

2.1 Implementation of the ERP System

There are various definitions of the ERP systems. For some authors, ERP is a meaningful software solution that links all business processes with a unique IT architecture and software to access all relevant information concerning the companies [27]. Others look at ERP as a system for collecting and systematic updating of data and their processing [28]. The most important role of the ERP system as a computer-supported information system is the integration of the enterprise [29, 30].

In any case, ERP implementation means the implementation of the ERP concepts and introduction of the ERP software. Implementing the ERP system is a complex task that requires the involvement of all relevant stakeholders (e.g. management, information system specialists, employees, consultants and partners) [31].

The paper [32] provides an overview of the ERP systems and taxonomy of the ERP research that covers the main topics in this area. The case study on ERP implementation in the industry [33] is focused on the integration and development of the planning process in the ERP systems. The paper also addresses the approach to implementation and the benefits that companies derive from the ERP system implementation from the aspect of the enterprise size [34] as well as implementing the ERP systems to increase the competitive advantage in the market [31, 35], and the guidelines for aligning the ERP implementation with competitive strategy [36]. The ERP implementation is an extensive organisational change and not just a software installation [37]. Therefore the part of the paper is the comparison of the ERP system implementation in the countries in Asia, Europe and the USA with regard to diversity in national cultures and the need to adapt the generic systems to the specifics of a particular country [26].

2.2 Critical Success Factors

Despite all the benefits that an enterprise can achieve by implementing the ERP system, it has been shown that the implementation is not always successful [37]. For this reason, researches are focused on critical success factors and there is the extensive relevant literature dealing with this problem, but mainly with the focus on large enterprises and developed countries. Fewer researches deal with both developing countries and small and medium-sized enterprises. CSFs have an impact on the success of the ERP implementation and numerous authors have identified the factors considered critical to the success of the ERP implementation. CSF is studied by many authors, mostly before and during implementation, but rarely in the post-implementation phase [38].

One of the first surveys of critical success factors in implementing the ERP systems in small and medium-sized enterprises (SMEs) on Canadian companies' examples is described in the paper [39]. Their findings have confirmed the results of earlier researches that significant CSFs include management support, discipline process, qualified consultants, project management and user training. When comparing the ERP system implementation in the countries of Asia, Europe and the USA with regard to diversity in national cultures and the need to adapt the generic systems

to the specifics of a particular country [26] the authors of the paper [40] found that these differences affect the success of ERP implementation.

Within the scope of their research, the authors of the paper [41] focus on human resources as one of the key success factors of the ERP implementation. The paper presents an overview of the critical success factors that affect the success of the ERP implementation, mentioned in the literature, and emphasize the organisational culture as a particularly important critical success factor. Consultant competences and absorption capacity are identified as critical success factors that affect knowledge transfer during the ERP implementation [42]. The paper [15] gives a comprehensive overview of previously identified CSFs in the implementation of the ERP systems according to the frequency of occurrence in the existing relevant literature.

The choice of a supplier of the ERP system is also a critical significant factor in the ERP implementation [43, 44]. Authors of the paper propose the framework for implementing the ERP system that takes into account the CSF priorities for SMEs.

As it can be seen in the literature review, most of the researches deal with an individual CSF, and a smaller number of published papers deal comprehensively with CSF [15, 16]. The authors of the paper [15] have chosen the most important ones according to the frequency of CSF occurrences. They have selected 13 CSFs for the ERP implementation by reviewing 200 relevant articles. CSFs cannot be viewed independently because they interact with each other [15, 16].

As the ERP application is one of the many key indicators highlighted by the European Commission under the Digital Agenda for Europe-one of the seven pillars of the Europe 2020 strategy defining the targets for the growth of the European Union (EU) by 2020, it is important to analyse the state of application of the ERP systems in the Republic of Croatia.

3 METHODOLOGY RESEARCH

In the first phase of the research, a comprehensive overview of the relevant scientific literature on the ERP system implementation and CSF is made. The literature review includes scientific papers in journals that are presented in relevant databases (Web of Science (WoS), Science Direct, Emerald, Elsevier, ...).

In the second phase, a survey method is used to analyse the state of the ERP systems application in Croatia. A questionnaire that was sent via e-mail is used as an instrument of research. Based on the extensive review of the literature, the questionnaire contains 12 questions about the ERP system implementation, the current status of the company, basic organisation and respondent information, motivation for the ERP system introduction, system upgrading needs and improvements. The respondents did not have to answer the question about the company they come from which ensured their confidentiality. Closed questions with dichotomous responses are used in the questionnaire. Intensity responses (Likert's ordinal scale with five gradients used by respondents to rate the degree to which they agree or disagree with a statement (1-I disagree, ..., 2-I agree)), and multiple choice questions are

offered in the questionnaire. In the next phase of the survey, a cover letter was sent via e-mail to a number of companies in the Republic of Croatia with a questionnaire request in order to gain an insight into problems related to the ERP system implementation in Croatian companies. The cover letter provides an URL with link to the online questionnaire so that the respondents submitted their answers online. The survey was conducted for over 2 months (January and February 2016). The companies were selected according to the company list published in Privredni vjesnik for 2014 (Privredni vjesnik, 400 Najvećih hrvatskih tvrtki u 2014./ 400 Largest Croatian Companies in 2014, August 2015 LXII, no. 3888). In choosing the companies, the intention was to cover the whole of Croatia, all sectors and sizes of companies. All counties in the Republic of Croatia were covered and a non-probabilistic (quota) sample was made. The invitation to fill in the online questionnaire was sent to the selected manufacturing and service companies from the mentioned list that had the highest total revenue in 2014. 300 Croatian companies were asked to complete the survey about ERP systems in Croatian companies, critical factors and their impact on the system implementation. A month later, a reminder to increase the response rate was sent. The total number of completed questionnaires is 74, thus the overall response rate is 24.67%, which is common for this type of survey of the ERP implementation [14, 19, 42]. Of the total number of completed questionnaires, 37% of respondents have not introduced and do not plan to introduce the ERP system or introducing the ERP system is in progress.

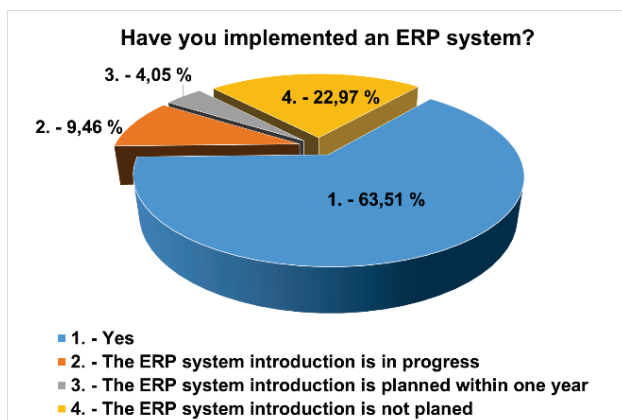


Figure 1 Status of the ERP system application in enterprises in the Republic of Croatia

The data collected by the survey were analysed by Tibco Statistica 13.3. using the methods of descriptive statistics. The Mann-Whitney U test was applied for the analysis of the questions, in which the 5-point Likert scale was used, since it is a non-probabilistic sample. First, the coding of variables was done, and then the attitudes of large (LE) and small and medium enterprises (SMEs) were compared.

4 SURVEY RESULTS AND DISCUSSION

In the first sub-section, general data on companies responding to the survey are processed, and in the second subsection critical success factors for the ERP system implementation in companies in Croatia are analysed.

4.1 Analysis of the General Information from the Questionnaire

Seventy-four companies, of which 38 large companies (250 and more employees) and 36 small and medium-sized companies responded to the questionnaire. Manufacturing and service industries are represented. According to the survey results, Fig. 1 shows the state of the ERP system implementation in Croatian companies, and Fig. 2 shows the share of companies participating in the survey according to the industry area.

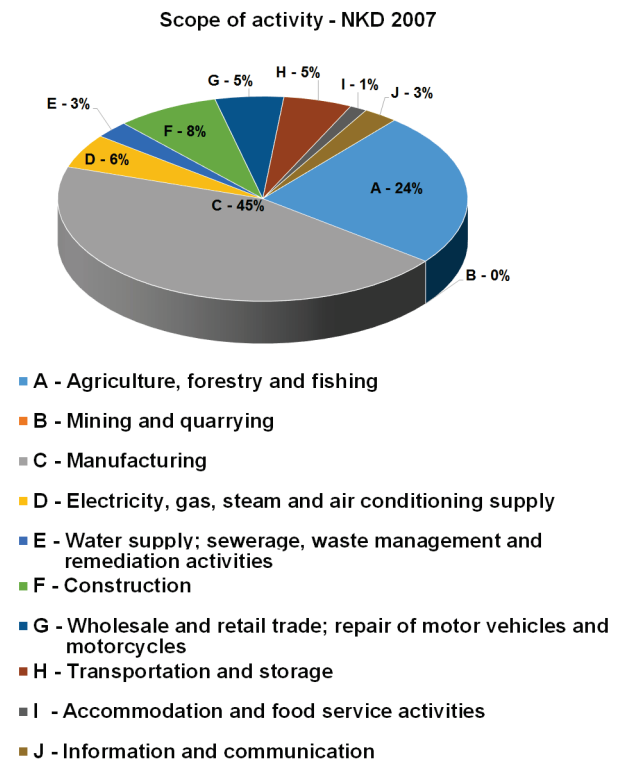


Figure 2 The share of companies participating in the survey per scope of activity (according to NCEA - NKD 2007)

63.51% of the companies introduced the ERP system, while up to 22.97% of companies are not planning to introduce ERP systems.

According to the results of the survey conducted in the Republic of Croatia, ERP systems of domestic and foreign suppliers are equally used. From foreign suppliers, the most frequently used system is SAP.

Several modules have been implemented to cover as many as possible departments in the company. The modules most often implemented are those that encompass common data, i.e. 96.08%, and accounting modules in 96.08% of cases.

In most cases, it was necessary to customize the system, even in 70.59% of companies. Customizations were conducted for several reasons, such as improved reporting (58.82%), for better display usefulness rate (11.76%), for product integration with other systems (41.18%), for functionality improvements (64.71%), and system customization to the existing business processes in 80.39% of companies.

As shown, most of the changes occurred due to the adapting the ERP system to business processes, and this is one of the reasons why a number of companies do not plan

to introduce the ERP systems because the market solutions do not meet their business needs.

In the case of enterprises with ERP system implemented, the process (74.51%) lasted from 7 to 24 months in most cases (7 - 12 months 47.06% and 12 to 24 months 27.45%). Since 80.39% of surveyed enterprises use the system for more than two years, their experience is relevant to the results of the survey conducted.

4.2 Analysis of Critical Success Factors of the ERP System Implementation

The aim of this survey is to investigate the attitudes of SMEs and large companies on the critical success factors in implementing ERP systems, how CSFs are ranked in terms of their importance, and whether there are significant differences in the attitudes of SMEs and large enterprises to CSF. The instrument consists of 26 items (CSF1 to CSF26) which the participants of the survey were asked to evaluate. The degree of agreement with the statement that a particular particle (listed critical success factor) is of great importance in the ERP system implementation using the 5-point Likert type scale. The participants expressed their opinion with a single partial choice with one of the following options: 1-I strongly disagree; 2-I disagree; 3-I neither agree nor disagree; 4-I agree; 5-I strongly agree.

Table 1 Indicators of the scale internal validity

Variable	Valid N: 51, Cronbach alpha: 0.920071	
	Item-Total Correl.	Alpha if deleted
CSF1	0.540572	0.917035
CSF2	0.487516	0.917976
CSF3	0.403914	0.919109
CSF4	0.571525	0.916449
CSF5	0.571010	0.916506
CSF6	0.640517	0.915144
CSF7	0.205424	0.922236
CSF8	0.276947	0.920417
CSF9	0.412690	0.918879
CSF10	0.709463	0.914004
CSF11	0.359789	0.920028
CSF12	0.373739	0.919442
CSF13	0.596032	0.916629
CSF14	0.506710	0.917532
CSF15	0.494102	0.917751
CSF16	0.702328	0.913840
CSF17	0.540357	0.917100
CSF18	0.543834	0.916923
CSF19	0.615973	0.915993
CSF20	0.535864	0.917069
CSF21	0.563039	0.916687
CSF22	0.729904	0.913757
CSF23	0.595439	0.916006
CSF24	0.745302	0.913496
CSF25	0.650181	0.914969
CSF26	0.415392	0.919378

The CSF (5-point Likert scale) response analysis was performed using the Mann-Whitney U test.

First, the coding of the variables was performed, and then, for comparison of the attitudes of small and medium and large enterprises, the Mann-Whitney U Test comparing two independent samples (SME and LE) was applied significance of the level $p = 0.01$. The research hypothesis is that there are no statistically significant differences in the attitudes of small and medium-sized enterprises and large companies about the critical success factors. For determining the internal scale validity,

Cronbach's reliability coefficient, Alpha-if-deleted indicator and item-to-total correlation were applied (Tab. 1).

The values of the Cronbach alpha coefficients indicate that the scale used has a satisfactory level of reliability. Namely, the internal consistency (Cronbach's alpha) is 0.92, and the value of Cronbach's reliability coefficient is greater than 0.70 which means high reliability [45] to see if there are statements that reduce the reliability of a given scale or do not show a strong correlation with the corresponding measurement scale. The value of the Cronbach alpha coefficient, and thus the reliability of the scale, would be slightly increased by the removal of CSF7 and CSF8 factors, but it is only a slight increase in the Cronbach alpha values so CSF7 and CSF8 are retained in further analysis.

Tab. 2 shows the results of Mann-Whitney U Test, which compares the attitudes on the critical success factors of small and medium-sized enterprises with large companies. The Mann-Whitney U Test analysis was made with the significance level $p = 0.01$.

Larger number of respondents rated all the CSFs mentioned in the questionnaire as significant with a high level of agreement (5-I strongly agree and 4-I agree).

According to the data in Tab. 2, it can be concluded that there is no statistically significant difference in the attitudes of large enterprises and small and medium enterprises about critical success factors or in the implementation of the ERP system (hypothesis H0 is accepted, with significance level $p = 0.01$) As shown in Fig. 3, large companies and small and medium enterprises have identical views on the critical success factors: user-friendly user interface and operations (ease of operation, ease of learning (guideline, online help)); data conversion; continuous support from system manufacturers (warranties, consultants' services, trainings, speed of problem solving); organisational culture; low level of general computer literacy; and weak institutional support for enterprise informatisation.

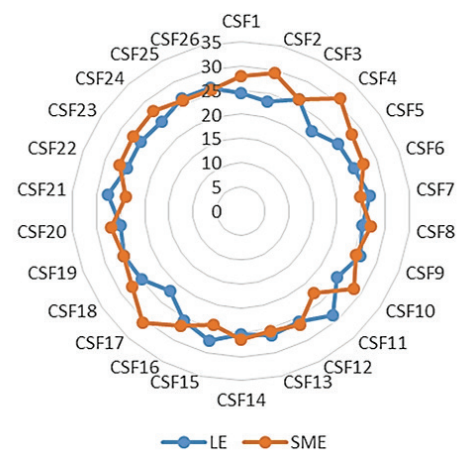


Figure 3 Polar graph for mean ranks of CSF (large companies and small and medium enterprises)

Most of the critical success factors are considered more significant by small and medium-sized enterprises than by large enterprises. Large enterprises, compared to small and medium-sized enterprises, rated higher only the following critical factors: business process reengineering,

reputation of software manufacturer (finance, market share), top-management support and lack of methodologies for evaluation and selection of ERP system. But there is no

statistically significant difference between the views of SMEs and large companies.

Table 2 The results of Mann-Whitney U Test, used to compare the attitudes on the critical success factors of small and medium-sized enterprises with large companies

Critical success factors	Variable	Mann-Whitney U Test By variable Enterprise type Marked tests are significant at $p < .01000$						
		Rank Sum LE	Rank Sum SME	<i>U</i>	<i>Z</i>	<i>p</i> -value	<i>Z</i> -adjusted	<i>p</i> -value
Total expenses (price, maintenance costs, consultants' costs)	CSF1	684,0000	642,0000	278,0000	-0,82345	0,410255	-0,85311	0,393601
Implementation period	CSF2	649,0000	677,0000	243,0000	-1,48599	0,137283	-1,56003	0,118754
System functionality (module completeness, proper function, security)	CSF3	726,5000	599,5000	320,5000	-0,01893	0,984897	-0,02641	0,978931
User-friendly user interface and operations (ease of operation, ease of learning)	CSF4	614,0000	712,0000	208,0000	-2,14853	0,031672	-2,24044	0,025063
System flexibility (upgradeability, ease of integration, easy upgrade)	CSF5	684,00	642,00	278,00	-0,82345	0,410255	-0,89991	0,368169
Development of required software upgrades, testing and troubleshooting	CSF6	701,00	625,00	295,00	-0,50164	0,615921	-0,54341	0,586847
Reengineering of business processes	CSF7	753,50	572,5000	296,5000	0,47324	0,636039	0,49428	0,621109
High system reliability (stability, data backup, data recovery)	CSF8	705,0000	621,0000	299,0000	-0,42592	0,670166	-0,51379	0,607397
Quality of information (reports)	CSF9	739,5000	586,5000	310,5000	0,20823	0,835051	0,26014	0,794758
Data conversion	CSF10	675,5000	650,5000	269,5000	-0,98435	0,324944	-1,03255	0,301817
Software manufacturer's reputation (finance, market share)	CSF11	804,5000	521,5000	245,5000	1,43866	0,150247	1,54121	0,123267
The manufacturer provides good technical capabilities (technical support, experience in implementation)	CSF12	719,5000	606,5000	313,5000	-0,15144	0,879630	-0,17435	0,861594
Continuous system manufacturer support (warranties, consultants' Services, trainings, troubleshooting rate)	CSF13	740,5000	585,5000	309,5000	0,22716	0,820301	0,27252	0,785222
Consultants' services	CSF14	714,5000	611,5000	308,5000	-0,24609	0,805615	-0,25836	0,796128
Top-management support	CSF15	770,5000	555,5000	279,5000	0,79505	0,426584	0,97207	0,331019
Inadequate management's knowledge of on the role and importance of ERP systems	CSF16	714,0000	612,0000	308,0000	-0,25555	0,798297	-0,26455	0,791355
Lack of methodologies for evaluation and selection of ERP systems	CSF17	618,5000	707,5000	212,5000	-2,06335	0,039080	-2,12803	0,033336
Project management	CSF18	695,5000	630,5000	289,5000	-0,60575	0,544679	-0,64954	0,515992
The project team's expertise	CSF19	728,0000	598,0000	322,0000	0,00946	0,992448	0,01056	0,991574
Organizational culture	CSF20	704,0000	622,0000	298,0000	-0,44485	0,656428	-0,48242	0,629509
Communication within the organization	CSF21	777,0000	549,0000	273,0000	0,91810	0,358570	1,03603	0,300190
Training and educating the user	CSF22	707,5000	618,5000	301,5000	-0,37860	0,704988	-0,42723	0,669213
User involvement (level of initiative, knowledge, and employee's desire to increase the level of inf.)	CSF23	704,5000	621,5000	298,5000	-0,43539	0,663283	-0,47141	0,637345
User acceptance	CSF24	694,5000	631,5000	288,5000	-0,62468	0,532179	-0,68330	0,494418
Low level of the users' general computer literacy	CSF25	735,5000	590,5000	314,5000	0,13251	0,894582	0,13736	0,890742
Lack of institutional support for enterprise computerization	CSF26	735,0000	591,0000	315,0000	0,12304	0,902073	0,12671	0,899169

Table 3 Mean ranks and assigned ranks according to mean ranks

Code	Critical success factors	Large companies		SMEs	
		Mean ranks	Assigned ranks	Mean ranks	Assigned ranks
CSF1	Total expenses (price, maintenance costs, consultants' costs)	24,43	21	27,91	5
CSF2	Implementation period	23,18	24	29,43	3
CSF3	System functionality (module completeness, proper function, security)	25,95	10	26,07	17
CSF4	User-friendly user interface and operations (ease of operation, ease of learning)	21,93	26	30,96	1
CSF5	System flexibility (upgradeability, ease of integration, easy upgrade)	24,43	22	27,91	6
CSF6	Development of required software upgrades, testing and troubleshooting	25,04	18	27,17	9
CSF7	Reengineering of business processes	26,91	4	24,89	23
CSF8	High system reliability (stability, data backup, data recovery)	25,18	15	27,00	12
CSF9	Quality of information (reports)	26,41	6	25,50	21
CSF10	Data conversion	24,13	23	28,28	4
CSF11	Software manufacturer's reputation (finance, market share)	28,73	1	22,67	26
CSF12	The manufacturer provides good technical capabilities (technical support, experience in implementation)	25,70	11	26,37	16
CSF13	Continuous system manufacturer support (warranties, consultants' Services, trainings, troubleshooting rate)	26,45	5	25,46	22
CSF14	Consultants' services	25,52	12	26,59	15
CSF15	Top-management support	27,52	3	24,15	24
CSF16	Inadequate management's knowledge of on the role and importance of ERP systems	25,50	13	26,61	14
CSF17	Lack of methodologies for evaluation and selection of ERP systems	22,09	25	30,76	2
CSF18	Project management	24,84	19	27,41	8
CSF19	The project team's expertise	26,00	9	26,00	18
CSF20	Organizational culture	25,14	17	27,04	10
CSF21	Communication within the organization	27,75	2	23,87	25
CSF22	Training and educating the user	25,27	14	26,89	13
CSF23	User involvement (level of initiative, knowledge, and employee's desire to increase the level of inf.)	25,16	16	27,02	11
CSF24	User acceptance	24,80	20	27,46	7
CSF25	Low level of the users' general computer literacy	26,27	7	25,67	20
CSF26	Lack of institutional support for enterprise computerization	26,25	8	25,70	19

According to the analysis of the survey results of the attitudes of SMEs and the large companies on the critical success factors, the list of critical success factors for SMEs and large enterprises is presented in Tab. 2.

5 CONCLUSION

The ERP system implementation with the aim of increasing competitiveness is extremely important for the Croatian economy. Due to complexity of the implementation of the ERP system and the risk of the project implementation caused by various factors, it is important to understand the impact of the critical success factors that can lead to successful implementation of the ERP system. The results of the research have shown that, although there is no statistically significant difference in the companies' attitudes towards the critical success factors of the ERP implementation, small and medium-sized enterprises rank critical success factors differently compared to large companies. In small and medium-sized enterprises, the most important critical success factors are user-friendly interface and operation, lack of methodology for evaluation and selection of ERP systems, and the duration of implementation, which are, at the same time, the least significant critical success factors according to the large companies.

The drawback of the research is a non-probabilistic sample, but although the results of this research cannot be generalised because of it/this a non-probabilistic sample, it may still be useful to researchers and practitioners to gain insight into the issues of the ERP implementation in companies in Croatia.

In future studies, it would be useful to extend a set of critical success factors and involve more people from the same enterprises to participate in research.

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