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**DEVELOPMENT TRENDS OF INFORMATIZATION IN THE FUNCTION  
OF BUSINESS CHANGE MANAGEMENT IN CROATIAN COMPANIES**

**TRENDovi RAZVOJA INFORMATIZACIJE U FUNKCIJI  
UPRAVLJANJA PROMJENAMA HRVATSKIH PODUZEĆA**

**ABSTRACT**

*This paper discusses the development trends of informatization in the function of the business change management in Croatian companies. This study is a review of the trends in development of informatization and factors of change management based on data collected from 50 large and medium-sized companies in Croatia. After analyzing the data, we systematized and analyzed factors of change management using complementary and comparative approach.*

*The aim of the research is to systematize the factors of business change management, identify key factors and trends in strategic development of informatization of business systems, and analyze the modalities, the direction and intensity of the impact of trends in informatization on change management, by components (factors) and in a synergistic manner.*

*In this paper we investigate the influence of strategic factors (trends) of development of business informatization on business change management factors to identify and systematize factors that promote alignment between business and IT strategy and factors of apps support to business system. The impact of strategic factors of informatization on business change management in Croatian companies has been investigated and presented using correlation-based techniques.*

*The paper is structured in six interrelated parts. In the first section, the introduction, we discuss the features and trends in development of informatization as a function of business change management system. The second section discusses the features of computerized business in the example of Enterprise 2.0. In the third part, we systematize and describe the strategic characteristics of business system as factors of change management that define the level of shift from traditional to computerized operations. The fourth part presents and analyzes the results of the research of impact of strategic factors of business informatization on the factors of change management. In the fifth part, based on the results of research, we form and present a model of the impact of factors of business informatization on*

*the factors of change management. A summary of the paper's main points has been included in the conclusion section.*

**Keywords:** *trends of informatization development, change management, strategic attributes, architecture, factors of informatization, correlation*

## SAŽETAK

*U radu se razmatraju trendovi razvoja informatizacije u funkciji upravljanja promjenama hrvatskih poduzeća. U istraživanju trendova razvoja informatizacije i čimbenika upravljanja promjenama prikupljeni su podaci od 50 velikih i srednjih tvrtki u Hrvatskoj. Na temelju obrađenih podataka, čimbenici su komplementarno i komparativno sistematizirani i analizirani.*

*Cilj istraživanja je sistematizirati čimbenike upravljanja poslovnim promjenama, identificirati ključne čimbenike i trendove strateškog razvoja informatizacije poslovnog sustava, te istražiti, analizirati i objasniti modalitete, smjer i intenzitet utjecaja trendova informatizacije na upravljanje promjenama po komponentama (čimbenicima) i sinergijski.*

*U istraživanju utjecaja strateških čimbenika (trendova) razvoja informatizacije poslovnog sustava na čimbenike upravljanja promjenama identificirani su i sistematizirani čimbenici povezivanja informacijskog i poslovnog sustava i čimbenike aplikativne potpore poslovnom sustavu. Utjecaj strateških čimbenika informatizacije na upravljanje poslovnim promjenama u hrvatskim tvrtkama istražen je i prezentiran metodom korelacijske povezanosti.*

*Rad je strukturiran u šest međusobno povezanih dijelova. U prvom dijelu, uvodu, razmatraju se značajke i trendovi razvoja informatizacije u funkciji upravljanja promjenama poslovnog sustava. U drugom dijelu razmatraju se značajke informatiziranog poduzeća na primjeru koncepcije poduzeća 2.0 U trećem dijelu sistematizirao se i opisuju strateška obilježja poslovnog sustava kao čimbenici upravljanja promjenama koje definiraju razinu pomaka od tradicionalnog prema informatiziranom poslovanju. U četvrtom dijelu prezentiraju se i analiziraju rezultati istraživanja utjecaja strateških čimbenika informatizacije poslovnog sustava na čimbenike upravljanja promjenama. U petom dijelu, temeljem rezultata istraživanja, oblikuje se i prezentira model utjecaja čimbenika informatizacije poslovnih sustava na čimbenike upravljanja promjenama. Sinteza rada predstavljena je u zaključku.*

**Ključne riječi:** *trendovi razvoja informatizacije, upravljanje promjenama, strateška obilježja, arhitektura, čimbenici informatizacije, korelacija*

## 1. Introduction

At the beginning of the first decade of the 21st century, the development of information and communication technology (ICT) brought about great changes. Take a case like web that at the time was an essentially read-only Web on which you could only browse the published content, which has changed into a read-write Web on which you can publish your own content, giving the final shape of a social web or Web 2.0. This transformation involves the emergence of new tools such as blogs, forums, wikis, social networks and the like. The transition from traditional to computerized business can be illustrated by comparing the concepts of Enterprise 1.0 and Enterprise 2.0. This transition was not abrupt as it could be concluded from the new version name (with an emphasis on web technology). The transition is gradual and is not over yet, and the term Enterprise 2.0 is really just a name for the change that started happening even before the term was thought out. The aim of the introduction of information technology in business is to enhance cooperation both among employees and constituents within the

enterprise and between enterprises and business partners to allow for collecting, creating, organizing and sharing data, information and knowledge in a faster and better way (Humski, 2012).

According to O'Reilly (2005), Web 2.0 is the second phase of the web development that has inherited the dominant model of web application aimed at publishing, with dynamic and flexible web services that are more responsive to user actions. Shortly after the appearance of the Web 2.0 paradigm, McAfee [5] presented the idea of the application of Web 2.0 technologies in business and in doing so created the concept of Enterprise 2.0. By implementing Web 2.0 technologies in business processes, an information management process can be upgraded with knowledge management and business intelligence. Main benefits of knowledge management and business intelligence are increased productivity and employee satisfaction, and better decision making. In addition, employees are no longer passive recipients of information but are more engaged in the process of content creation (O'Reilly, 2005).

A central element of Enterprises 2.0 is collective intelligence according to which employees who work together on a common project through the exchange of knowledge and experience contribute to increasing the value of knowledge which ultimately leads to easier and faster problem solving. Maturing new technologies in business will allow us to leave cooperative forms (division of labor, where each person is responsible for a certain part of the job) behind; cooperation is increasingly being replaced by collaboration (working together in order to solve a problem). (Orehovečki et al., 2008).


Companies that are able to adapt their information systems to new paradigms of Enterprise 2.0 through a series of generally simple applications enable rapid sharing of knowledge both among employees and between the organization and its environment. In fact, this type of applications is based on cooperation and dynamism, the ability to easily connect and transfer information in new contexts, which contributes to the openness of the enterprise and its better perception of customer needs. The information system of such an organization becomes a reflection of organizational autopoiesis and is no longer strictly a complex technical system but user-oriented interconnected series of applications that allows managers and employees rapid knowledge exchange and dissemination throughout the organization. In this matter, Enterprise 2.0 is not a complete replacement for traditional information systems, but a supplement that provides organizations with greater flexibility and faster restructuring depending on the changes in their environment (Žugaj, Schatten, 2009).

Concepts of traditional enterprises (1.0) and computerized web enterprises (2.0) are not independent, but rather complementary to each other. This means that the concepts of computerized enterprises to a lesser extent replace, and more complement the concepts of traditional enterprises. The free form of emerging world described as Enterprise 2.0 is not an evolution of the structured world of Enterprise 1.0; in practice these two concepts exist as intertwined points of tapestry that define a complete picture of how modern computerized enterprise looks like (Bardoliwalla, 2009).

## **2. Factors influencing management of change from traditional to computerized business**

Factors influencing the management of change from traditional to computerized business have been systematized according to research findings presented within E2 Conference on innovation management using business apps (Enterprise 2.0 Conference, 2009). Factors of change management have been presented as strategic attributes of a company in the context of the relationship between traditional and computerized business (see table 1).

**Table 1** Scale of estimation between traditional business and business informatization

Attributes	Traditional business	Scale  estimation	Business informatization
Purpose	Growth, Size	5 4 3 2 1 0 1 2 3 4 5	Development, Quality
Resource	Capital, Labor, Material Resources	5 4 3 2 1 0 1 2 3 4 5	Information, Knowledge
Motive	Short-Term, Profit	5 4 3 2 1 0 1 2 3 4 5	Long-Term, Success
Environmental relation	Competition	5 4 3 2 1 0 1 2 3 4 5	Cooperation
Objectives and manner of functioning	Efficiency, Execution of Tasks	5 4 3 2 1 0 1 2 3 4 5	Success, Actions, Results
Functioning in an environment	Procedural, relatively fast	5 4 3 2 1 0 1 2 3 4 5	Flexible, Adaptive, Momentary (Prompt)
Strategy	Production Planning	5 4 3 2 1 0 1 2 3 4 5	Production in line with market needs
Business perspective	Business function	5 4 3 2 1 0 1 2 3 4 5	Business process
Organizational unit	Department	5 4 3 2 1 0 1 2 3 4 5	Cross-functional team
Focus for employees	Supremacy, Competitiveness	5 4 3 2 1 0 1 2 3 4 5	Participation, Cooperation
Business tasks	Closely defined	5 4 3 2 1 0 1 2 3 4 5	Flexible, Comprehensive
Information systems	Complex technical system	5 4 3 2 1 0 1 2 3 4 5	Business apps
Relationship between people and technology	Technology driven by IT experts	5 4 3 2 1 0 1 2 3 4 5	Technology driven by users
Openness of enterprise	Departments and clear boundaries	5 4 3 2 1 0 1 2 3 4 5	Unmarked boundaries
Value chain	Supplier and consumer oriented	5 4 3 2 1 0 1 2 3 4 5	Linking business oriented

Source: Authors according to Enterprise 2.0 Conference, May 2009

In the survey questionnaire respondents were invited to assess attributes of the company in terms of the relationship between traditional and computerized business processes by bolding or underlining the appropriate response

Strategic attributes have been analyzed and assessed in terms of the relationship between the traditional and computerized business using rating scale method. Table 1 parallelly shows attributes of traditional

business (column to the left of the rating scale) and the attributes of computerized business (column to the right of the rating scale). The attributes may be mutually contradictory, but also complementary to each other (can also be used in combination and synergy). Directions and intensities of orientation as shown in the table can be determined on the rating scale (5- 0 - 5). Scores going down to the lowest score possible (-5) mean greater traditional orientation, while high numbers (going up to 5 as the highest score possible) mean a strong focus on computerized business. Scores in the middle or equal to zero mean more moderate orientation with the possibility of combining the opposite attributes.

For example, a score of 5 for Strategy on the right side indicates that the company is fully oriented to production and market needs, while zero score for Environmental relation reveals a combination of competition and cooperation.

#### **4. Enterprise architecture and factors in Information systems management**

The role of information system in business management has long been irreplaceable, but complex relationships between business processes and information systems can create difficulties. Business architecture provides concepts for the information system development process to align with the business life cycle, but it is also used to improve business processes. Aligning IT and business system is a key factor of success of the company.

Ross (2007) defines enterprise architecture as the organizing logic for business processes and IT capabilities reflecting the integration and standardization requirements of the firm's operating model [8]. Business architecture provides concepts for aligning business strategy and business processes with the information system development process. Enterprise architecture is a discipline for proactively and holistically leading enterprise responses to a changing business environment.

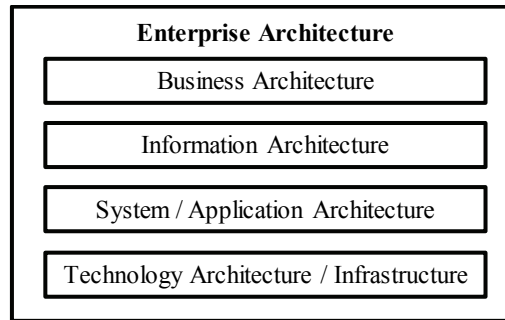
Business architecture framework describes the business model and the considered area, the model of the new system, the model of technological solutions, the model of components of the information system and the model of development and use of the information system. The Zachman Framework (1987) for Enterprise Architecture provides a structured way to view an enterprise and its main perspectives (data structure, functions / processes, users, location, time and motivation). In his article titled 'A Framework for Information Systems Architecture' Zachman laid the foundation for enterprise architecture in a form as we see it today - as comprehensive business and technology architecture. Zachman's approach to enterprise architecture puts the spotlight on information technology, and enterprise architecture is thus defined as the blueprint for infrastructure of organisational information (Zachman, 1987).

TOGAF (The Open Group Architecture Framework) is perhaps the most popular enterprise architecture framework today, established under the auspices of The Open Group (TOG). TOGAF can be seen as a multidimensional framework for developing and managing the lifecycle of enterprise architecture. TOGAF is modeled at four levels, as illustrated in Figure 1 (Ylimaki, 2006):

1. Business Architecture, which defines the business strategy, management, organization and business processes in an organization / company;
2. Information architecture, setting out the model and structure of the information system and the concepts of information system development and management;
3. Applications Architecture, setting out architectural blueprint & guidelines to be respected in the implementation of application systems, business applications and their interaction and relationships;

4. Technical or technological architecture that describes the hardware, software and network infrastructure required for the smooth execution of critical applications.

**Figure 1** Levels of Enterprise Architecture



*Source: Ylimaki, 2006*

Identifying key factors of business system informatization and strategic development of enterprise informatization, is the foundation for developing a methodological framework for the development of strategic information systems. Comparative analysis of the key factors from the perspective of the period of development of information systems shows the basic trends in the development of information technology from the viewpoint of its application in the business and provides valuable data and information in defining the guidelines of the strategic development of informatization.

#### **4. Correlations between the factors of business system informatization and strategic attributes of business system**

This chapter presents and analyzes the results of the research on the impact of the strategic factors of business system informatization on the factors of change management. The impact of strategic factors was explored on the basis of data collected from Croatian companies through survey questionnaire on the factors. The concept of research was based on a study of development of information systems in companies in the United States conducted by the Management Information Systems Research Centre (MISRC) at the Minnesota University and Society for Information Management (SIM) (Brancheau, J.C. et al., 1996).

By identifying the key factors of business system informatization, a methodological frame of the strategic development of information systems can be built. Continuous research within the defined time periods allows for comparative analysis of the issues that impact the information systems management, revealing trends and offering information relevant to forecasting the development of informatization. In other words, comparative analysis of the results of researches by specific time period offers a mean of identifying issues, which are growing in relevance with the trend of continuous growth, or show a decreasing trend or have varying trends where trend of changes and return to previous position is recorded (Brancheau, J.C. et al., 1996., Vukmirović, S., Čapko, Z. 2009., Vukmirović, S., Čičin-Šain, M., 2012.) The research on key issues in information systems management in the Croatian companies was made on data collected from 50 large and medium-sized companies in Croatia from 2011 to 2014, of which 41 companies responded to all questions.

Identification and systematization of key issues of information systems management (ISM) was done according to the concepts of Niederman et al., 1991. According to this methodology, these factors have been systematized into four groups (Brancheau et. al.,1996.):

- 1) Business relationship (BR): these issues deal with concerns external to the IS department. They focus on managing the relationship between IS and the business.
- 2) Technology infrastructure (TI): these issues deal with technology concerns. They focus on the integration of technology components to support basic business needs.
- 3) Internal effectiveness (IE): these issues focus internally on the IS function. They are concerned with those essential activities comprising the bulk of the IS function's work.
- 4) Technology application (Apl): these issues focus on the business application of specific information technologies.

Key issues of information systems management could be represented as factors of business system informatization. By integrating groups of factors of Information systems management and the enterprise architecture domains it can be concluded that the identification and systematization of the factors that affect Information systems management as done according to the Niederman concept, correspond to the levels of enterprise architecture as shown in Scheme 1:

- 1) Factors of Business relationship (BR) correspond to the Business Architecture level;
- 2) Factors of Internal effectiveness (IE) correspond to the Information Architecture level;
- 3) Factors of Technology application (Apl) correspond to the Applications Architecture level;
- 4) Factors of Technology infrastructure (TI) correspond to the Technological Architecture level.

Correlations between factors of business system informatization and strategic attributes in Croatian companies are shown in Matrix 1. The correlations identified between factors as indicated in Matrix 1 provide significant information and generate guidelines for the development of informatization of business systems for enterprise change management. Matrix 1 presents correlation coefficients that indicate the impact of the factors of business systems informatization on the strategy attributes of a business system (factors of change management). The correlations that are significant at the 1% significance level are bold and underlined, while those at the 5% significance level are bold and italic.

In estimating effects of the impact of the strategic factors of business systems informatization on the strategic attributes (factors of change management), or the relationship between the two variables we used a rating scale according to Petz (2007) as shown in Table 2.

**Table 2** *Example of rating scale for interpreting strength of relationship between variables*

<b>Interval of correlation coefficient (R)</b>	<b>Strength of correlations</b>
0.00 to 0.20	insignificant
0.20 to 0.40	easily broken
0.40 to 0.70	truly significant
0.70 to 1.00	very strong

*Source: Petz (2007)*

**Matrix 1** Calculating correlations between the factors of business system informatization and strategic attributes of business system

No	The Issues in Information Systems Management	Strategic Attributes of Business System														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Staff IT education	0,1	<b>0,4</b>	0,1	-0,1	0,2	0,2	-0,2	<b>0,3</b>	<b>0,4</b>	0,2	<b>0,5</b>	0,1	0,2	0,0	<b>0,5</b>
2	Internet services in networking between business systems	0,0	0,2	-0,1	0,2	0,2	0,2	0,0	<b>0,3</b>	0,1	0,1	<b>0,4</b>	0,0	0,1	<b>0,4</b>	<b>0,4</b>
3	Internet services in inter-organizational nwtworking with other companies	0,2	0,2	0,2	0,0	0,2	0,3	<b>0,3</b>	0,0	0,0	0,1	0,0	0,2	0,1	0,2	0,1
4	Systems (applications) for Enterpriose Resource Planning (ERP)	-0,1	0,0	-0,1	<b>0,3</b>	0,0	-0,2	0,1	<b>0,4</b>	-0,1	0,2	0,2	0,1	-0,2	0,0	0,1
5	Data warehouses, online analytical data processing and business intelligence	-0,2	0,1	-0,1	0,1	0,0	0,0	-0,1	0,3	0,0	0,1	<b>0,3</b>	-0,1	0,0	0,2	0,1
6	Cloud Computing	0,1	<b>0,4</b>	0,1	0,1	0,3	0,2	0,3	<b>0,4</b>	0,1	0,3	0,3	0,2	0,0	0,0	0,2
7	Tools for online colaboration and workflow management activities	0,2	<b>0,5</b>	<b>0,4</b>	-0,4	0,0	-0,1	-0,1	<b>0,3</b>	0,0	0,1	0,2	0,0	0,0	-0,1	<b>0,3</b>
8	The level of management and staff understanding on the role of infomation system in business system	-0,1	0,3	0,1	0,0	0,2	0,1	0,2	0,1	0,1	0,1	0,2	0,0	0,2	0,1	0,1
9	Organisational learning	0,0	0,2	0,2	0,0	0,3	0,1	0,2	0,3	0,1	-0,1	0,0	0,1	-0,1	-0,1	0,1
10	Organisation and positioning information service	0,2	<b>0,3</b>	<b>0,3</b>	-0,1	<b>0,4</b>	0,0	0,2	0,2	0,2	0,2	0,3	<b>0,3</b>	0,2	0,2	<b>0,5</b>
11	IT staff's competency level	-0,2	0,1	-0,2	0,1	0,0	0,0	0,0	0,0	0,1	0,0	0,0	0,0	-0,2	0,1	0,0
12	Strategically oriented IT education for managers	<b>0,3</b>	<b>0,3</b>	<b>0,4</b>	-0,1	<b>0,5</b>	<b>0,3</b>	0,2	0,2	<b>0,5</b>	0,1	0,3	0,2	0,2	0,2	<b>0,3</b>
13	The use of information system in the integration of business functions	0,0	0,0	0,1	0,1	0,2	0,2	0,2	0,1	0,3	0,2	<b>0,5</b>	0,0	0,1	0,3	0,2
14	Managing user orientted computing	-0,2	0,0	-0,2	0,3	0,1	0,1	0,0	0,1	<b>0,3</b>	0,1	<b>0,6</b>	0,1	0,1	0,3	0,3
15	Alignment between information system and organisation structure	0,0	0,2	0,2	0,1	<b>0,5</b>	<b>0,4</b>	<b>0,4</b>	0,1	0,1	0,3	0,3	<b>0,4</b>	0,0	0,2	0,3
16	Alignment between information system and business strategy	0,1	0,2	0,1	0,3	0,2	0,1	0,1	0,3	0,1	0,3	<b>0,3</b>	0,1	0,0	-0,1	0,1
17	Web 2.0	0,0	0,3	0,2	-0,2	0,1	0,1	-0,1	0,0	0,2	-0,2	0,1	-0,2	0,0	0,1	0,3
18	E-learning	0,3	<b>0,4</b>	<b>0,3</b>	0,1	0,3	0,2	0,1	0,3	0,3	0,2	0,3	0,3	0,2	-0,1	0,2

Source: Authors' calculation



Correlation coefficients which are calculated and presented in table 3 indicate the impact of the factors of business systems informatization on the strategy attributes of a business system (factors of change management). The correlations that are significant at the 1% significance level are bold and underlined, while those at the 5% significance level are bold and italic.

Correlation coefficients were calculated using SPSS. Figure 2 shows correlation calculation using SPSS on an example of the impact of strategy oriented IT education (factor of informatization, VAR00027) on organizational structure (strategy feature of informatization, VAR00009). Scheme 2 reveals a significant correlation between variables with a correlation coefficient of 0.48. Calculation of significance level indicates that correlation is significant at the 1% significance level.

**Figure 2** Calculating correlations using SPSS

**CORRELATIONS**  
 /VARIABLES=VAR00009 VAR00027  
 /PRINT=TWOTAIL NOSIG  
 /MISSING=PAIRWISE.

Correlations		VAR00009	VAR00027
VAR00009	Pearson Correlation	1	,480**
	Sig. (2-tailed)		,002
	N	41	40
VAR00027	Pearson Correlation	,480**	1
	Sig. (2-tailed)	,002	
	N	40	40

\*\*. Correlation is significant at the 0.01 level (2-tailed).

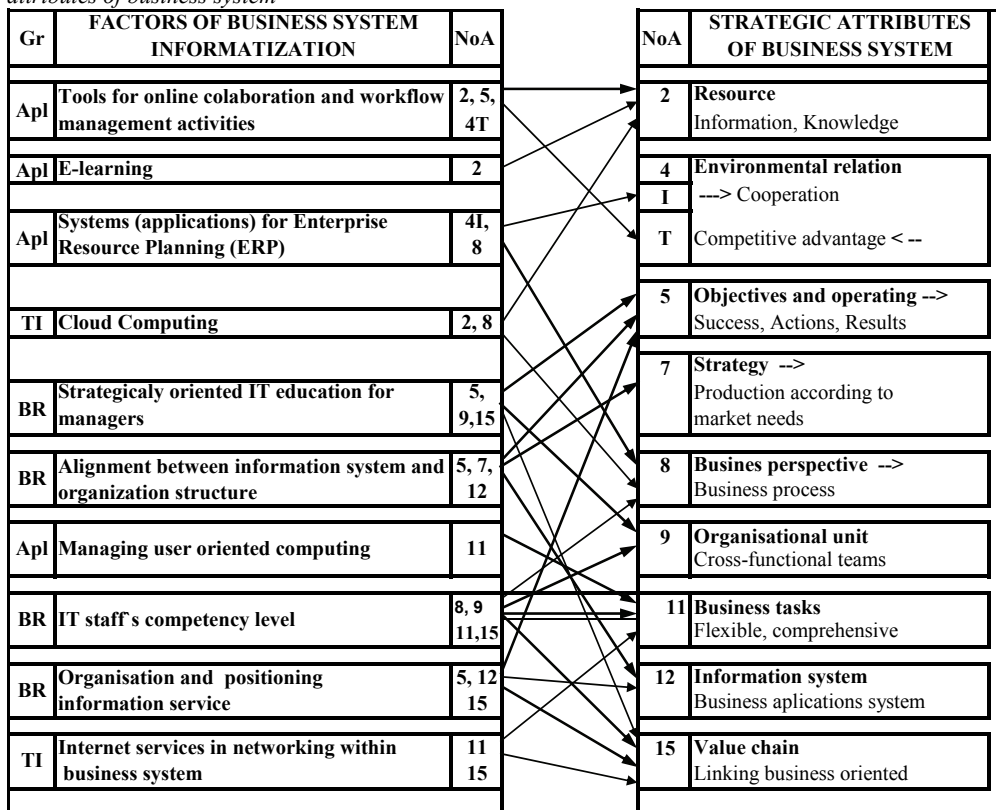
Source: Authors' calculation using SPSS

## 5. Model of the impact of factors influencing business systems informatization on the strategy attributes of business system

Based on the correlations as calculated in the table we were able to construct a model of the impact of the factors of business systems informatization on the strategy attributes of business system (factors of change management). To construct a model, we isolated factors and attributes indicating significant correlation, and most prominent. As shown in Figure 3. strategy attributes are designated by ordinal numbers (left rectangle), and IT factors in the right rectangle are associated with ordinal numbers of those strategy attributes indicating significant correlation. The bold arrows indicate correlation at the 1% significance level.

Each factor of business system informatization has been associated with a label (abbreviation) which indicates to which group the factor belongs, as defined according to a study made by MIRSC and SIM as described in the chapter. Specifically, 'BR' means a group of factors influencing Business-IT alignment, 'Apl' stands for factors of Business support systems, and 'TI' indicates factors of Information and communication (technological) infrastructure. The model indicates that the factors affecting business relationship (BR) have the greatest impact on the business strategy features, which determine the trends of change management, revealing a distinctive importance of the IT education factors.

**Figure 3** Model of the impact of factors influencing business systems informatization on the strategy attributes of business system



Source: Authors

## 6. Conclusion

In the study of change management in Croatian companies within the context of computerized business, we identified and analyzed strategy attributes of business system as factors that affect the management of change from traditional to computerized business. The factors were ranked according to the ratings of management on the intensity of their use and significance in the informatization of business system. The research results indicate that the majority of the considered strategy attributes of the company (factors of change management) tend to computerized operations, with the following strategy attributes having the greatest impact: Purpose, Motive and Information Systems. Negative mean values that reveal moderate tendency to traditional business go with the following strategy attributes: Organization, Openness of the enterprise, and Value chain. Business strategy attributes have been systematized from the perspective of the management of change from traditional to computerized Operations in two categories: shift and sinergy.

In exploring the impact of the strategic factors of business systems informatization on the factors that affect change management we identified and systematized the factors of business relationship (BR) and

factors of technology application (TA). The impact of IT strategic factors on business change management in Croatian companies has been investigated and presented using a correlation method, wherein the calculated correlation coefficients were tested for 1% and 5% significance level. Based on a correlation matrix we were able to construct a model of the impact of factors affecting business systems informatization on the strategy features of business system (factors of change management). Identified correlations and the model of the impact of strategic factors of business systems informatization on the factors of business change management provide important information and generate strategic directions for future development of business systems informatization for business change management.

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