A Preliminary Survey into the Use of Business Process Tools in Croatian Companies

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***Abstract* - This paper presents the analysis of process-oriented information technology. Process information technology can be defined as all information technology that a company uses in order to reach the highest possible level of process orientation. It includes information technology for managing business processes and information technology for performance measurement. The paper identifies and describes process information technology and it examines the influence based on actual research done in Croatian businesses, information technology has on levels of business process orientation. Information technology has a favourable effect on process orientation, according to the research. It has been established that information technology is the least valued aspect of process orientation and that corporate informatization in the Republic of Croatia is still insufficient. The adoption and usage of process information technology in Croatian enterprises are crucial, according to the aforementioned data.**

Key words - process-oriented information technology; process management; Croatia; empirical research.

I. INTRODUCTION

The analysis of information technology is the foundation of this study. Every company is defined with different business processes that describe the way the company operates. A series of tasks that make up a business process are logically related and utilize firm resources with the overarching objective of meeting customer demands for goods and services of a suitable quality and cost in a sufficient amount of time while also generating some value [1]. Business processes gather data about the situation and requirements of the company's clients and employees, then process that data in order to take actions that can meet those requirements. They are, in essence, the brains and nervous system of every business [2], so managing them is crucial. There are several important components to business process management (BPM). This idea is understood in science and practice in a variety of ways, from a narrow focus on information technology to a comprehensive view of process management. Business process management initially placed a strong emphasis on the technical, i.e., the application of information technology in business processes and process design [2]. It is only in recent years that researchers have begun to look at using business process management as a comprehensive strategy that goes beyond information technology. A comprehensive picture of business process management is presented by [3]. They view business process management as a novel way of conducting business in an organization in contrast to the conventional functional, hierarchical method. The organizational components of process management are included in a holistic approach, which views processes as the central means and such operations are carried out as long as they are supported by the staff of the organization. That is why business process management integrates a managerial strategy with the right technology.

Organizations today are compelled to connect their business processes via functional units as a result. Organizations employ a process-oriented approach to managing their activities as a result of the requirement for such cross-functional connections. Process orientation (also known as BPO) has several meanings in the literature, but one that claims that an organization's process orientation is determined by how much attention it gives to its primary business processes may be the most accurate [4]. Process orientation in business refers to efforts made by organizations to build organizational structure and strategic planning upon business processes [2].; it emphasizes processes as the antithesis of hierarchy in the organization and it increases organizational efficiency by coordinating organizational activities in a system that is based on overall processes. Process orientation is very closely related to information technology and informatization of business. A suitable degree of orientation of business processes degree is a requirement for informatization of business processes. Informatizing chaotic, unconnected, and uncoordinated corporate processes is pointless. In contrast, information technology supports and encourages many procedures to be performed [5].

The research questions that arise are: what types of technology belong to process information technology and what is its influence on the business process orientation in a company. The first chapter defines and describes the concepts essential for this topic. The second chapter defines information technology, classifies it and emphasizes its importance. In the third chapter, the informatization of the Croatian companies is empirically examined and the information technology's effect on process orientation is tested. Finally, the fourth chapter gives concluding remarks of this paper, explains the scientific contribution and shortcomings of the completed research, as well as providing recommendations for future research.

II. PROCESS INFORMATION TECHNOLOGY

Information technology (IT) can be used to develop process orientation, according to many writers [6;7]. According to [8] IT can affect business processes in 3 complimentary, but different ways. IT adds worth to the entire organization through these impacts on business operations. First, automated impacts refer to value produced from IT's position as a capital asset that replaces labour from the efficiency perspective. Value within this dimension primarily comes from effects like increased productivity, labour cost savings, and cost reduction. Second, IT's capacity to of information collecting, storing and processing is the main source of information effects. Following these outcomes, adding value entails enhancing decision quality, empowering individuals, conserving resources, enhancing organizational effectiveness, and enhancing quality. Third, transformational effects describe the benefits derived from IT's ability to support transformation and innovation of processes. A shorter time period and improved goods and services are how the business value related to these outcomes is seen. According to [7] using information technology to support business process execution has many advantages. He claims that information technology makes it possible to automate business processes, shorten their duration, collect, store, and deliver information more easily through the creation of business process repositories, supervise and monitor business processes, make interventions in real-time, analyse data, connect business process activities, and transfer information more quickly between geographically distant areas. Better process execution is made possible by information technology, but it does not by itself bring value. However, the administration of business processes is a required and inevitable support for information technology. Information technology and processes are closely related, therefore process-oriented businesses must inevitably use technologies to manage their business operations automatically.

Information and communication technologies advanced greatly near the close of the 20th century as they started to be employed more and more in the workplace. This advancement, along with advances in computing power and transmission speed, made it possible to digitize business processes within the firm. The growth of technology brought about by process changes was sparked by the growing interest in enhancing corporate processes as well as technological advancements. This includes the usage of integrated information systems and BPM tools for process integration. Over the past 20 years, business process management systems have seen constant change. First, everything started with process automation, management of business processes and creation of software solutions for connecting different information systems within the company. At the end of the 1990s, the focus shifted to connecting with information systems of business partners, developing and connecting systems for electronic business, and connecting systems to supply chains. Such unification of a traditional information system for managing business flows, a system for interactive communication of groups of users, a system for BPM and information technology for measuring business success resulted in a new technology called process information technology [9].

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A. Information technology for business process management

According to [7] business process management from the aspect of information technology includes five components:

- Business processes are modelled using common notations, called process modelling;
- Process monitoring, which refers to the capability of determining how well a process is performing;
- Measuring the process's effectiveness: evaluating the process's effectiveness based on performance indicators;
- Management of business rules: the objective is to extract business rules from conventional software applications, store them, and manage them using independent components referred to as the business rule engine;
- Process engines are employed as parts of process-based applications and are information technology systems. They ensure that procedures are carried out in accordance with their instructions.

In the beginning, information technology was developed in the direction of support in modelling business processes. But business process modelling is only one phase of BPM life cycle. It is the basis of management because if there is no clearly defined model of how business is conducted, management is not possible

either. Information technology must support all stages of the BPM life cycle [10]. Therefore, software tools oriented to business processes can be divided into two basic groups [11]:

- Tools for modelling and analysing business processes;
- Tools for business processes management.

Business process management tools' primary goal is to automate and regulate the execution of business processes, whereas business process modelling and analysis tools' primary goal is to record, evaluate, and provide suggestions for bettering business processes. Tools for process modelling and BPM tools and have some fundamental differences and these are is that modelling tools are only a modelling environment, while business process management tools are an execution environment. However, these two categories of tools are complementary and it is necessary to combine them when implementing a business process change project. Although there are quite a few software tools available that fall outside of the two categories mentioned, it is not necessary to pay attention to these tools separately because they are frequently either a crucial component or a supplementary module of software tools from the aforementioned categories [12].

B. Information technology for business process managment

The literature has shown that many approaches to business performance measurement proposed in the last two decades emphasize the measurement dimensions and performance indicators that must be considered. In contrast, issues related to information technology that support performance measurement have been largely neglected. [13] points out that building a performance measurement system does not necessarily include information technology. However, for such a system to be successful, information technology is necessary. Information technology enables: monitoring of business operations, ongoing data gathering on business performance, comparison of historical, achieved, and target values of collected data, information extraction from primary data concerning new business trends or anomalies, and dissemination of obtained results to business participants. In other words, it can be said that information technology has various roles in performance measurement: collection, analysis, reporting and presentation roles. The question that arises is what kind of information technology can serve as support for methods and tools for measuring performance. The analysis of the literature shows that for the purpose of measuring the success of a company's operations, business intelligence tools [12] and integral information systems [14].

Software tools of business intelligence can be considered various application software supports created for reporting, analysis and presentation of data [15]. Business operations must be closely watched at all times. To determine the effectiveness of the processes that have been put in place, they must be measured. Tools for business intelligence can be employed to manage business operations. Starting with static process control, which keeps track of process stability using a wide range of dynamic tools like simulation, what-if analysis, and business cost analysis, it progresses to gauging how satisfied internal and external customers, process owners, employees, and suppliers are with the process. Future-focused businesses are starting to understand that gathering information on business processes can result in large operating cost reductions and quicker returns on technology expenditures.

One of the prerequisites for the success of a company's operations is the support of an integral information system (Enterprise Resource Planning, ERP), which is used to collect and distribute information throughout the organization, in order to connect different organizational parts and create a basis for quality decision-making [11]. An ERP system connects all organizational business operations, supports and combines the work of all services and functions, and encompasses the complete business model of the company, as well as external business processes related to business partners [15]. ERP uses a single database and performs the functions of a transactional and managerial information system and integrates elements of a decision support system. It enables document tracking and process level reporting, employee teamwork, and planning, monitoring, and use of all company resources. The basic idea of ERP is the connection between the organization and the process, which enables the recording of all business events so that the data can be used and analysed within the entire organization at the process level. The results of monitoring and measuring the success of business processes serve the management for comparison with competitors, for creating strategic maps of the company and for evaluating the effectiveness of the company's strategy's implementation. The ERP approach to automation and integration of business processes is based on the idea that many key business processes are similar in different organizations and an information system for automating such similar processes can therefore be developed. Business processes integration is achieved when nearly all business processes within an organization are performed within the boundaries of an integral information system. Practice has shown that ERP systems are imperative, but that an ERP system in a company is not enough by itself. According to [16] "for a successful ERP system, the customer is king, technology is the key, information is a competitive weapon, business process management software tools and business intelligence software tools lead the way." This means that CRM must be integrated within ERP, technologies must be improved, especially those related to electronic business, and timely and accurate information about what is happening inside and outside the organization must be available to ERP systems. However, without following two trends recognized in practice today [14], namely: integration of ERP and business intelligence tools; integration of ERP and business process management tools.

III. EMPIRICAL RESEARCH

Companies in Croatia must evaluate the practice of using process information technology in order to be able to become and remain competitive. Therefore, an empirical investigation into how process information

technology is used in large, medium-sized, and small businesses in the Republic of Croatia was conducted.

A. Methodological framework of the research

An electronic questionnaire served as the primary tool used in this study to gather primary data. The questionnaire used examined the process orientation of companies in the Republic of Croatia. Process information technology is one of the aspects of BPO. The practice of using such technology in Croatian companies was examined through this dimension, which contained a total of 11 questions. The other 8 dimensions of BPO are not relevant to the topic of this paper. Since in most cases the questions (statements) are of a closed type with the offered answers of intensity, a discrete 7-point Likert scale was used, where it applies: 1=not true at all,…, 7=completely true, x=don't know. The degree to which respondents approved or disapproved of the declarations was gauged on a scale of 1 to 7. The questionnaire and accompanying letter were sent to the electronic addresses of 1,200 large, medium and small companies in the Republic of Croatia, and information about them was obtained using the register of the Croatian Chamber of Commerce (the e-mail contacts that were available were used). The research sample consists of 127 companies, which means that the response rate is 10.58%.

To determine the general characteristics of the organization, questions about the main activity of the organization and the average number of employees were used. In order to demonstrate the heterogeneity of the sample, the volume of annual turnover was also observed. To determine the activities of the organizations that participated in the questionnaire in response to the question about their main activity, 19 options were offered according to the categorization of the State Bureau of Statistics. The largest number of companies from the sample are from other activities (16.53%), professional scientific and other technical activities (15.75%), followed by companies from processing activities (11.81%) and from trade and repair of motor vehicles (11.02%). Not a single company from education or cultural, entertainment and recreational activities participated in the survey, and one company from the sample did not respond. 33.9% of large, 34.6% of medium and 31.5% of small companies took part in the survey according to the number of employees. 35.7% of large, 27.7% of medium and 36.6% of small companies took part in the survey according to the criterion of annual turnover. As a result of the research's participation by businesses from various industries, the data sample adequately represented all business sectors. Furthermore, the sample is a good representative of the population of large, medium-sized, and small Croatian businesses.

A. Results and discussion

By analysing the responses of all companies from the sample, both the average ratings of the state of process orientation of Croatian companies and the average ratings of its individual dimensions were obtained. The investigation revealed that the worst-rated aspect of process orientation is information technology, which has an average score of 4.1827, which indicates that in the practice of Croatian companies, the informatization of business is insufficient. The issue is caused by the fact that information technology rather than business processes, is based primarily on business functions. Processes must be the foundation of business so that information technology may automate them. Companies gave the lowest ratings of this dimension precisely in the aspects related to the described process information technology: the use of software tools for documenting and analysing business processes (3.62), the use of software tools for managing business processes (3.44), the use of software business intelligence tools for measuring business performance (3.56) and the introduction and use of an integral information system (3.65). Furthermore, these parts (questions) have the lowest marks of all the parts of the entire questionnaire, which is devastating (Table I).

TABLE I. PROCESS INFORMATION TECHNOLOGY QUESTION GRADES

Process information technology	**Average grade**
Business informatization is based on processes (not on business functions)	4.88
Our information system provides the management with relevant information on business processes effectiveness.	4.88
Our information system is flexible and adjustable to business process change.	4.66
An organization uses special programme solutions for customer relationship management.	4.03
An organization uses some aspect of e-business.	3.86
An organization has document management system.	4.62
An organization uses specialised business process modelling and analysis programme tools.	3.62
An organization uses specialised business process management tools.	3.44
An organization applies business process management system.	3.56
An organization uses business intelligence programme tools for measuring business performance.	3.65
An organization applies an integral system for business process management.	4.25

In the future, the use of such tools will have to be intensified, because they allow managers a mechanism to efficiently coordinate all the human and technological resources required to carry out certain business processes, adding value to the firm by harmonizing its operations. Even among companies that have tools for modelling and

documenting business processes, 54.9% occasionally use them, compared to only 45.1% who use them consistently. The situation is no better with business process management tools. They are only utilized routinely by 48% of businesses, and sporadically or infrequently by 52% of businesses. Businesses most commonly employ ARIS Toolset (5 mentions), SharePoint (3 mentions), IBM BPM (2 mentions), and Microsoft Visio among the software tools for modelling and documenting business processes (2 cases). ARIS, MS Dynamics NAV, SAP BPM, and IBM WebSphere Business Integration Suite are the software programs that businesses most frequently employ to manage business processes (listed in four of the cases) (2 cases). Some companies give inadequate answers to questions about specialized software tools for modelling and documenting business processes and to questions about business process management tools they use, from which it can be concluded that these companies are not familiar with the concept and terms of business processes. As for business intelligence software tools for measuring business performance, 66.9% of the companies in the sample use tools for business reporting, 52.8% perform analytical data processing, 63% perform ad hoc queries and analyses, 59.1% statistical analysis and data mining, and only 32.3% alarm systems and early notification systems.

All of the above indicates that the implementation of process information technology in Croatian companies must become imperative. It is information technology that is mentioned in the literature as a factor that facilitates the restructuring of business in the direction of the process paradigm [14; 17], therefore, in the conducted research, we wanted to empirically test whether there really is a connection between information technology and the process orientation of the company. For this purpose, IT and BPO were the subjects of a correlation study. The p-value is equal to 0.000, and the Spearman correlation coefficient is 0.702 in value. According to these findings, Information technology adoption and business process orientation are statistically significantly and positively correlated. At the significance level of 1%, and according to Gulford's table, this relationship is on the cusp of being a moderate to high connection (Table II).

TABLE II. BPO AND IT CORRELATION

		IT	**BPO**
IT	Correlation	1	0,702
	P-value		0,000
	N	127	127
BPO	Correlation	0,702	1
	P-value	0,000	
	N	127	127

As stated previously, many authors in their works classify integral information systems and business intelligence software tools as elements of information technology for performance measurement, but none of them tried to prove it empirically. Given this fact and the fact that today many companies use business intelligence software tools, and all successful companies have integral information systems, the question arises whether business intelligence software tools and integral information systems truly support the management and design of business processes. The conducted research therefore tested whether the use of integral information systems is positively related to the process orientation of the organization and whether the use of business intelligence software tools is positively related to the process orientation of the organization. Spearman's correlation coefficient was used for testing. The use of integral information systems is positively correlated with the process orientation of the organization at a significance level of 1%, according to the Spearman coefficient between the variables of use of integral information systems and the variable of process orientation, which is 0.385 with a p-value of 0.000. The usage of business intelligence software tools is positively correlated with the organization's process orientation, according to the Spearman correlation between the variable use of business intelligence software tools and the variable process orientation, which is 0.495 with a p-value of 0.000. Based on the conducted statistical analysis and all of the above, it can be concluded that the use of information technology is positively related to the process orientation of the company. Given that the connection has been empirically proven, it was additionally wanted to examine whether there is also an influence of the use of information technology on the process orientation of the company. Regression analysis is used to examine the impact. The regression analysis in this case was carried out in such a way that process orientation was a dependent variable, and information technology was an independent variable. The performed analysis indicates that the regression model explained 46.8% of all deviations of the dependent variable. The magnitude of the Durbin-Watson test is 1.852, which means that there is no autocorrelation problem. Information technology as an independent variable is significant at the 1% significance level, and the calculated parameter's value of 0.441 suggests that information technology has a favourable effect on the company's process orientation, meaning that using information technology causes the company to have higher levels of process orientation (Table III).

TABLE III. THE INFLUENCE OF IT ON BPO

Coefficients [a]								
Model		Unstandardized Coefficients		Standardized Coefficients	t	p-value	95,0% confidence interval	
		$\hat{\beta}$	Standard error	$\hat{\beta}$			Lower bound	Upper bound
1	Constant	2,994	,186		16,072	,000	2,625	3,362
	IT	,441	,042	,684	10,490	,000	,358	,524

a. Dependent variable: BPO

IV. CONCLUSION

The review of the pertinent literature revealed how crucial it is for businesses to increase their process orientation by utilizing information technology. In order for such a claim not to remain only on a theoretical basis, the conducted research examined the connection of information technology with the process orientation of the company. The paper first defined and classified the so-called process information technology, and then its influence on process orientation was empirically tested. Information technology's effects on businesses' process orientation and the connection between the use of business intelligence tools and integral information systems with process orientation have been statistically proven. In other words, the importance of information technology for the process orientation of the company was empirically proven, which reflects the scientific contribution of this work. In the literature so far, there are only theoretical claims about the existence of the mentioned influence and connection, but there are no empirical tests. The conducted research also examined the practice of using process information technology in Croatian companies. It has been proven that the informatization of business in the Republic of Croatia is still inadequate and that information technology is the least rated dimension of process orientation. All of the aforementioned evidence led to the conclusion that process information technology adoption and use in Croatian businesses are essential.

One of the main limitations of the research in this work is related to the size of the cause on which it was conducted. Namely, although the representative sample consisted of 127 large, medium and small companies of the Republic of Croatia, a larger sample would have provided much more detailed and concrete results. The research, despite using a professionally crafted survey questionnaire, cannot overcome all the drawbacks of this approach, chief among which is the respondents' incapacity to provide objective answers to the questions and their lack of understanding of specific issues. Therefore, increasing the sample with the additional use of the interview method would largely eliminate the limitation related to the shortcomings of the survey method. Using an interview would avoid misunderstanding of the questions by the respondents, as well as their subjectivity when answering.

Finally, empirical research was conducted only in the Republic of Croatia. Future study could be expanded and conducted concurrently in a number of European Union member states in order to determine the standard level of process orientation for European companies. This would enable a transparent comparison of samples from different countries, as well as the development of a methodology for the use of various types of process information technology necessary for businesses to move toward greater levels of process focus.

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