researched student readiness to use ERP technology through model TAM, but they researched ERP acceptance after students read an online newsletter provided by the ERP communication, education, and training team entitled "What is ERP". Participants were then requested by their professors to complete the survey. So, they did not have practical experience with use of ERP solution. Their research shows that gender and perceived ERP benefits are related to students' readiness for change, and readiness for change is a significant predictor of students' attitude toward usage of the ERP system. Scott and Walczak (2009) examined cognitive engagement, prior experience, computer anxiety, and organizational support as determinants of computer self-efficacy in the use of a multimedia ERP system's training tool. They also examined the impact of computer self-efficacy on its acceptance. Their sample consisted of students taking an ERP course elective in the information systems undergraduate and graduate programs.

3 CONCEPTUAL MODEL AND RESEARCH DESIGN

The main objective of our research is to identify the factors, included into the extended TAM as external factors, that are significantly shaping the antecedents

of students' attitudes and future intentions of students to use the ERP solutions.

As already mentioned, the TAM introduced by Davis (1989) and Davis et al. (1989), suggests the following relationships (this original TAM is presented by grey rectangle in Figure 1) among the factors, that are perceived ease of use (PEOU), perceived usefulness (PU), attitude toward using ERP system (AT), behaviour intention (BI) and actual use (Use) of IT/IS (hypotheses H1 to H5). In the case of our research refer to the ERP solutions:

- H1: Perceived ERP ease of use (PEOU) has positive and direct effect on perceived ERP usefulness (PU).
- H2: Perceived ERP ease of use (PEOU) has positive and direct effect on attitude toward ERP system (AT).
- H3: Perceived ERP usefulness (PU) has positive and direct effect on attitude toward ERP system (AT).
- H4: Attitude toward ERP system (AT) has positive and direct effect on behaviour intention (BI).
- H5: Behavior intention (BI) has positive and direct effect on actual use (Use).

Even though TAM can be applied to a variety of technologies, it must be extended and modified for analysis of specific information systems (Calisir et al., 2009), as we already pointed out. The literature review revealed that the external factors in general can be divided into more groups of factors (Sternad et al., 2011, Sternad and Bobek, 2013, 2014).

One of exposed groups could be factors of personal characteristics and information literacy, which including personal characteristics that can influence individuals' perceptions of ERP system acceptance and usage.

We were exposed five factors:

- Personal Innovativeness toward IT (PI) from the IT view-point (Yi et al., 2006; Thompson et al., 2006),
- Computer Anxiety (CA) (Venkatesh et al., 2003; Scott and Walczak, 2009)
- Computer Self-Efficiency (CS) (Venkatesh and Davis, 2000; Venkatesh et al., 2003; Shih and Huang, 2009)
- Individual Benefits (IB) (Hsu et al., 2015; Rienzo andHan, 2011)
- Computer Playfulness (CP) (Venkatesh andBala 2008)

Above mentioned authors expose in their studies, that external factors of PI, CA, CS, BI and CP have impact on perceived ease of use (PEOU) and/or perceived usefulness (PU) in different IT/IS environment (mostly voluntary use). In the case of our research refer to the ERP solutions, Therefore the following two hypotheses were formed:

- H6: External factors PI, CA, CS, BI and CP have positive and direct effect on perceived ERP usefulness (PU).
- H7: External factors PI, CA, CS, BI and CP have positive and direct effect on perceived ERP ease of use (PEOU).

The questionnaire was developed in three phases. In the first phase, we clarified the relationships between the constructs and the measurement scales for individual constructs, we reviewed the literature and resources. A questionnaire was employed. All items in the questionnaire were scored on a 7-point

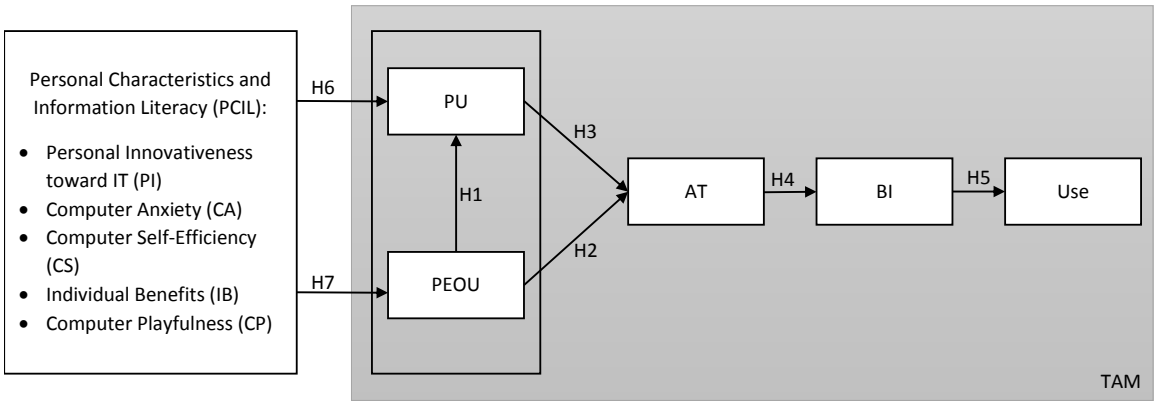

Figure 1: Conceptual Model.

Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The research design consisted of five constructs arising from the TAM model (PEOU, PU, AT, BI and Use) and five external factors (PI, CA, CS, IB and CP), that we formed and included into the expanded TAM model. Our conceptual model includes ten first-order factors.

In the second phase the instrument was pilot tested with a small group of students, who head ERP solution (20 students) as elective subject. Based on the results of the pilot testing, small revisions and additions regarding word order were made to the instrument.

In the third phase the survey was conducted. Our sample included a total of 85 Croatian students in the second (4th semester) year of graduate study programs "Information and Software Engineering", "Organization of Business Systems" and "Databases and Knowledge Base". The survey was carried out at the beginning of semester after students' have introduction with Microsoft Dynamics NAV ERP solution (after 2 lecture hours), within the course that includes all together 30 teaching hours of lectures of ERP topics with focus on selecting and implementing integral information systems in methodological way and 30 hours in computer labs where students adopt the knowledge of the business processes functions in Microsoft Dynamics NAV (introduction, basic in finance and accounting process, purchasing process, sales process and some advance functionality simulating every day activities). The Microsoft Dynamics NAV 2016 (NAV) was used. On the second lecture in the semester (October 2018) 85 questionnaires were properly filled out by respondents and used for the purpose of analysis. Respondents were 16.47 % (14) male and 83.53 % (71) female. The average age of students was 20.70 years.

Demographic data was analysed by SPSS. All other empirical data was analysed in two steps analysis using partial least squares (PLS) technique, with Smart PLS 3.2.1 (Ringle et al., 2015). PLS path modelling is a variance-based structural equation modelling (SEM) technique which is widely used in education, business and social sciences in past two decades (Henseler et al., 2016; Garson 2016). We utilized this approach because of the relatively small sample size. In the first step, measurement model was assessed, and in the second step, structural model. Path significance has been estimated using bootstrapping resampling technique with 5000 sub-samples as suggested by Ringle et al. (2015). While analysing data, we followed the guidelines specified by Henseler et al. (2016) and Garson (2016).

4 ANALYSIS AND RESULTS

All measurement scales were examined for their psychometric properties (reliability, convergent validity, and discriminant validity) prior to testing hypotheses (bootstrapping with 5000 subsamples) (Henseler et al., 2016). While all items did not meet assessment requirements of the measurement model, it was excluded from further analysis. The final version of the model is present. Detailed analysis can be obtained from the authors.

Table 1: Descriptive statistics and psychometric properties of measures (n=85).

Factor	Items	M	SD	Loadings	CR	AVE
Personal Innovativeness toward IT (PI)	PI1	5.11	1.18	0.85	0.89	0.73
	PI2	4.24	1.38	0.85		
	PI3	5.17	1.21	0.86		
Computer Anxiety (CA)	CA1*	2.17	1.57	0.89	0.90	0.74
	CA2*	1.59	1.27	0.84		
	CA3*	1.51	1.08	0.86		
Computer Self-Efficiency (CS)	CS1	5.10	1.24	0.84	0.81	0.52
	CS2	5.01	1.33	0.75		
	CS3	5.50	1.21	0.65		
	CS4	5.63	1.16	0.62		
Individual Benefits (IB)	BI1	6.61	1.18	0.60	0.75	0.61
	BI2	5.15	1.26	0.93		
Computer Playfulness (CP)	CP1	4.85	1.44	0.91	0.96	0.86
	CP2	4.70	1.41	0.85		
	CP33	4.67	1.38	0.95		
	CP4	5.03	1.42	0.90		
Perceived ERP usefulness (PU)	PU1	5.08	1.03	0.85	0.89	0.67
	PU2	5.10	1.13	0.80		
	PU3	4.61	1.18	0.85		
	PU4	4.41	1.16	0.77		
Perceived ERP ease of use (PEOU)	PEOU1	4.51	0.89	0.82	0.89	0.66
	PEOU2	4.55	0.87	0.81		
	PEOU3	4.33	1.05	0.72		
	PEOU4	4.48	0.93	0.90		
Attitude toward using ERP (AT)	AT1	5.22	1.27	0.81	0.86	0.68
	AT2	4.91	1.27	0.83		
	AT3	4.61	1.24	0.83		
Behaviour intention (BI)	BI1	4.50	1.25	0.95	0.96	0.89
	BI2	4.41	1.34	0.95		
	BI3	4.27	1.34	0.94		
Use	Use1	5.03	1.57	0.46	0.86	0.61
	Use2	4.95	0.99	0.85		
	Use3	4.65	0.98	0.86		
	Use4	4.53	1.07	0.89		

Note: * Intverted scale

Internal consistency reliability was examined by composite reliability (CR), where value should be more than 0.6. For assessment of validity, two validity subtypes are usually used: the convergent validity and the discriminant validity. For convergent validity Fornell and Larcker's assessment criteria has been used: the average variance extracted (AVE) for each construct should exceed 0.50. As shown in Table 1 each of our ten factors had value CR above 0.6 and value AVE above 0.50. All factors loadings are significant at p<0.01 and almost all (except one) exceed 0.60.

Our measurement scales meet the criteria for convergent validity. AVE is also used to establish discriminant validity by the Fornell and Larcker criterion. For our model values of the square root of AVE are higher than correlations between factors, which appear below it. The value of standardized root mean square residual (SRMS) measures the difference between the observed correlation matrix and the model. Model has good fit when SRMS is less than 0.10 (Garson, 2016). SRMR of our model is 0.082, which means that model is acceptable.

The structural model was examined to test hypotheses. Paths are interpreted as standardised beta weights in a regression analysis. The relationships testing results are based on bootstrapping (with 5000 subsamples) to test the statistical significance of each path coefficient using t-tests, as recommended by Chin (1998).

Our research confirms results of original TAM. All relationships in original TAM are statistically significant as shown in Table 2 and Figure 2. Perceived ERP ease of use (PEOU) has significant effect on perceived ERP usefulness (PU) (β = 0.442, p<0.01) and significant effect on attitude toward using ERP system (AT) (β = 0.318; p<0.01). Perceived ERP usefulness (PU) has significant effect on attitude toward using ERP system (AT) (β = 0.395; p<0.01). Attitude toward using ERP system (AT) has significant effect on behaviour intention (BI) (β = 0.678; p<0.01) and behaviour intention (BI) has significant effect on actual use (Use) (β = 0.492; p<0.01).

We researched the impact of external factors of personal characteristics and information literacy (PCIL) through factors personal innovativeness toward IT (PI), computer anxiety (CA), computer self-efficiency (CS), individual benefits (IB) and computer playfulness (CP). We cannot confirm, that any of five factors have impact on PU at the beginning of using ERP solution, but two of them computer playfulness (CP) (β = 0.207, p<0.01) and computer self-efficiency (CS) (β = 0.264, p<0.01) have significant positive effect on perceived ERP ease of use (PEOU) (see Table 2 and Figure 2).

The R^2 indicates the exploratory power or variance explained of the latent endogenous variable and it is the most common effect size measure in path models (Garson, 2016). The PCIL factors (namely CP and CS) could explain 41.1 percent variance in PU (R^2 = 0.411) and 20.4 percent variance in PEOU (R^2 = 0.204). PU and PEOU together explain 39.3 percent of the variance in AT (R^2 = 0.393). The AT explain 45.9 percent of variance in BI (R^2 = 0.459) and BI explain 24.2 percent of Use (R^2 = 0.242) (Figure 2).

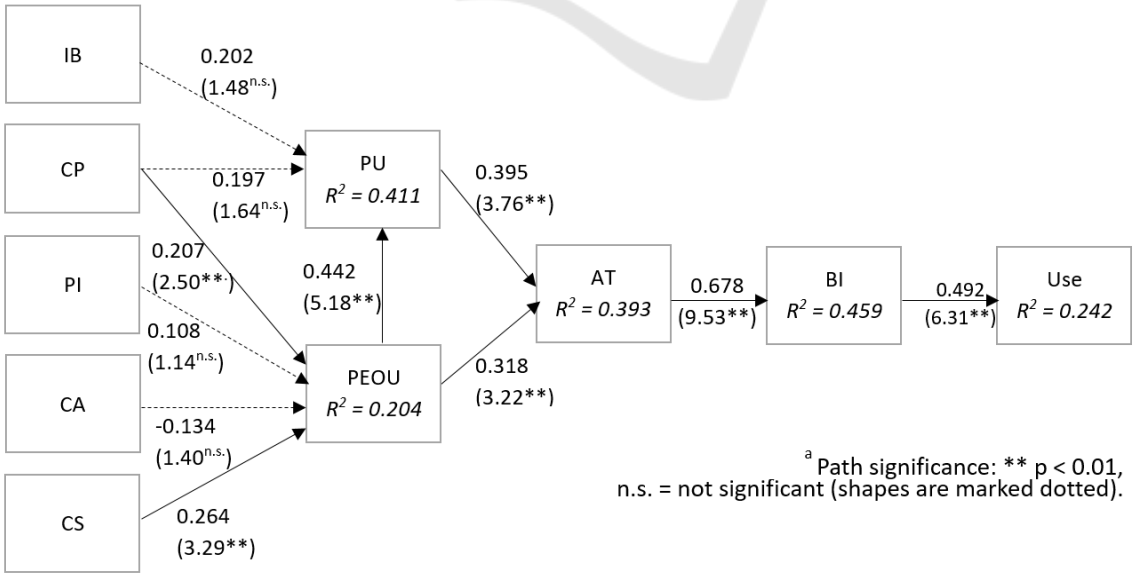

Figure 2: Results of structural model analysis.

Table 2: The structural model was examined to test the hypotheses.

Relationship	β-coefficient	t-statistics
PI → PEOU	0.11	$1.14^{n.s.}$
CA → PEOU	0.13	$1.40^{n.s.}$
CS → PEOU	0.26	3.29**
IB → PU	0.20	$1.48^{n.s.}$
CP → PU	0.20	$1.64^{n.s.}$
CP → PEOU	0.21	2.50**
PU → AT	0.40	3.85**
PEOU → PU	0.44	5.17**
PEOU → AT	0.32	3.24**
AT → BI	0.68	9.59**

Note: ** 0.01 of significance; n.s. not significant.

5 DISSCUSSION

Results of the present study regarding the hypotheses of original TAM model are consistent with several other research results regarding the IT/IS acceptance (Davis, 1989; Davis et al., 1989; etc.). Both, PEOU and PU have strong positive effect on ERP usage, with the relationship of PU being a bit stronger. Therefore, hypothesis H2 and H3 were confirmed. Also, PEOU has statistical effect on PU. Hypothesis H1 was also confirmed. The findings about the importance of PEOU and PU in the literature are vague; Davis (1989), Davis et al. (1989) and Simon and Paper (2007) exposed that PU has stronger positive effect on IT/IS usage as PEOU, while PEOU has weaker or even no statistical effect on IT/IS usage after some time of usage. Since students were surveyed at the beginning of semester, where they did not know the ERP solution, this could be the reason for the results obtained.

Hypotheses H4 and H5 were confirmed. Factor AT is vital in the TAM model and has very strong positive effect on BI and through it also indirect strong positive effect on Use, which is consistent with other researches (Pijpers and Montfort, 2006; Simon and Paper, 2007).

The main result of this research is the identification of external factors which influence students' ERP acceptance and have an impact on the antecedents of PU and PEOU at the beginning of ERP course.

None of observed five external factors have significant impact on the PU (see Figure 2). Therefore, hypothesis H6 was not confirmed. Only two factors exposed in group PCIL – namely computer self-efficiency (CS) and computer playfulness (CP) - had significant impact on PEOU. Hypotheses H7 is supported.

Factor computer anxiety (CA) is not statistically significant – this can be explained by the fact that the computer anxiety is probably a state of fear that is not known any more to the young population who grew up with the computers included in all (or at least many) aspects of the everyday' s life. Factor Personal Innovativeness toward IT (PI) captures characteristics of students regarding using new software tools and applications in general. From Table 1 we can see that mean values are a little above average (4). We can speculate that this generation of students are not keen on new software tools and applications. Individual Benefits (IB) includes claims how ERP knowledge can increase student's effectiveness and productivity and have impact on regarding future job. We think that because of complexity of ERP solutions students did not recognize individual benefits of ERP knowledge after two hours of lectures.

We suggest teachers to put an important effort into the preparation of ERP lectures and that try to explain ERP topics related content to students using simple routines, with the real business environment characteristics. To understand the ERP solutions is challenging for students, because they do not have practical experience of how ERP solutions are used in enterprises.

6 CONCLUSION

The aim of this research was to identify which external factors have impact on students' acceptance of ERP at the beginning of study programme, while they are exposed to ERP solution (in our case Microsoft Dynamics NAV). We want to know how to motivate students to take course dealing with the ERP solution Microsoft Dynamics NAV, with all due seriousness and importance. That is why we studied five personal characteristics and information literacy (PCIL) external factors which might have an impact on students' ERP acceptance. Studying the influence of the system of external factors on constructs not only contributes to the theory development, but also helps in designing teachers' curriculum. Our research shows that most important researched external factors are especially two: computer self-efficiency (CS) and computer playfulness (CP). That factors will be in focus in future work.

Several implications for researchers and practitioners arise from the results of the extended version of TAM. Findings indicate that students have

positive perception on the PU, PEOU, AT, BI and Use and that they understand the usefulness of ERP systems and their relevance as the support, important for their current or future jobs. These findings can help business schools assess students' engagement as they develop ERP software skills desired by employers. By many organizations, a big concern is whether students understand business processes (also process flows, sub processes, etc.) behind ERP system. ERP system is very complex system and no single factor alone influences student's use of ERP. Our research showed that most important external personal factors are computer playfulness and computer self-efficiency. For students are important to understand the functionality of the system, its usefulness, and ease of use.

This study has certain limitations which are at the same time the opportunities for further research within this important and comprehensive topic. Since the respondents were limited to one group of students in Croatia, the study could be extended to other countries. Further research is needed to explore the importance of external factors included in different time frames (after introduction of course, at the end of course) as well as inclusion of additional external factors. Another limitation is also that research was conducted for one ERP solution only – namely for Microsoft Dynamics NAV; the importance of external factors may be different, when other ERP solutions are taking place (SAP, Infor ERP etc.).

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