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DEVELOPMENT AND SPECIFIC IT SOLUTIONS IN PROCUREMENT MANAGEMENT: THE CASE OF SERBIA

Razvoj i specifična IT rešenja pri upravljanju nabavkom - slučaj Srbije

Abstract

Modern IT solutions are becoming involved more and more in a variety of contemporary company business segments. Like other functions within the supply chain, managing procurement activities is becoming unthinkable without an adequate support of a certain software. That is precisely the starting point within the analysis in this paper, by which we want to test the influence of development and the usage of specific IT solutions on procurement management on the precise example of companies in Serbia. The entire paper is divided into two parts. Within the first part, we establish a theoretical review of key terms and elements connected to the usage of IT solutions in procurement. The focus in this part of the paper is the analysis of specific procurement software, both internal and external. The second part of the paper is dedicated to the empirical research connected to the main topic carried out for companies in Serbia. The aim of the paper is to empirically test the theoretical setting of this issue, and to find practical specifics which shall allow us see how the question of IT support in procurement is treated within the companies in Serbia and is there, and in what degree, space for its improvement.

Key words: *IT, procurement management, internal procurement software, external procurement software, Serbia*

Sažetak

Savremena IT rešenja postaju sve više uključena u brojne segmente poslovanja preduzeća današnjice. Poput ostalih funkcija unutar lanca snabdevanja, tako i upravljanje aktivnostima nabavke postaje nezamislivo bez adekvatne podrške odgovarajućih softvera. To je upravo polazište pri analizi u radu, kojom se želi ispitati uticaj razvoja i primene specifičnih IT rešenja na upravljanje nabavkom na konkretnom primeru preduzeća u Srbiji. Celokupan rad podeljen je u dva dela. U okviru prve celine, vrši se teorijski pregled ključnih pojmova i elemenata vezanih za primenu IT rešenja u nabavci. Fokus u ovom delu rada je na analizi specifičnih softvera nabavke, internog i eksternog tipa. Druga celina rada posvećena je empirijskom istraživanju vezanom za osnovnu temu, koje je sprovedeno za preduzeća u Srbiji. Cilj rada je da empirijskom proverom testiramo teorijske postavke ove problematike, kao i da pronađemo određene praktične specifičnosti koje će nam omogućiti da vidimo kako se pitanje IT podrške u nabavci tretira kod preduzeća u Srbiji i da li i u kojoj meri postoji prostor za njegovo unapređenje.

Ključne reči: *informacione tehnologije, upravljanje nabavkom, interni informacioni softver u nabavci, eksterni informacioni softver u nabavci, Srbija*

Introduction

We are witnesses that everyday advances and development within the field of creating sophisticated software and new solutions in information technologies (or shortly IT) are changing thoroughly the way people live, but also the way they do business. Besides the general impact on business, the mentioned advances have a specially significant influence on procurement, but also on supply chains, as a whole. Since we are talking about an enormous field for potential analysis, we must conclude that a serious number of papers and studies could be dedicated to this issue. However, bearing in mind the primary aim of this paper, we shall try to respond to ambitious requests set by this issue in the most systematic and thorough way. The questions we specifically address in the theoretical part of our paper refer to: the evolution of supply chains and procurement under the influence of IT solutions; internal and external procurement software. After the theoretical review of these questions, we perform a detailed analysis of the carried out empirical research within companies in Serbia, dealing with the specifics of IT solutions in managing procurement.

IT development and its impact on supply chain and procurement evolution

During the contemporary, turbulent business conditions, procurement managers expect effective solutions for business issues. However, organizations have not always been equipped with sophisticated software systems we know of today. See Table 1 for the demonstration of the evolution of procurement, but also the entire supply chain under the influence of IT solutions, starting from the 70's of the XX century up to now.

The early use of information technologies is associated with the field of finance and accounting. However, as can be seen in table 1, at the beginning of the 70's of the XX century IT solutions found their wider usage in procurement operations and distribution. Companies started implementing systems such as Materials resource planning (MRP) and Distribution requirements planning (DRP). These systems were used to improve planning and supply control in manufacturing (MRP systems) and distribution (DRP systems). Since these systems were primarily internally oriented, it was evident that the implementation of electronic base with suppliers and clients was necessary. Led by the efforts of sectors such as railways or fast moving consumer goods, a special system of Electronic data interchange (EDI) was developed as a solution to transfer information to mentioned groups during the 80's and the 90's of the XX century. Although the usage of early IT solutions brought about the efficiency improvements of procurement and the entire supply chain, intensive competition in the last two decades of the XX century forced companies to implement a detailed re-engineering of their business processes in order to become even more agile. During this period almost every big company carried out some kind of restructuring, while thousands of workers and managers were laid off,

Table 1: Evolution of procurement and the entire supply chain under the influence of IT solutions

IT solution	Time period	Focus	Primary system usage
MRP-DRP	70's of the XX century	Internal/supply management	Supply planning and control; efficient distribution orientation
EDI	80's of the XX century	External	Electronic order transfer
ERP	90's of the XX century	Internal	Integration of all business functions by processing and reporting
SRM and CRM	2000's	External	Management and interface control between buyers, suppliers and clients
Collaboration	2000's	External-internal	Introducing CPFR system which allows constant communication within the supply chain using RFID and POS systems
Advanced supply analytics and social networks	Intensively since 2009 up to now	External-internal	Supply analytics and computerized negotiations; Relationship building using social networks

Source: [6, p. 9]

in order to increase productivity and diminish costs. Simultaneously with this trend, companies have intensified the usage of IT solutions in order to surpass the lack of laid-off workers. So, during the 90's of the XX century the revolutionary enterprise resource planning systems (ERP systems) for company resource management were introduced. These systems have not lost their popularity till the present day. ERP systems have an integrating role of all business functions of planning and processing, as well as the task to avoid any interruption in data transfer, in order for the business decision to be better, and business more effective and efficient. The idea of this solution is that all company parts should have access and work with the same data. Precisely the procurement managers were in the center of this trend, and their main challenge was to develop precise data bases in order to improve the process of decision making [6, p. 12-16].

The following development step referred to the diffusion of systems based on the internet. Unfortunately, ERP systems were mainly of internal character and were missing the link with suppliers and clients. Surpassing this "communication gap" was enabled with the wider usage of the internet. Due to low costs, software providers developed systems which connected all mentioned entities. The connection with suppliers can be seen in the development of the supplier relationship management systems (SRM systems), while the relationship with the clients can be seen in the development of customer relationship management systems (CRM systems). SRM systems have the goal to strategically plan for, and manage all interactions with third party organizations that supply goods and/or services to an organization in order to maximize the value of those interactions. CRM systems refer to the approach to managing a company's interaction with current and future customers.

Today, at the middle of the second decade of the XXI century, software solutions are aimed to establish systems of collaborative planning, forecasting and replenishment (CPFR systems) between partners in procurement and entire supply chains, by using systems connected to the point of sales (POS systems), then systems of radio frequency identification (RFID systems) and similar systems for information diffusion. Finally, there are even newer applications such as software for following the product life cycle, auction optimization, as well as computerized models for negotiations, which shall be available to staff engaged in the procurement of the future. These very powerful tools shall be connected by networked mobile systems, devices such as IPad or IPod or powerful cell phones such as IPhone, Blackberry etc. Using such technical solutions, procurement managers can have an uninterrupted approach to information, at literary any moment. Connecting using social networks, blogs or cloud computing increases the availability of information and significantly improves partner relationships among different entities, which are oriented to cooperate [12, pp. 10-16].

Having explained the evolution path of procurement and the entire supply chain under the influence of IT solutions, it is necessary to also mention the *factors* which have helped the IT to make such an advance in this area. Summing up a greater number of relevant influences, see Table 2 for a summarized review of key factors which have contributed to the present situation.

Internal procurement software

The division onto internal and external types of information software follows the logic stated while analyzing the evolution of IT solutions, and their influence onto company procurement. Therefore, *internal software forms* refer to

Table 2: Relevant accelerating factors of IT usage in procurement management

Internal and external strategic integration
Globalization and communication
Data and information management
New business processes
Changes in legal systems
Strategic cost management

Source: [7, pp. 111-113]

solutions which are used within a company and are often customized (but that is not a permanent rule) to respond to its specific demands. If customization is used to a software solution, than this kind of software is usually marked as an *in-house* software and is thus very expensive to develop. Therefore, such solutions are exclusively used by more developed companies with sufficient funds, which can support high development prices. On the other hand, *external forms of software* serve to connect a greater number of entities, i.e. companies which naturally develop closer business cooperation. The precondition of their usage is the information empowerment and compatibility of every entity.

The most famous representatives of internal software which serve to manage resources of all company parts, including procurement, are certainly the ERP systems, which we have already mentioned. Due to their complexity and high importance, the focus of our analysis in this part shall, in a great deal, be on these software solutions. ERP software unites employees from different parts of the company, directing them to work together. Besides tracking and human resource connecting, the focus is also on processes, materials, equipment, money and technology, securing in that way the support for decision making. These elements are grouped by interfaces called *modules,* which represent specific parts or functions of a company.

ERP software can be designed in different forms, but they are usually developed with the focus on one of the four primary business processes: [4]

* *Product sales* (with the module for managing customer orders);
* *Production* (with the modules for execution and operation planning);
* *Supply* (with the module for procurement);
* *Financial transactions* (with the module for financial management).

ERP software facilitate the integration of mentioned processes by a unique data base for clients, products and suppliers. The information are inserted only once, using a standard template, diminishing the chance to insert wrong or semi-complete inputs.

Although it significantly helps business, the very task to implement ERP systems has often shown in practice

as "strategically capital and over-demanding" for the company. The basic problem with the implementation of ERP systems is their very intrinsic complexity, so the managers must have detailed information on every process, before the implementation starts. The best way to start the process is to use some form of *process charts.* [14, p. 78] A process chart is a graphical and symbolic representation of the processing activities performed on the work piece. Despite its complexity, the process of implementing ERP software can generally be divided into four phases or steps: [14, pp. 80-82]

* *Determining current processes.* Teams for the implementation of ERP software document all current processes by using a greater number of process charts and similar tools.
* *Devising improved processes.* Teams must have a clear picture of current system lacks, in order to design its improvements.
* *Designing the ERP system/software.* It is often an iterative process, within which implementation teams collaborate in order to respond to a great number of demands.
* *Solving any issues which occur during implementation and final system starting.* The obvious dangers which occur while transferring from the old to the new ERP system are usually connected to the lack of company readiness to adjust to changes. That can result in difficult software functioning when specific activities are performed.

Concentrating on procurement, we point out that the main precondition to use ERP software within this set of business activities is to have a reliable *data base.* The mentioned data bases are called *data warehouses* in the advanced version. The difference between these two terms lies in the fact that data warehouses represent consolidated bases separated from other bases in the organization [3, pp. 242-246]. The specifics of data bases used to coordinate activities of procurement refer to special information which are inserted in them.

See Table 3 for some typical information contained within the data bases important for procurement activities.

Finally, besides integral software solutions which cover the system as a whole, where we have ERP software

Table 3: Data most often found in data bases needed for procurement management

A unique identification number of the part/resource which is used within a company

Detailed specifications and demands concerning every company resource

Basic data on the supplier (name, address, company headquarters, tax identification number, etc.)

Information on previous procurement

Detailed production plans

Structured resource list necessary to make every product

Foreseen demand for every company product

Position and state of product on stock

Forthcoming deliveries and order review

Source: [3, pp. 248-251]

as the main representative, it is important to point out the role of individual tools such as the user-friendly software of the MS Office package, firstly Excel. However, no tool, not even Excel, has such a comprehensive approach to management, of not just procurement but all company activities, as does the ERP software. Therefore, in our analysis this software is dominantly positioned, with full justification.

External procurement software

Up to now, we have mainly been analyzing software procurement elements with internal usage, i.e the usage within an individual company. However, the procurement activities can not only be limited to one entity, i.e. company but in its everyday functioning they demand a practically constant contact with external partners. Thereby, we refer to activities such as: order specification, supplier terms arrangement, production timetable scheduling, delivery documenting, as well as any other activity which demands communication with an external entity. Traditionally, information exchange has been performing slowly and imprecise due to mistakes while processing data, followed by over-exceeding in using time of the employees, while the entire process of communication was rather expensive and unpredictable. Today, the advances within the field of information technology have significantly made quicker and easier the process of external communication, especially with the development of the internet and its possibilities.

If the milestone in the development of internal procurement software is said to be the usage of ERP systems, than the usage of EDI technology is the same

thing, just in external communication. Therefore, we dedicate our full attention to EDI technology in this part of the analysis. EDI technology can be defined as a communication standard, which assumes that the users on remote locations, using different systems, can transfer without problems information between different computers. Despite being introduced in the 80's of the XX century, we can clearly say that EDI has experienced its full affirmation only today. Key components of the EDI system assume: [5, pp. 66-80]

- Standard form (the so-called EDI standards)- including the basic rules of formatting, agreed between network users;
- The capability to translate (the so-called EDI software)- converting data bases specific for the company into standard EDI transfer format;
- The broadcasting service (the so-called EDI network)- which has the task to transfer documents. This way a bond is formed between two computers, which can even be a telephone line, in the simplest form.

Continuing, we shall try to explain through a practical example a specific use of EDI technology in the activities of company procurement. When the buyer and the supplier are to connect using EDI technology there occurs a typical procedure of activities. This procedure starts, when the supply management system of the acquiring company follows the material usage by RFID or similar technology. When the supplies of certain goods fall beneath a pre-defined level, the computer recognizes the need to order additional goods and automatically fills out the order form. EDI software for translating converts the order into the EDI format and sends it to the supplier. The supplier

receives an order on its computer, and converts it into its EDI format, while the buyer is automatically sent an order receipt. The data on goods order is sent to the supplier, i.e. to its various folders: the accounting folder, the supply folder, the invoice folder etc. After the supplier unifies its delivery, it generates the needed, accompanying documents and sends them to the buyer. When the goods reach the buyer and it accepts it, the receipt is placed into the folder with confirmed arrived orders. Based on the buyer confirmation, the supplier sends an invoice, which is converted into its format and stored along with the receipt and the order. Under the assumption that there are no additional data, a payment permit is electronically generated, and the payment is carried out using the money transfer from the buyer's account to the supplier's account. In the last instance, the supplier receives generated information that the goods have been paid for, while the folder with the given transaction closes at that instant [5, pp. 81-83].

At the beginning of this part of the analysis we have pointed out the fact that even though the EDI technology has been in use since the 80's of the XX century, it has gained its full affirmation just in the beginning of the second decade of the XXI century. The reason for this is that the beginning modes of EDI system demanded a much greater company investment in the corresponding hardware and software. This has been a particularly demanding request for small suppliers which perceived this expense as a great one. Therefore, EDI was not considered to be an interactive system. Today, with the serious presence of the internet in the lives and business of people, all has been changed. The advantages brought by the expansion of the internet refer to omnipresence, low costs and almost a universal character concerning compatibility. In order for the advantages of the internet to live up to their full potential, companies usually obtain e-procurement tools, used by buyers in order to harmonize the processes and increase technology efficiency [2, p. 99].

Specific IT solutions in procurement management: The case of Serbia

Several times we have pointed out that the adequate management of the logistics segment of procurement activities is becoming more and more a "powerful weapon"

in the hands of company management in achieving the desired competitive advantage on the market. Numerous examples of globally successful companies only confirm this statement. Therefore, it would be logical to conclude that the company management in Serbia correctly perceives the total procurement importance, and the importance of its adequate management. Namely, regardless of the relatively unfavorable economic situation within the country, due to the wide availability of global knowledge which is being virally distributed, company management in Serbia should be aware of these trends and use the advantages of adequate procurement management, among which is certainly the use of modern IT developments. However, in a great extent that is not the case.

In some of our earlier papers, we have pointed out that, unfortunately, a great number of companies in Serbia still does not realize enough the potential of adequate management and procurement activity optimization and mostly regards it through the specter of operative importance [11, pp. 133-142], [1, pp. 171-184]. Of course, that is not the case with all companies, but the impression is that the number of positive examples is still small to make a conclusion that there is a "critical mass" which would value procurement adequately. Mentioned, earlier performed analyses, have dominantly relied on available, secondary data, due to a justified impossibility to realize the research at the given moment in another form. Therefore, a need arose to carry out a primary research of the present state concerning this issue, with the focus on IT solutions given in the form of procurement software. Precisely, that was the starting point while formulating the total idea concerning the empirical research presented in the following part of the paper.

Research methodology

The subject of the empirical research was a detailed analysis of the current way IT support is organized and carried out for the procurement activities within companies doing business in Serbia. The mentioned research aimed to determine the way Serbian companies organized procurement activities concerning IT solutions, i.e. what was the information support to procurement activities.

Besides the numerous useful information about the status and treatment of IT activities, while managing procurement within Serbian companies, the mentioned empirical research also aimed to test the basic hypothesis, which was our starting point:

H1: *In case of using software packages as information support to procurement activities in Serbian companies, generic software is more used by small companies, while the in-house software has big companies as predominant users.*

The hypothesis set in this manner was based on the previously stated theoretical explanation of generic/in-house software and their specifics concerning the price demands. Gathering data for the empirical research on the specifics of IT solutions while managing procurement in Serbian companies was carried out using the *survey method.* Namely, for the needs of research and gathering data a special, adjusted questionnaire was formed, set on a link of an adequate internet page. See Table 4 for an example of statements used in the research survey.

The link with the questionnaire was distributed on-line to the e-mail addresses of chosen convenient sample members, formed from professionals exclusively or at least dominantly involved in procurement activities within the companies which do business in Serbia. Involvement in procurement activities was the main criterion for forming the used convenient sample. The dominant, and not exclusive involvement in the procurement activities arose only in justified cases (for example, when the company was too small to have procurement activities as a separate group). Besides the questionnaire, a cover letter was also sent explaining the way the questionnaire should be filled out. The sample members were asked to read with attention the statements in the questionnaire, and based on their own opinion, to express the degree in which they agreed/disagreed with each of those statements. The degree of agreement/disagreement was measured by a classical five-degree Likert scale, where the sample members had available answers from 1 to 5 for every statement. For every statement the sample members had to click on one of the offered numbers, while the interpretation of the alternative answers was the following: *I completely disagree* (1); *I partially disagree* (2); *I am not sure* (3); *I partially agree* (4); *I completely agree* (5). Besides the answers connected to the statements, it was necessary for every sample member to fill in the general data on his/her company (the size and general business area) as well as personal data (gender, level of education, age, years of work, type of job engagement and the company managerial level) given in the form of standard offered options. While creating the questionnaire in the application *Google disk,* an option was set that the questionnaire could not be sent back unless completely filled out. In that manner, we have achieved a significant effect- all filled out and sent questionnaires contained all the answers, so the issue of missing data which would cause problems in the following phase of the statistical analysis of the obtained results was surpassed. The data obtained using the mentioned on-line survey were used both to test the basic hypothesis of the paper and also to perform a wider analysis of procurement treatment by companies in Serbia.

The following step in the analysis was to implement the chosen statistical methods and techniques onto

Table 4: The example of the used statements in the questionnaire aimed at researching the IT support in procurement management

d1	In my company, as an assistance in the realization of the procurement activities, we use a specific software (*Excel, ERP etc.*).	1	2	3	4	5
d2	The software used in my company to realize procurement activities can be used without modifications in other companies as well.	1	2	3	4	5
d3	The software used in my company to realize procurement activities has been ordered and designed especially for the needs of my company.	1	2	3	4	5
d4	My company mutually obtains and uses software for aiding in performing procurement activities with some other company.	1	2	3	4	5
d5	My company regularly invests in the modernization of existent and the procurement of new software solutions in order to increase efficiency in the realization of the procurement activities.	1	2	3	4	5
d6	The usage of software allows my company to monitor procurement costs and control them.	1	2	3	4	5

collected data. Of course, before that we performed the coding, categorization and systematization of collected data. The stated activities were performed using a specialized statistical software *Statistical Package for Social Sciences (SPSS),* version 22.0 [8]. The first analysis referred to the structure and specifics of the very sample, according to company size and general business area, as well as according to gender, level of education, age, years of work, type of job engagement and the company managerial level of the sample members. In order to test and confirm the reliability of the measuring scale given within the questionnaire, we used the Cronbach's Alpha coefficient [9]. Testing this coefficient gave us the value of 0.721, which confirmed that the questionnaire was a completely reliable instrument. After this, we carried out the second analysis- the descriptive statistical analysis. To be precise, we tested the variable (statement) expressiveness given in the survey by the measures of central tendency (the mean) and the measures of dispersion (standard deviation). Finally, since the next step in the analysis assumed the usage of a chosen, non-parametric test, it was first necessary to determine whether its usage was needed. Besides the sample size, the distribution normality is one of the determining factors when selecting a statistical test (parametric or non-parametric). Therefore, we tested the normality using *Kolmogorov-Smirnov* test [13]. Casting away the assumption on distribution normality for the answers obtained to given statements needed to test the set hypothesis, and due to a relatively small sample size (n=52) conditions were created to use a non-parametric statistical test. Finally, we used the Spearman test for the basic hypothesis testing [10]. For testing the stated hypothesis we used the following two statements:

d2	The software used in my company to realize procurement activities can be used without modifications in other companies as well.
d3	The software used in my company to realize procurement activities has been ordered and designed especially for the needs of my company.

For the mentioned statements we tested the interdependence with the variable *company size* (small/big). The results of this test are given in the following part of the paper dealing with the integral empirical research results.

The research was carried out during a period of one month, from 30th September 2014 until 30th October 2014 by sending a request by e-mail to potential participants to fill out the on-line questionnaire, which we have already explained. This period was estimated as convenient since the majority of employees by that moment had already finished with their annual holidays, so the possibility for them to be on the job was bigger, and also the possibility to answer the questionnaire.

During that period, with the time space of 10 days, twice in total, potential participants were sent a reminder in form of an e-mail to fill out the questionnaire. The questionnaire was sent to e-mail addresses of 96 companies, i.e. 96 employees of those companies. Those e-mail addresses are the addresses of particular individuals which are exclusively, or at least dominantly, in charge of procurement activities. The needed e-mail addresses were obtained by desk research: searching through business social networks (for example *linkedin*), browsing internet presentation of company sites and, in a minor part, by personal contact. Since the research focused on the judgement of the current state of a specific procurement aspect in those companies, it was sufficient for every company to have one respondent which deals with procurement more or less dominantly. In order to secure company differentiation within the sample, a request for filling out the questionnaire was sent to the e-mail addresses of companies with a wide specter of general business area. No economic branch, as part of the sent questionnaires, nor in the sample, is present more than around 15%, which secures that no business area has a dominant influence and in that way disturbs the correctness of the conclusions.

Research results

Out of 96 companies (individuals) which were sent the link with the questionnaire via e-mail, 52 of them responded, which means that the feedback was 54% of companies (individuals). That is absolutely considered a high response rate with the realization of similar on-line research. All companies in which the sample members work, except one which has monetary intermediation as a general business area, belong to the private sector.

Table 5: The sample structure according to gender, age, level of education and the years of work

Characteristics of analysis		Frequency	% of the sample	% cumulative
Gender	male	22	42	42
	female	30	58	100
	Total	*52*	*100*	-
Age	18-25	2	4	4
	26-35	34	65	69
	36-45	7	13	82
	46-55	5	10	92
	more than 55 years of life	4	8	100
	Total	*52*	*100*	-
Level of education	Secondary school	9	17	17
	High school	4	8	25
	BSc studies	24	46	71
	Msc studies	15	29	100
	Total	*52*	*100*	-
Years of work	Up to 2 years	13	25	25
	From 3 to 5 years	15	29	54
	From 6 to 15 years	10	19	73
	From 16 to 25 years	7	13	86
	From 26 to 30 years	4	8	94
	31 years and more	3	6	100
	Total	*52*	*100*	-

If we treat the aspect of *company size* from which the sample members come from, we can conclude that the sample includes 15 big companies (or 29% of the sample), 17 middle companies (or 33% of the sample) and 20 small companies (or 38% of the sample). If the *general business area* is analyzed, we can conclude that the sample includes 17 production companies (or 33% of the sample) and 35 service companies (or the 67% of the sample). Focusing on the characteristics of the very participants in the sample, see Table 5 where we jointly present data concerning their *gender, age, level of education and years of work*.

For the review of the analyzed sample structure according to *type of job engagement and the company managerial level* see Table 6.

The results of the descriptive statistical analysis of the sample are given within Table 7.

Analyzing the survey questions, we can see that the statement d1 had the biggest expressiveness (M=4,42), followed by the statement d6 (M=4,13), while the least expressiveness was noted for the statement d4 (M=1,73). The interpretation of such shown expressiveness goes as follows: there was the highest concordance degree between

Table 6: The sample structure according to type of job engagement and the company managerial level

Characteristics of analysis		Frequency	% of the sample	% cumulative
Type of job engagement	Procurement activities only	29	56	56
	Procurement but also other activities	23	44	100
	Total	*52*	*100*	-
The company managerial level	First line manager	22	42	42
	Middle manager	21	41	83
	Top manager	9	17	100
	Total	*52*	*100*	-

Table 7: Descriptive statistical analysis for the given sample

Statements	N	Min	Max	M	Sd
d1- In my company, as an assistance in the realization of the procurement activities, we use a specific software (*Excel, ERP etc.*).	52	1.00	5.00	4.4231	1.09089
d2- The software used in my company to realize procurement activities can be used without modifications in other companies as well.	52	1.00	5.00	3.5000	1.35038
d3- The software used in my company to realize procurement activities has been ordered and designed especially for the needs of my company.	52	1.00	5.00	2.7885	1.49950
d4- My company mutually obtains and uses software for aiding in performing procurement activities with some other company.	52	1.00	5.00	1.7308	1.13958
d5- My company regularly invests in the modernization of existent and the procurement of new software solutions in order to increase efficiency in the realization of the procurement activities.	52	1.00	5.00	3.2115	1.49950
d6- The usage of software allows my company to follow procurement costs and control them.	52	1.00	5.00	4.1346	1.18865

N-number of sample members, Min- minimum, Max-maximum, M-mean, Sd- standard deviation

the participants about the fact that certain software were used as help in the process of procurement activity realization and that these software were useful since they enabled tracing and control of procurement costs. That was the situation with the majority of companies of the sample members. On the other hand, the lowest concordance degree was achieved concerning the issue of procurement software supply and its usage within some other company, which means that this activity in the majority of companies of the sample members was still performed individually.

Spearman test was used as a basis to test the main paper hypothesis. In order to test this hypothesis it was necessary to carry out a correlation analysis using the Spearman coefficient. This coefficient was used to measure the degree of rank correlation of the two variables (statements). Since it was our primary interest to determine the relationship between the variables (statements) d2 *The software used in my company to realize procurement activities can be used*

without modifications in other companies as well and d3 *The software used in my company to realize procurement activities has been ordered and designed especially for the needs of my company* with the variable *company size,* this coefficient imposed itself as one of the better solutions of this dilemma. Namely, company size represents a variable measured on an ordinary scale, and the good feature of the Spearman coefficient is that it can only be applied to categorical variables (differing from Pearson coefficient, which is applicable only to metric variables). For the results of the Spearman test see Table 8.

Based on the given results, a statistically significant negative correlation was determined between the statement d2 and *company size* (r_s=-0,545). That practically suggested that the bigger the company was, the less chances it had to use a generic software in the realization of procurement activities. On the other hand, a statistically significant positive correlation was determined between the statement d3 and *company size* (r_s=0,530). That suggested that with

Table 8: The results of the Spearman test

		Statement d2	Statement d3	Company size
Statement d2	*Spearman* correlation coefficient	1.000	-.179	-.545**
	P value	.	.204	.000
Statement d3	*Spearman* correlation coefficient	-.179	1.000	.530**
	P value	.204	.	.000
Company size	*Spearman* correlation coefficient	-.545**	.530**	1.000
	P value	.000	.000	.

**statistical significance at the level of 0.01

the increase of company size its chances to use an in-house procurement software grew. Finally, that way we saw that the implementation of the Spearman test confirmed our basic hypothesis.

Besides the carried out analysis and tested hypothesis, the research results also indicated the following: companies included in the research mainly used some form of information support (an adequate software) while managing procurement activities. Also, there was a dominant concordance that the stated software enabled procurement costs tracing and helped control them. However, we can conclude that the usage of mentioned software was far from their usage potential. Namely, most companies used non-specialized, generic software (for example, Excel) which besides procurement activities, could and usually was used for multiple other purposes. Although that meant that the multi-functionality of the software was used in that way, due to the absence of their specialization, sub-optimal results were achieved concerning procurement management. The reason to use generic in stead of in-house software had to do in a great deal with the practical dimension- the majority of companies did not have sufficient financial funds needed to obtain personalized software packages. Finally, although the dominant part of the companies invested regularly in maintaining and renewing the personal information capacities which served as aid to procurement activities, the supply of software in cooperation with other companies was not a usual activity of the analyzed companies. Since we already stated that the future of procurement software usage was it's integration between different participants in the supply chain, more attention should be paid to this trend in Serbian business practice from now on.

Research limitations

Carrying out any empirical research is almost impossible to be realized in ideal conditions. Therefore, it is always important to point out the limiting factors which influence the plausibility degree of the drawn conclusions connected to the main research questions. In that manner, we obtain a realistic picture of the phenomena or the analyzed issue. Focusing our attention to the limitations of the empirical research dealing with determining the specifics of IT solutions as a support to procurement management within Serbian companies we point out the following few limitations that we have identified:

a) The time frame of the carried out research. The analysis of the specifics of IT solutions as support to managing procurement within companies in Serbia has been carried out within a research defined for an exact time period- a month's period of surveying. In that manner, we obtained only the current image, i.e. the picture of present treatment of procurement activities within companies included in this research. Thereby, we eliminated the possibility to determine with certainty the development path of that process, i.e. to determine how shall the relationship towards the specific logistics group (IT segment) of procurement activities and the perception of their importance change in future.

b) Difficulties in operative realization of the research. The realization of the stated research has once again shown the insufficient openness of the professional community towards research efforts of the participants of the academic community. Namely, on one hand, there is an evident lack of interest among companies to participate in practical research, considering them not important due to the lack of perception on (in)direct use of their implementation. On the other hand, the communication with the company representatives had shown evident reluctance, even fear, to give answers to survey questions, even before a questionnaire could be seen, usually considering the questions might endanger the principal of business information secrecy.

c) The research form. The problem connected to the previous discussion is certainly connected to the form of the very research. Namely, by sending a link with the questionnaire to be filled out on-line, excludes the possibility for the researcher to directly communicate with the participants and to additionally explain, at any moment, any dilemmas that might occur. However, since the questions were set rather explicitly and since it was always possible to communicate via e-mail if any dilemmas occurred, a much greater limitation of this research form is *the limited extent of gathered information.*

Besides all stated limitations, we consider that the correctness of our conclusions can not be questioned,

nor can the general research results. Stating the previous limitations, we do not intend to say that there are no other limitations, just that we have pointed out the most important ones in our opinion.

Conclusion

Using modern information technologies represents one of the leading trends in managing contemporary procurement. The analysis carried out within the theoretical part of this paper clearly made a difference between systems which could be used within one and more different companies. Although the internet potentials are growing daily and achieving long term consequences, their full integration has still not been achieved. However, all experts in the field agree that integration is the certain future, and that it is only a matter of time when the unification of internal and external procurement software, but also the management of all company interest groups, shall occur.

As for the conclusions drawn from the empirical analysis in Serbia, the companies included in the research mainly used some form of information support (an adequate software) while managing procurement activities. Also, there was a majority concordance that the given software facilitates procurement costs tracking and controlling. However, we also concluded that the usage of procurement software is far from its potential. Namely, the majority of companies (small and middle) used non-specialized, generic software (for example, Excel), which besides procurement activities can be put to many other purposes. It has been proven that in-house software were mostly used by big companies in Serbia.

Finally, although the dominant part of the companies included in the research in Serbia regularly invested in maintenance and renewal of personal information capacities which serve as support to procurement activities, software procurement in cooperation with other companies was not an often activity with analyzed companies. Since it was already stated that the future of procurement software usage was it's integration between different participants in the supply chain, more attention should be paid to this trend in Serbian business practice.

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