

The level of the usage of the human resource information system and electronic recruitment in Croatian companies

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Abstract. Performing business according to contemporary requirements influences companies for continuous usage of modern managerial tools, such as a human resource information system (HRIS) and electronic recruitment (ER). Human resources have been recognised as curtail resources and the main source of a competitive advantage in creation of successful business performance. In order to attract and select the top employees, companies use quality information software for attracting internal ones, and electronic recruitment for attracting the best possible external candidates.

The main aim of this paper is to research the level of the usage of HRIS and ER within medium-size and large Croatian companies. Moreover, the additional aim of this paper is to evaluate the relationship among the usage of these modern managerial tools and the overall success of human resource management within these companies.

For the purpose of this paper, primary and secondary research has been conducted in order to reveal the level of the usage of HRIS and ER as well as the overall success of human resource management in Croatian companies. The companies' classification (HRIS and ER) is done by using the non-hierarchical k-means cluster method as well as the nonparametric Kruskal Wallis test. Further, the companies are ranked by the multicriteria PROMETHEE method. Relevant nonparametric tests are used for testing the overall companies' HRM. Finally, binary logistic regression is estimated, relating binary variable HRM and HRIS development. After detailed research, it can be concluded that large Croatian companies apply HRIS in majority (with a positive relation to HRM performance), but still require certain degrees of its development.

Key words: human resource information system (HRIS), electronic recruitment (ER), human resource management (HRM), survey analysis, multicriteria classification and ranking

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1. Introduction

Human resources represent unique companies' resource due to their specific knowledge, skills, abilities or behaviour that significantly distinguishes them

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among the leading competitors. The crucial areas of human resource management (HRM) are recruitment, maintaining and development of employees. In order to attract and select the top employees, companies apply a different set of HRM policies and practices, respecting also modern techniques, such as HRIS and ER for attracting internal and the best external candidates, respectively. The use of HRIS has been advocated as an opportunity for human resource (HR) professionals to become strategic partners with top management. The main idea of HRIS is to allow for the HR function to become more efficient and to provide better information for decision making. Consequently, the usage of ER in modern business surrounding has evolved as a result of the growth in the usage of the Internet. The Internet has changed the ways job seekers and companies think about the recruiting function.

The main aim of this paper is to research the level of the usage of HRIS and ER within medium and large Croatian companies. Moreover, the additional aim of this paper is to evaluate the relationship among the usage of these modern managerial tools and the overall success of HRM within these companies.

After providing primary and secondary research within companies from the sample, selected statistical methods are applied in order to reveal the level of the usage of HRIS and ER as well as its relation with the development of the overall HRM system.

2. Human resource management – a strategic partner in successful business performance

HRM has evolved from personnel management to today a strategic role in performing business as an equally important function among all other managerial functions. It is defined as a strategic and coherent approach to the management of an organisation's most valued assets – the people working there, who individually and collectively contribute to achievement of its objectives [3]. Today, we have seen that trends like globalisation, indebtedness and technology confront employers with new challenges, such as squeezing more profit from operations, while employers expect their HR managers to address these challenges. It is not sufficient that HRM just oversees activities such as recruiting, but it must add value by boosting profitability and performance in measurable ways from HR manager's actions [8].

As one out of five main managerial functions, today HRM can be definitely recognised as a dominant function, controlling and directing all other functions toward sustaining organisational strategic goals. This function is rather broad in its content and it is comprised of a variety of different activities, usually

arranged according to the following group of activities: analysis and planning, recruitment and selection, training and development, motivation, appraising, compensations, labour relations and health and safety. All these groups of activities are focused on managing and developing employees, taking the advantage of their skills, knowledge and abilities on behalf of employers as well as employees themselves. The crucial areas of HRM can be summarised as recruitment, maintaining and development of employees.

In order to recruit and select the best potential employees as well as to develop them as the most important organisational capital, HR managers apply a different set of HRM policies and practices to produce their superior performance. With respect to that, HR managers apply modern techniques, such as ER (in order to attract and select the best potential employees) and HRIS (in order to facilitate the process of producing employees' superior performance and decision making). Furthermore, as modern managerial tools in creation of companies' success, HRIS and ER will be described in more detail.

2.1. Human resource information system – a managerial tool in creation of companies' success

HR managers deal with crucial questions, such as how to attract, select or motivate the best human potential and how to manage their work or performance, fortifying it by the usage of HRIS. The use of HRIS has been advocated as an opportunity for HR professionals to become strategic partners with top management. The idea is that HRIS would allow for the HR function to become more efficient and to provide better information for decision making [2].

It is possible to define HRIS as a system used to acquire, store, manipulate, analyze, retrieve and distribute pertinent information about an organisation's human resources [19]. Also, HRIS constitutes suitable systems making it possible for the enterprise to manage the flows of information relating to its HR, as well as improve the quality of HR- related decisions, which can be either strategic or operational, and this owing to the automation of the administrative procedures [18]. HRIS have thus become a critical tool for integrating HR information into the organisation's business strategy and for demonstrating the positive contribution that HR can make to the bottom line through the more effective and efficient management of the organisation's HR [17].

The organisation determines what kind of information it will need by deciding what kind of decision it will be making based on the HRIS information [2]. Today, HRIS is still in charge of some simple HR activities, but it also

supports the process of recruitment and retention, advances the performance management process, promotions, discipline, compensations and benefits, training and development as well as promotion and succession planning [11]. Finally, HRIS can be implemented at three different levels, such as publishing of information, the automation of the transaction and finally transformation of the entire operation of the HR department so that it plays a more strategic role and adds more value to the organization [13]. However, HRIS could be viewed as a hybrid of several classical types of information systems. Currently, HRIS includes features of transaction processing systems, decision support systems, communication systems and systems with elements of artificial intelligence [11].

Accordingly, it can be concluded that HRIS implements and combines crucial elements of different disciplines; management and information technology. Firstly, advances in information technology are changing the industry structure as well as the way companies operate. Furthermore, information technology is an increasingly important lever that companies can use to create a competitive advantage. Finally, the information revolution is spawning a completely new business [15].

Many authors, especially during the last two decades, have researched the influence of a particular HR activity or a bundle of those activities on the overall organizational performance. Subsequently, there is recognized research pointing the benefits of HRIS on overall HRM practices and performances. However, HRIS represents a large investment decision for companies of all sizes, so companies have to be aware of all sorts of HRIS benefits. When one would summarize benefits of HRIS usage on the overall HRM and organizational performance, it could be stated that HRIS increases competitiveness by improving HR practices, produces a greater number and variety of HR operations, shifts the focus of HR from the processing of transactions to strategic HRM, makes employees part of HRIS and reengineers the entire HR function. Moreover, HRIS is the accurate and timely access to diverse data provided to HR managers and top managers. In conducting HR planning, it examines scenarios and simulations to test out different strategic alternatives [17].

However, there are certain concerns about the potential invasion (and abuse) of employee privacy, but also about costs (purchase, development and maintaining costs). Additionally, the problem in HRIS usage can be recognized as the lack of knowledge of the HR department about HRIS and the lack of importance given to the HR department in organizations. Nevertheless, HRIS is recognized as a managerial tool assigned for different users, such as operational users (processing routine transactions), middle managers (generating regular reports for decision making and control) and senior managers (dealing with

strategic planning and decision making). Having accessible data enables HR planning and managerial decision making to be based to a greater degree on information rather than relying on managerial perception and intuition [20].

2.2. Usage of electronic recruitment as a modern way of performing business

High growth of ER is the result of many advantages it has in accordance with traditional methods, but it is also the result of the growth in the usage of the Internet. The Internet has changed the ways job seekers and companies think about the recruiting function [10]. Although usage of the Internet and ER raises questions of a privacy and security issue [9] as well as excerpts a discrimination issue among Internet users and non-users [14], it also provides many advantages over traditional recruiting methods. Some indicators of using the Internet show that the e-recruitment strategy is the integration and utilization of Internet technology to improve efficiency and effectiveness of the recruitment process.

ER allows employers to broaden the scope of their search, with the emphasis put on high-quality candidates who are mostly young, computer literate, educated employees at the worldwide level [5]. Except higher investments at the start, ER reduces recruiting costs overall (newspaper advertisements, job fairs and head hunter fees, mailing costs and reduced workload for the HR department). Additional benefits of ER are recognized as a faster hiring process, efficient feedback and accessibility at any time [4]. Consequently, companies are usually dedicated to electronic job posting, direct online applications, detailed selection process information and faster feedback. Online job recruitments, online CV databases, electronic applications, applicant management systems, corporate skill databases and information system (IS) supported workflows are just few examples how IS supports the recruitment process [12]. ER also provides more objective screening, enables the organization to evaluate the success of its recruitment strategy, it is more realistic and the recruitment process can also be provided with candidates virtually anywhere. In order to secure the maximum from this system support, it has to be effectively adopted by employers and interplayed between HR departments, specialized departments, service centres and external service providers [4].

However, certain disadvantages can be recognized within the ER process. This process is more impersonal and inflexible in comparison to traditional recruitment methods, not all groups of applicants have access to online facilities and it may exclude some minority groups, such as older age applicants who may perceive themselves as less tech competent than a new generation of employees.

3. Research methodology and data selection

3.1. Methodology

For the purpose of the empirical part of the paper, primary and secondary research has been conducted. Primary research included a written survey distributed to all Croatian public companies listed on the Croatian Stock Exchange Market. The survey was designated to HR managers, investigating their subjective opinions about development of HRIS activities within their company as well as development of the overall HRM. Secondary research included evaluation of companies' official web pages (participated in the first round of research). It was oriented forward topics dealing with ER (exist or does not exist).

Furthermore, appropriate statistical methods are applied in order to test relations between HRIS usage and the level of the usage of ER with the overall HRM. After reliability analysis by Cronbach's Alpha, the companies' classification is done using the non-hierarchical k-means cluster method according HRIS and ER. The term cluster analysis [1] encompasses a number of different algorithms and methods for grouping objects of similar kind into respective categories. A general question facing researchers in many areas of inquiry is how to organize observed data into meaningful structures, that is, to develop taxonomies. In other words, cluster analysis is an exploratory data analysis tool that aims at sorting different objects into groups in a way that the degree of association between two objects is maximal if they belong to the same group and minimal otherwise. Cluster analysis does not presuppose any statistical significance, and it is therefore recommended to use appropriate statistical tests in practical analyses. So, the nonparametric Kruskal Wallis test confirmed the obtained classification results. Furthermore, the companies are ranked according HRIS and ER by the multicriteria PROMETHEE method [21]. The multicriteria problem is:

$$\text{Max}\{f_1(a), \dots, f_n(a) | a \in K\}, \quad (1)$$

where K is a finite set of possible actions (here companies), and $f_j(a)$, where $j = 1, \dots, n$ are n criteria to be maximized. For each action, $f_j(a)$ is an evaluation of this action. When we compare two actions, $a, b \in K$, we must be able to express the result of this comparison in terms of preference. Therefore, we consider a preference function P :

$$P : K \times K \rightarrow [0,1], \quad (2)$$

representing the intensity of action a with regard to action b . In practice, this preference function will be a function of the difference between the two evaluations $d = f(a) - f(b)$, and it is monotonically increasing. Six possible types (usual, U-shape, V-shape, level, linear and Gaussian) of this preference function are proposed to the decision maker [6] and [7]. The effective choice is made interactively by the decision maker and the analyst according to their feeling of the intensities of preference.

Relevant nonparametric tests are used for testing overall companies' HRM regarding average HRIS usage and an average level of ER usage. Finally, binary logistic regression is estimated, relating a binary variable HRM (values higher than 3 = 1) and HRIS development.

3.2. Research sample

The survey was part of larger research conducted in 2011. It was distributed to 232 companies with the response rate of 32.76%. After subtracting companies with uncompleted data, the total number of companies within the sample was 68[†].

3.3. Variables

Evaluating development of companies' HRIS, respondents took into consideration its four particular aspects, i.e., record keeping and administration tasks (HRIS 1), HR planning (HRIS 2), training and HR development (HRIS 3) and performance management (HRIS 4). Also, respondents were asked to evaluate development of the overall companies' HRM system, evaluating eight different groups of activities within the HRM system. Each group of activities consisted of four particular elements and groups were as follows; job analysis

[†] The research was conducted in two sequential steps. The first step included a written survey distributed to all Croatian companies (232) listed on the Zagreb Stock Exchange Market, what resulted in the total number of 68 companies. However, 3 companies provided uncompleted data and were excluded from the sample, resulting in 65 companies in total. This part of research investigated the usage of HRIS within Croatian companies. The second step of research was oriented toward researching the usage of ER within Croatian companies, but solely it included companies that responded in the survey from the first step. This research included an Internet survey and it was done for all 68 companies that participated in the first round of research.

(group 1), planning (group 2), recruitment and selection (group 3), training and career development (group 4), motivation (group 5), performance appraisal (group 6), compensations (group 7) and health and safety (group 8). These variables (and their particular elements) were chosen according to previous research, but also according to the need and use of Croatian companies regarding HRM in general and their usage of HRIS. Respondents evaluated a particular aspect using the 1-5 Likert scale (1-negative grade; 5-excellent grade).

Part of the research dealing with ER was oriented toward the evaluation of six particular aspects, such as application link for opening position (ER 1), possibility for e-mail application (ER 2), link for opening positions (ER 3), currently open position (ER 4), information regarding career development within company (ER 5) and information of the selection process within the company (ER 6). Researchers had to evaluate each aspect by using 0 – not existing or 1 – existing option within a particular company.

4. Results

The empirical part of the paper provides the non-hierarchical k-means cluster method, according to companies HRIS and ER in order to provide companies' classification (Table 1). Reliability Statistics Cronbach's Alpha for companies' HRIS is 0.840, which implicates good internal consistency, while for ER it is 0.765 implicating acceptable internal consistency.

Further, the k-means cluster method was used in order to introduce three different clusters. The Anova test (F-test p-value), used for both classifications, shows that all HRIS contribute to a statistically significant difference among defined clusters. Regarding development of companies' HRIS, cluster 1 forms companies with the greatest degree of HRIS development, mostly large companies (68%). Cluster 3 represents companies with the lower degree of HRIS development, also mostly large companies (59%). Cluster 2 represents companies with a lowest degree of HRIS development, mostly medium-size companies (60%). It is expected that large companies will be characterised by the greatest degree of HRIS development. Those likely provide larger investments in HRIS than medium-size companies, because large companies require greater support within HR administration as well as decision making.

Companies					
Classification according to HRIS (values 1-5)			Classification according to ER (values 0-1)		
Cronbach's Alpha: 0.840			Cronbach's Alpha: 0.765		
Kruskal Wallis test: p <0.001	Medium-size companies N (%)	Large companies N (%)	Kruskal Wallis test: p <0.001	Medium-size companies N (%)	Large companies N (%)
CLUSTER 1: <i>mean rank: 50.4**</i> <i>mean = 4.13***</i> <i>median = 4.00***</i>	10 (32%)	21 (68%)	CLUSTER 1: <i>mean rank: 24.5**</i> <i>mean = 0.018***</i> <i>median = 0.00***</i>	21 (45%)	26 (55%)
CLUSTER 2: <i>mean rank: 3.0**</i> <i>mean = 1.55***</i> <i>median = 1.75***</i>	3 (60%)	2 (40%)	CLUSTER 2: <i>mean rank: 61.6**</i> <i>mean = 0.583***</i> <i>median = 0.59***</i>	2 (25%)	6 (75%)
CLUSTER 3: <i>mean rank: 20.1**</i> <i>mean = 2.91***</i> <i>median = 3.00***</i>	12 (41%)	17 (59%)	CLUSTER 3: <i>mean rank: 57.4**</i> <i>mean = 0.409***</i> <i>median = 0.33***</i>	4 (31%)	9 (69%)
ANOVA (HRIS)			ANOVA (ER)		
Aspects	p-value*		Aspects	p-value*	
HRIS 1	<0.001		ER 1	<0.001	
HRIS 2	<0.001		ER 2	<0.001	
HRIS 3	<0.001		ER 3	<0.001	
HRIS 4	<0.001		ER 4	<0.001	
			ER 5	<0.001	
			ER 6	0.079	

*The F tests should be used only for descriptive purposes because the clusters have been chosen to maximize the differences among cases in different clusters. The observed significance levels are not corrected for this and thus cannot be interpreted as tests of the hypothesis that the cluster means are equal; **Mean rank is calculated for average appropriate variables according to the Kruskal Wallis test; ***Mean and median are calculated for average appropriate variables

Table 1: *Companies' classification using the non-hierarchical k-means cluster method according to HRIS and ER*

Regarding companies' classification in accordance with ER, companies forming cluster 1 usually do not use ER as a mean of the recruiting process. Cluster 1 is almost equally comprised of medium-size companies (45%) and large companies (55%). Furthermore, cluster 3 corresponds to the companies that provide ER (a majority of large companies 69%). Cluster 2 forms companies which apply ER to the maximum degree within their HR strategy (a majority of large companies 75%). Greater placement of large companies regarding the level of the usage of ER is not surprising, because those companies employ a great number of employees and ER represents the process which is easier to obtain and provides lower costs. HRIS and ER means and medians in appropriate clusters confirmed previously provided classification results. Interpreting the Kruskal-Wallis test we can notice a statistically significant difference regarding development of HRIS within defined clusters. The level of the usage of HRIS and ER confirms mean ranks from the nonparametric Kruskal-Wallis test. The

same statistically significant difference is notified regarding the level of the usage of ER within provided clusters.

CRITERIA	Ranking according to HRIS (values 1-5)				Ranking according to ER (values 0-1)***					
	IS1	IS2	IS3	IS4	ER1	ER2	ER3	ER4	ER5	ER6
Min/Max	max	max	max	max	max	max	max	max	max	max
Type	4*	4*	4*	4*	1**	1**	1**	1**	1**	1**
Indifference Treshold	1.80	1.80	1.80	1.80	-	-	-	-	-	-
Preference Treshold	2.20	2.20	2.20	2.20	-	-	-	-	-	-
Weight	0.25	0.25	0.25	0.25	0.17	0.17	0.17	0.17	0.17	0.15
	Medium-size companies N (%)		Large companies N (%)				Medium-size companies N (%)		Large companies N (%)	
Percentiles 0-20:	6 (43%)		8 (57%)		Percentiles 0-20:		2 (20%)		8 (80%)	
Percentiles 80-100:	5 (36%)		9 (64%)		Percentiles 80-100:		***		***	

*Level preference function; **Usual preference function;

***According to electronic recruitment there were companies with the same (the worst) ranks

Table 2: *Types of preference functions, weights and companies' ranking according to HRIS and ER by multicriteria PROMETHEE II method*

Furthermore, Table 2 shows matrix types of preference functions and criteria's weights for the multicriteria PROMETHEE II ranking method. Companies' ranking has been provided according to the level of HRIS usage as well as the level of ER usage. For the ranking according to HRIS, the level preference function was selected with thresholds 1.80 and 2.20 (survey analysis was done using the 1-5 Likert scale as it is usual in all levels of the Croatian educational system and social research). According to cluster analysis, it is shown that all aspects of HRIS contribute to a significant difference among defined clusters (p-values <0.001) and all HRIS aspects have the same weights 0.25. ER 1-5 criteria are contributed to a significant difference among defined clusters (p-values <0.001) and ER 6 has the p-value 0.079. So, all ER criteria have the same weights 0.17, except ER 6 with the weight 0.15. In this way, the unbiased analysis is ensured in accordance with the original numerical values. For future research a different scale can be used. A scale from 1 to 9 offers a better assessment [16]. Observing ranking in accordance with HRIS development, it is visible that up to the 20th percentile large companies prevail (57%). On the other hand, the majority of companies with the lower degree of HRIS development (80th-100th percentile) also belongs to large companies (64%). As stated previously, large Croatian companies are those that generally invest more in HRIS than medium-size companies, due to their specificities and needs in the area of HRM. However, Croatian companies are still introducing HRIS in general (and the majority of those are large ones), and it is reasonable

that those still require a certain degree of development. It may also be stated that within Croatian companies HRIS is still not showing its full potential. Consequently, according to the level of ER usage, firstly ranked companies are predominantly large companies (80%). Explanation for these results is the same as the following Table 1; large companies invest more in managing HR as their crucial resource, their requirements in HRM are significant, therefore, they speed up the process, alleviate it and make it cheaper by applying modern techniques. On the other hand, medium-size companies usually seek more for traditional selection tools, fortifying this process as the one that is obtained more easily.

		Mann-Whitney U test: p-value			Chi-square test: HRM and ER p-value
		HRM			All
		All	Medium-size companies	Large companies	
HRIS	HRIS1	<0.001*	0.004*	0.002*	0.171**
	HRIS2	<0.001*	<0.001*	0.001*	
	HRIS3	<0.001*	0.008*	0.003*	
	HRIS4	<0.001*	0.001*	0.015*	
	HRIS average	<0.001*	<0.001*	<0.001*	

*Particular HRIS (mean rank) are significantly higher within companies with developed HRM; **There is no statistically significant interdependence

Table 3: *Mann-Whitney U test of HRIS regarding HRM development in medium-size and large companies*

In Table 3, a significant statistical difference regarding overall companies' HRM (mean ranks) is evident according to average development of HRIS within all companies as well as within different companies' sizes. Observing all companies from the sample, it is evident that companies with a higher degree of HRM development provide higher HRIS development. If we segment companies according to their size, the conclusion is the same, i.e., a higher degree of HRIS development in a particular company provides a higher degree of overall HRM development in the same company. The theory previously explained the benefits of HRIS usage for the HRM performance and subsequently to the overall business performance. Among all advantages at the level of HRIS usage, the most important is to state that it increases competitiveness by improving HR practices and produces a greater number and variety of HR operations which affect the accomplishment of the overall HRM performances. Although Croatian companies are still in the introduction era of the level of HRIS usage, those provide positive and optimistic results for future considerable investments. This is an additional argument that HR investments can not solely be observed as temporary companies' costs, but as significant investments in companies' future development and a sustainable competitive advantage.

According to the Chi-square test shown in Table 3, it is clear that there is no statistically significant relationship between companies that have the highest degree of HRM development and companies that apply ER (p-value 0.171). Weak results can be explained by the fact that Croatian companies still do not invest proper effort (time and money) in enhancing the recruitment process, although modern recruitment techniques can be applied without companies depending on the level of HRIS development.

Within Table 4, we can notice evaluated Binary Logistic Regression Models about dependence of HRM and HRIS development relating all companies from the sample, as well as medium-size and large companies. Parameters were evaluated by iterative maximum-likelihood estimation (MLE).

Companies	Independent variable	B (Wald test p-value)	Exp (B) (odds ratio)
All companies	Constant	-9.264 (0.001)	9.5E-05*
	HRIS	3.269 (<0.001)	26.284*
Medium-size companies	Constant	-11.188 (0.045)	1.4E-05*
	HRIS	3.948 (0.037)	51.844
Large companies	Constant	-8.479 (0.006)	2.1E-04*
	HRIS	2.990 (0.004)	19.890

* Significance according to 0.01

Table 4: *Binary Logistic Regression results about dependence of HRM and HRIS development*

All models indicate HRIS as a variable influencing HRM development in medium-size as well as in large companies. Parameters $B > 0$ point that probability of companies' HRM is at a higher degree of development if HRIS is developed within the same company, which once again approves previously stated results.

5. Conclusion

Surviving in a changing business environment, human resources represent companies' crucial resource, especially in combination with the usage of modern business practices and techniques. Attracting and selecting adequate employees is the first step in securing the best human potential for the company and the process of recruitment and selection will generate better results if a proper tool is applied. Croatian companies are still at the beginning of the usage of HRIS and ER, what is the crucial fact that made this research more difficult. Simultaneously, it was the main research limitation. Nevertheless, the level of the usage of those tools already obtains positive success within HR performance in Croatian medium-size and large companies. From the result it is evident that

Croatian large companies are those that apply HRIS in majority, but still are at the beginning of modern era and require certain degrees of its development. In general, large companies are those that mostly apply ER as well, what is in accordance with their investment possibilities, but unfortunately this still does not affect their overall HRM performances. On the other hand, literature suggests and results show that the usage of HRIS within a particular company will positively influence their HRM performances. Conclusion findings presume modern HRM techniques as a necessity, knowing the fact that HR are the companies' most important resources, and their continuous investment will generate positive results. Although investment in particular HRIS is considerable, it can not be observed as temporary costs, but as significant investments in companies' future development and a sustainable competitive advantage.

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