Software Tool for Managing the Effectiveness of the Enterprise e-Business System

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Abstract. **The present paper considers possibilities for managing effectiveness of enterprise e-business system by the use of a specially developed software tool. The software is developed based on the self-established ontological model describing the area of the enterprise e-business system and methodology for assessment and management of the efficiency of this system. Opportunities for application of the developed tool include its usage by senior executives at the stage of developing a strategy for e-business of the company or evaluation of the existing enterprise e-business system. In the last case, the software would help optimise these systems.**

Keywords**: e-business, management, effectiveness, software tool.**

I. INTRODUCTION

The current financial crisis that affected economies globally and the collapse of dot-com companies over the past decade have not changed attitudes among the senior management personnel, according to which ICT is a corporate source with the greatest role in creating a new organization in the field of management, production, relationship with suppliers, partners and customers, etc. As [1] shows, although a vast majority of them willingly invest in high technology, among the management staff there is a limited view of the practical force or the strategic importance of the proposed and / or used ICT, as well as significant advantages, which would be provided to the relevant organization. According to the same source, the benefits of ICT are perceived solely in terms of reduced costs through staff reductions due to automation of the working processes.

According to [2], [5], in the global economic crisis ICT sector is less affected because it is a way to reduce the negative effects on individual economic entities and the economy as a whole. Modern ICT with its rapidly increasing potential and rapidly declining maintenance reveals more opportunities for new forms of labour organization and employment in both individual corporation and society. The implementation of ICT reduces the information barriers between territorial distant markets and reduces their information monopoly.

Change in the view point of senior management and IT departments of the large companies in direction of assessing the full potential of the implemented ICT, not only as a means of reducing costs and / or staff, but as well as the choice of appropriate technology, represents the steps that allow for a proper migration of traditional business processes to their electronic equivalents. This approach allows e-business to preserve its attractiveness and to enable the individual companies to develop their presence in the global network more successfully. Unfortunately, not every company can afford to hire a team of experts in the field of e-business or maintain its own team. A significant problem may also be the implementation of effective communication between the members of the management team and ICT specialists. The problems in this communication include the incomplete knowledge of the issues and driving processes in specific areas of specialists from other areas. This often results in the delayed adoption of technologies providing a significant competitive advantage or, conversely, aimless investment in advanced technologies that have little or no effect on the position of the organization. The lack of communication can be expressed, also in terms of exchange of key information influencing the business position of the organization. Both sides are not able to observe the importance of information, which may be crucial or key information structured incorrectly or masked in a huge stream of unnecessary data.

The increase in the business efficiency through e-business systems requires a systematic activity, which takes place in several stages in precisely defined fields. The first stage is the analysis of the company problems associated with the lack of long-term strategy for its development, inconsistency between the organizational structure and the adopted plans for business development, weak structured business processes. At this stage, the role and place of the e-business strategy must be defined to increase the business efficiency.

The second stage is associated with improvement of the management system, re-engineering of the business processes, creation of a transparent business system and strategy for transition of the company to the process management. For this purpose, it is necessary to perform diagnostics of the management system, implementation of a targeted organizational structure, systematization of the information flows for ensuring maintenance of the decisions taken. It is also necessary to make a distinction of the authorities and areas of responsibility.

The next stage is to determine the price and the quality of the enterprise e-business system. At this stage, it is important to define the price of the license and the cost of ownership of the e-business system, the total value of ownership of the system, the stages of the life cycle affecting the price, the cost of implementation. The quality of the e-business system includes such parameters as mobility, real time operation, adaptability, scalability, maintenance, safety and reliability.

The return on investments of the e-business systems comes not from the system itself, but by increasing the efficiency of the business processes, which it supports. The e-business system can ensure and support many new types of processes,

but this is a task that should be solved by the company itself. The effective use of the e-business system primarily depends on the implementation of successful business strategy. It is impossible to think of the effective implementation of the e-business system, by which it is possible to improve the market position of the company without reaching one or another level of key productivity indicators.

Cases reviewed by the existing business practices show that it is necessary to develop specialized instrumentation to assist the process of taking final decisions concerning the evaluation of the effectiveness of the existing or newly developed enterprise e-business system.

This article reviews the possibilities for management of the enterprise e-business system efficiency, using software developed especially for this purpose. The software is developed on the basis of a designed ontological model, which describes the company e-business subject area and a specially developed methodology for assessing the effectiveness of this system.

The opportunities for application of the developed software allow it to be used by the management staff as the stage of the developing of the e-business strategy of the company, as well as the evaluation of the already existing systems for e-business in terms of their optimisation.

II. Enterprise e-Business System

Electronic business and its successful implementation by various organizations definitely depend on the overcoming of a number of stereotypes set in the minds of the majority of users and to some extent in the management personnel. One of those imposed stereotypes is the adoption of e-business and e-commerce like synonyms, but as [8] concludes they do not describe the same functions and processes. The overcoming of such a belief, caused by the insufficient knowledge of the functions and processes that are involved, would help avoid the unwittingly limited idea for the effectiveness and benefits of e-business in terms of overall globalization and increasing competition in business. The correct evaluation of these functions and processes and their presentation in apparent form would enable management and ICT specialists to develop e-business more successfully and effectively or to develop strategies for its implementation.

The term "electronic business" or "e-business" (in English e-business), is used for the first time by the company IBM (http://www.ibm.com), as part of a broad thematic campaign conducted in 1997, which seeks to extend the approach of the migration of traditional business relationships in the global network environment.

According to this definition, the e-business is "a secure, flexible, and integrated approach to delivering a differentiated business value by combining the systems and processes that run core business operations with the simplicity and reach made possible by Internet technology" (http://www.ibm.com).

The next four definitions from Eurostat, OECD, US Cencus Bureau and UNSD are according to [4]. Eurostat gives the following definition of the e-commerce: "… transactions conducted over Internet protocol-based networks and over other computer-mediated networks. The goods and services are ordered over those networks, but the payment and the ultimate delivery may be conducted on-line or off-line. Orders received via telephone, facsimile and non-interactive e-mails are not counted as electronic commerce".

The Organization for Economic Cooperation and Development (OECD) considers that "… the electronic commerce refers generally to all forms of transactions relating to commercial activities, including both organizations and individuals that are based upon the processing and transmission of digitized data, including text, sound and visual images." The OECD also distinguishes transactions over computer mediated networks (broad) from Internet transactions (narrow).

The U.S. Census Bureau defines e-commerce as "… any transaction completed over a computer-mediated network that transfers ownership or rights to use, goods or services. Transactions occur within selected electronic business processes. Transactions are completed when the agreement between the buyer and seller to transfer the ownership or rights to use goods or services occurs over computer-mediated networks. Only priced transactions will be measured."

The United Nations Statistics Division defines that: "… e-business is any process that a business organization conducts over computer-mediated network channels. Business organizations include any for-profit, governmental, or non-profit entity. Examples of these processes are on-line purchasing, on-line sales, on-line logistics, customer support, employee training and recruiting, and vendor-managed inventory, production design and control."

According to [3], the e-business represents a number of different computerized traditional business processes migrated for work in the environment of different types of networks. It changed the vision, the mission and the strategies that companies used to achieve their goals. In the e-business, the traditional physical activities are being replaced by electronic interactions, as the traditional production chains are expanding into a virtual chain for adding value.

The quoted definitions are showing that in order to overcome the misunderstanding about the strategic importance of ICT from the senior management defined in [1], it is necessary to accept that the e-commerce is a subset of e-business. At the same time, in order to meet the expectations regarding the benefits of ICT it is necessary during the establishment of the e-business strategy or the assessment of the existing one to consider both the models and the methods of doing business and all business processes because they are intrinsic.

Solving of the identified problems associated with the correct perception of the e-business and underlying concepts in its definition may be decided by defining an enterprise e-business system. Applying the ideas of such a system would help change the management views, as well as taking the appropriate final decisions related to the introduction and / or development of the e-business or assessing its economic efficiency. In its essence, the enterprise e-business system will be a system built on a modular principle, which also

guarantees a certain minimum for the normal functioning of the selected priorities for development of the economic entities, whose organization and work meet the specific tasks related to:

• proper identification of the economic identity of the entity to a specific sector and key economic indicators for the normal and rhythmic functioning of the entity;

• proper and successful migration of the traditional business processes to their electronic analogues;

• reporting of the electronic interactions in environment of different types of networks according to the model of functioning and e-business category, which has been developed;

• identification of the specific hardware and software components and technologies directly related to the e-business called nowadays under the collective name of ICT;

• the assessment of the economic efficiency on the basis of embedded set of criteria and methodology developed for its assessment.

• the requirement for a certain minimum, which involves the minimum hardware and software configuration prompted by the relevant regulatory and non-regulatory conditions of the economic environment.

The main features of the proposed enterprise e-business system in relation to structure, behaviour and interaction of the individual elements are discussed in [7]. For this purpose, in the environment of Protege 4.1 there is designed OWL ontological model, which describes the main classes, the basic interactions between them and their basic properties. There are also introduced individuals as representatives of the proposed classes. The model contains information concerning 260 major classes and their interactions, for example, base classes are united into two main groups related to the business of the economic entity and relevant to the ICT of the entity. The hierarchy that is used for the base classes is shown in Figure 1.

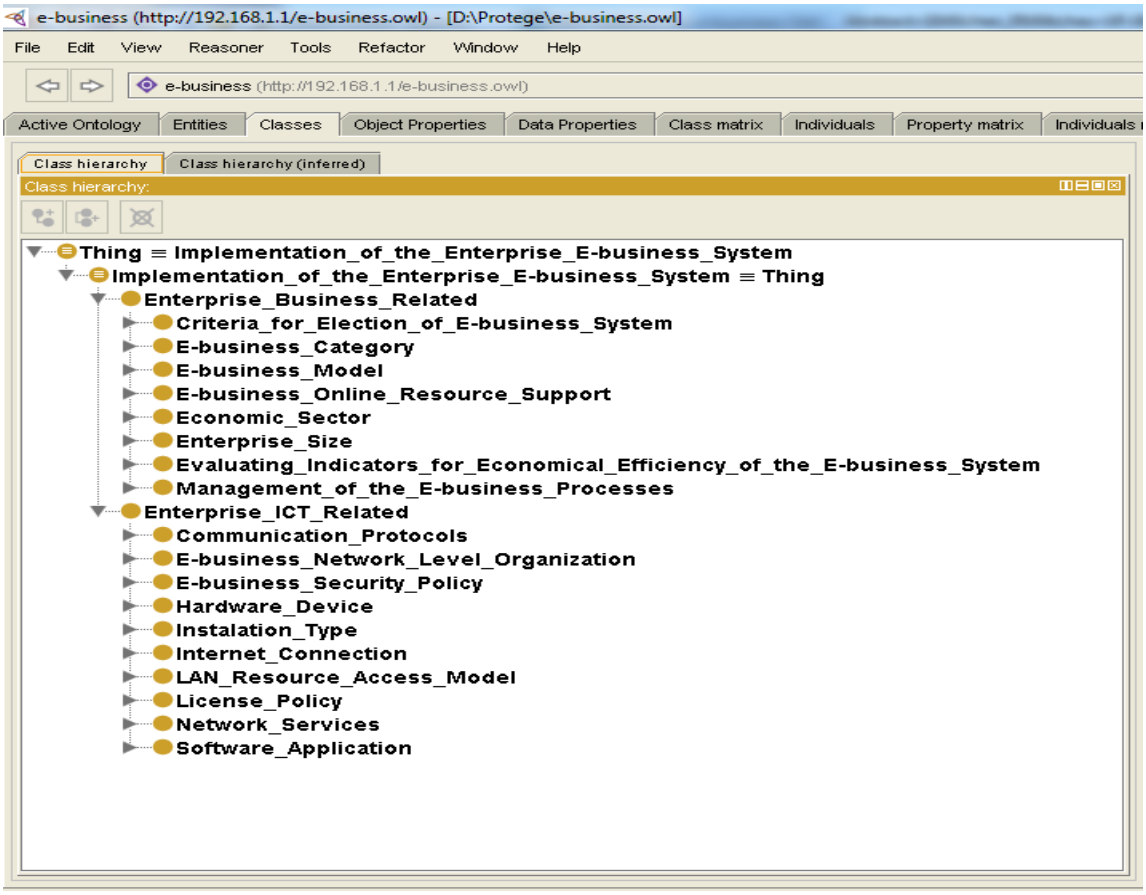


Fig.1. Basic classes of the ontological model of an enterprise e-business system in the environment of Protege 4.1

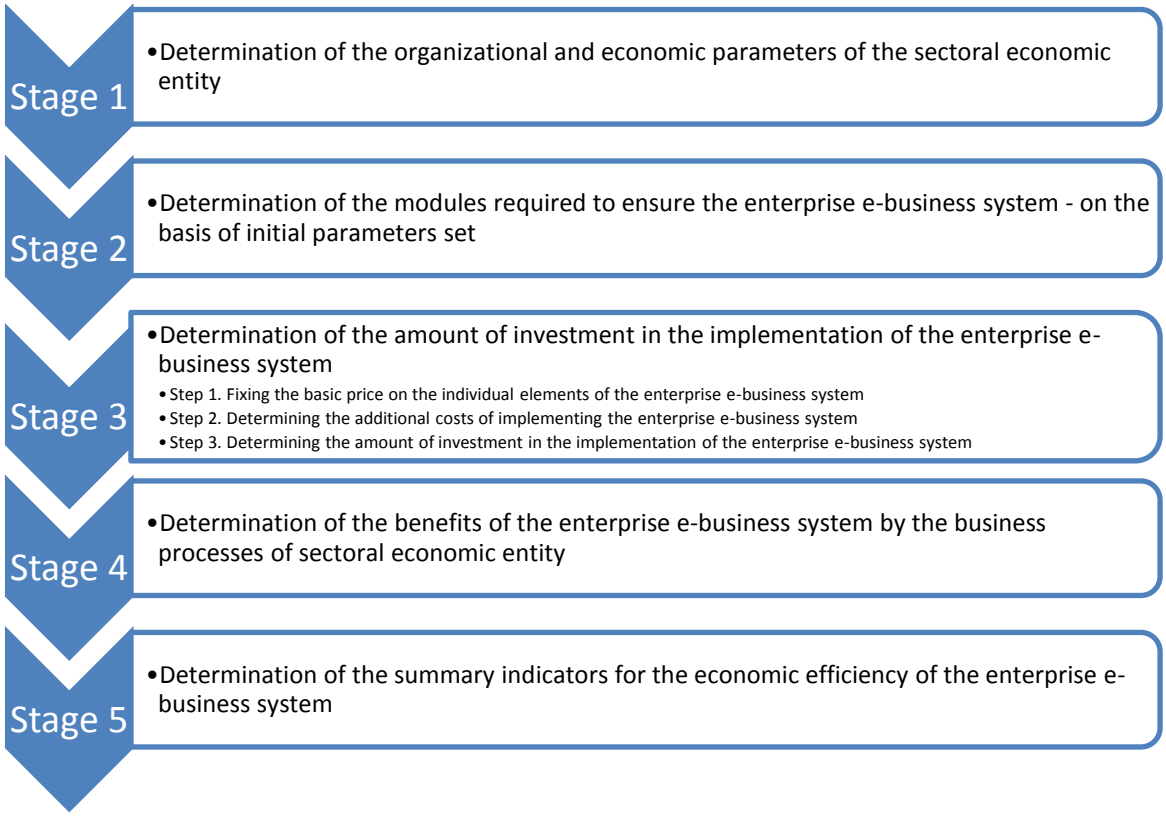


Fig.2. Main stages of the implemented methodology for assessing the effectiveness of an enterprise e-business system.

The evaluation of the economic effectiveness of an enterprise e-business system is based on the research mentioned in [6]. According to these surveys, the evaluation of the economic effectiveness of an enterprise e-business system is based on the author's methodology containing five main stages, shown in Figure 2.

III. Main Features of the Developed Software Tool

The analysis of the achieved results, as regards the definition of the enterprise e-business system using the ontological model designed and the created methodology for assessing the economic efficiency of the enterprise e-business system, showed that there were opportunities to automate processes set behind them. The development of software in the form of a computer application installed and running locally would enable the set functions to be used more fully. The development of an appropriate user interface would also allow for easier operation by the users who have less or insufficient knowledge of using software, enabling them to take advantage of laid down knowledge and expertise in the developed products in taking final decisions as the stage of the developing a strategy for e-business of the company, as well as the evaluation of already existing enterprise e-business systems in terms of their optimisation.

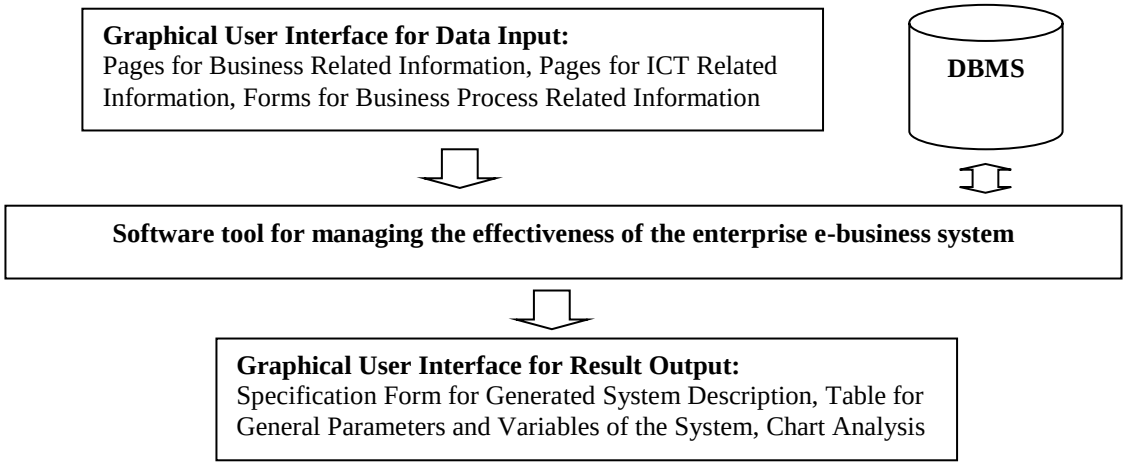


Fig.3. Organization of the graphical user interface of the developed software tool

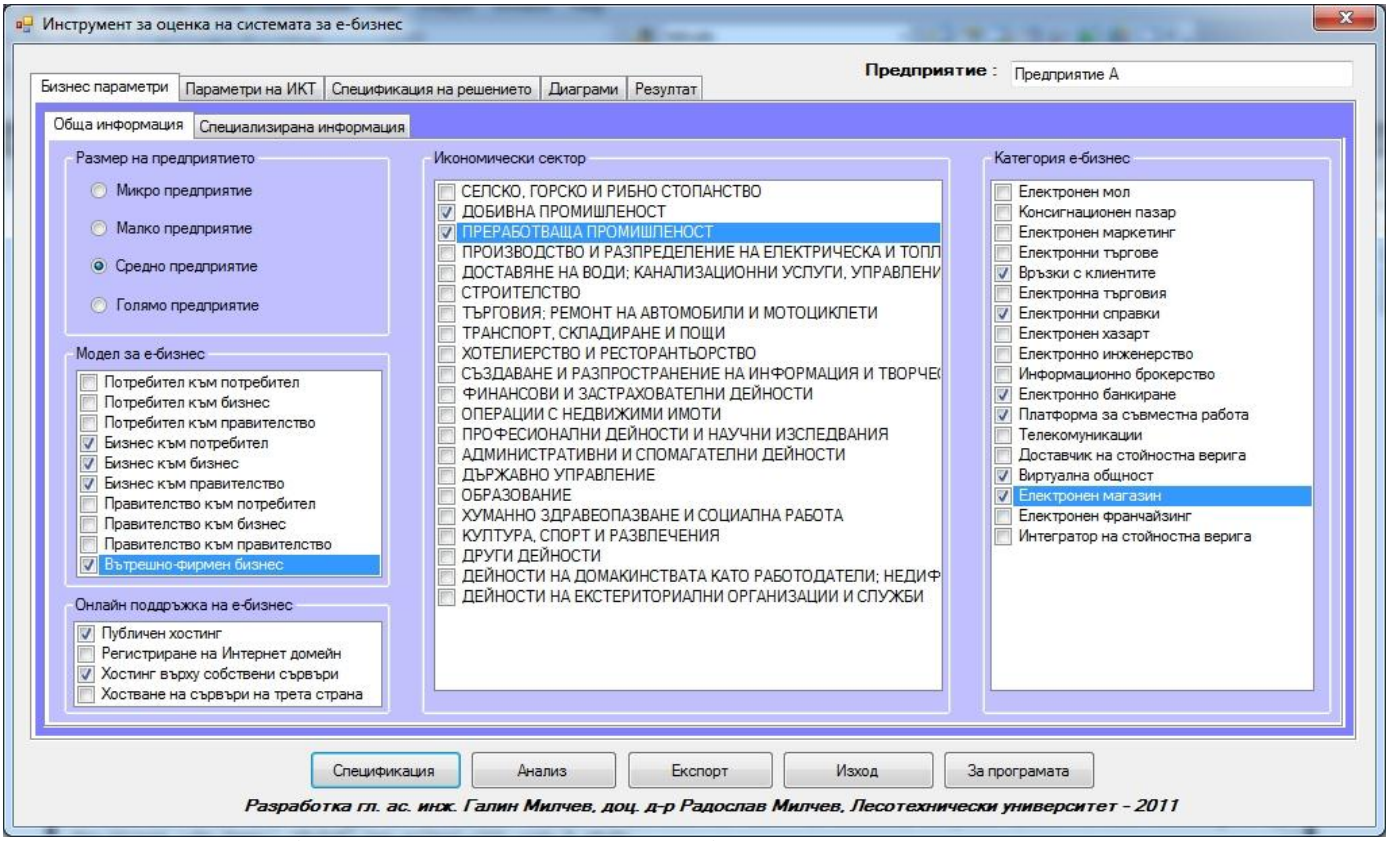


Fig.4. GUI for data input – a page with common business information about the studied enterprise e-business system

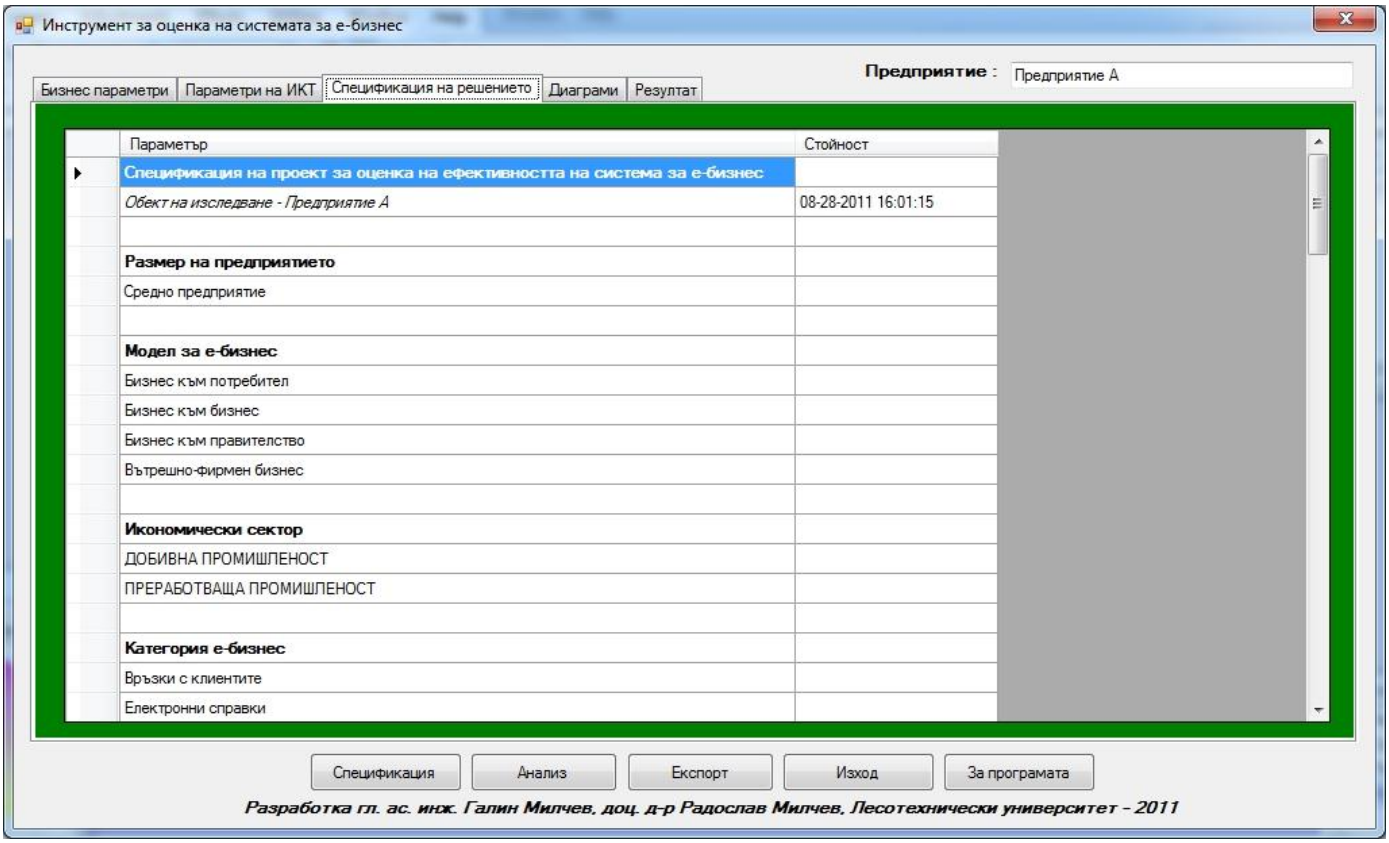


Fig.5. GUI for data input and general visualization of the generated enterprise e-business system

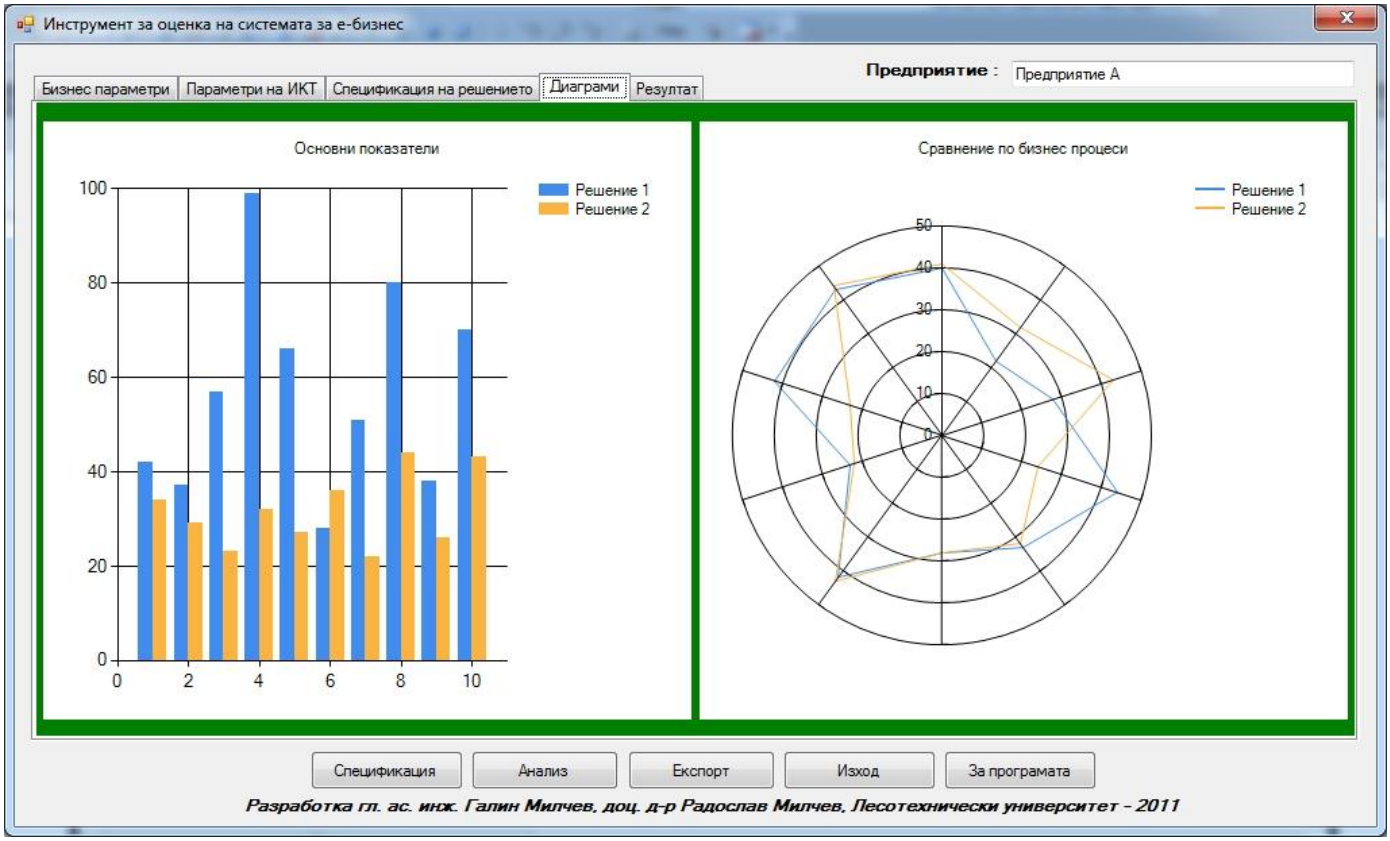


Fig.6. Capabilities of the GUI to demonstrate the results of the analysis in form of different charts

The software is developed by means of the Microsoft Visual Studio 2010 and works in an environment of OS Windows. The choice of the environment, in which the application runs, is made on the basis of the widespread use of that operating system within the state and business organizations in Bulgaria. The graphical user interface uses standard visual tools that facilitate users in the implementation of the necessary initial information and do not require additional skills in terms of their handling. To structure the information, a tabular structure is used that follows the characteristics of the developed ontological model, while the manipulations into separate controls cause changes in the other on the basis of the set interactions in the same model. Outputs are in the form of standard tables in Microsoft Excel format; graphics tools for creating charts help to make a decision easier, when assessing several possible solutions. The overall structure of the graphical user interface is shown in Fig. 3, and examples of graphical user interfaces (GUI) are shown in Fig. 4, Fig. 5 and Fig. 6.

For example, Fig. 4 shows the capabilities for control input information required to survey the enterprise e-business system. Tabbed page interface is designed to introduce general information about the studied business entity. The information is structured in groups arranged in three columns. The different groups follow the basic classes of objects of the ontological model shown in Fig. 2. In the left column, the user must select information related to the size of the organization, model for e-business and opportunities for online support of the e-business. Group in the middle is used to determine the economic sector, in which the company develops. In the right column, there is the group, where users can define the categories of e-business that would like to develop. The choice of these initial parameters will influence the necessary ICT to participate in building the enterprise e-business system.

The graphical user interface shown in Fig. 5 presents the part of generated specification of the decision. The main feature of the used spreadsheet is the ability to update the values set by the user in the last column. This approach allows a flexible way to change the set value, especially in the case of evaluation of the already existing systems. The generation of specification is done after pressing the command button with the same name at the bottom of the window.

Fig. 6 shows the capabilities for graphical representation of the results of the analysis. Used controls allow the creation of various types of diagrams similar to the types available in the various Microsoft Office products.

The developed application implements an approach "step by step", which allows the user to gradually clarify the scope of the existing or projected enterprise e-business system. According to this purpose, the main activities related to assessing the effectiveness of enterprise e-business system have been implemented with buttons located at the bottom of the application window. These activities include preparation of specifications, analysis, export of the studied solution and

assistance in using the program. In the application, there are also set and sample restrictions that follow the interactions of the developed ontological model that allows avoiding an action by the user due to insufficient knowledge of ICT and ensuring the requirements that guarantee a certain minimum for the proper functioning in selected priorities for development of the economic entity. However, the program is also flexible enough by enabling work at a certain level of stock, i.e. formation of a decision over the minimum requirements. This option is provided in order to report the overall strategy for development of the respective organization, not only the strategy associated with the implementation of e-business. Furthermore, the developed application used relational database storage of the necessary output quantified information (prices, manufacturers, warranty terms, etc. from the viewpoint of the information to individuals) set in the ontological model. The database is also used and as a tool for storing the different analysis of the enterprise e-business system performed at the exploratory stage.

Table 1 shows part of the exported information related to the analysis of the sample enterprise e-business system, which takes into account incorporation and influence of six business processes. We can see quantitative parameters of the system associated with the hardware, software, depreciation, etc., and reported conditional expenses, profit and growth. According to this information, senior management of the enterprise can take action easily to build a profitable system for e-business based on synergies or on break-even diagrams obtained by applying the methodology and calculations derived from the software tool with respect to the impact of the migrated business processes.

TABLE I

PARTIAL RESULTS OF THE EVALUATION OF THE EFFECTIVENESS OF SAMPLE ENTERPRISE E-BUSINESS SYSTEM

ACCORDING TO THE INCORPORATION AND INFLUENCE OF DIFFERENT BUSINESS PROCESSES

Parameters and variables of enterprise e-business system	Values of individual business processes						Total
	BP_1	BP_2	BP_3	BP_4	BP_5	BP_6	
Expenditures for software, BGN	3000	2000	6000	20000	0	0	31000
Expenditures for hardware, BGN	5000	7000	8000	10000	0	0	30000
Depreciation costs for software, BGN	1500	1000	3000	10000	0	0	15500
Depreciation costs for hardware, BGN	2500	3500	4000	5000	0	0	15000
Actual production volume, QTY	6000	6000	6000	6000	6000	6000	6000
Product price – base variant, BGN	2600	2600	2600	2600	2600	2600	2600
Product price as a result of incorporation of the proposed BP, BGN	2600	2600	2600	2600	2665	2600	2665
Level of fixed costs, BGN	1800000	1800000	1800000	1800000	1800000	1800000	1800000
Revenue – base variant, BGN	600000	600000	600000	600000	600000	600000	600000
Production volume increased by the proposed BP, QTY	6300	6540	6900	6000	6000	6000	7740
Total revenue, including incorporation of the BP, BGN	716000	815000	957000	920000	945000	700000	2261800
Total revenue increase from incorporation of the single BP, BGN	116000	215000	357000	320000	345000	100000	1453000
Level of total costs, including incorporation of the proposed BP, BGN	1804000	1801000	1803000	1810000	1845000	1700000	1763000
Total revenue from BPs, BGN							1661800
Total revenue, including base variant, BGN							2261800
Revenue from the synergy between BPs, BGN							208800
Production volume in break-even point, QTY	4510	4503	4508	3978	3968	4250	3390
Revenue in break-even point, BGN	11726000	11706500	11719500	10342857	10574032	11050000	9035375

Notes: BGN – Bulgarian national currency; QTY – quantity; BP – business process

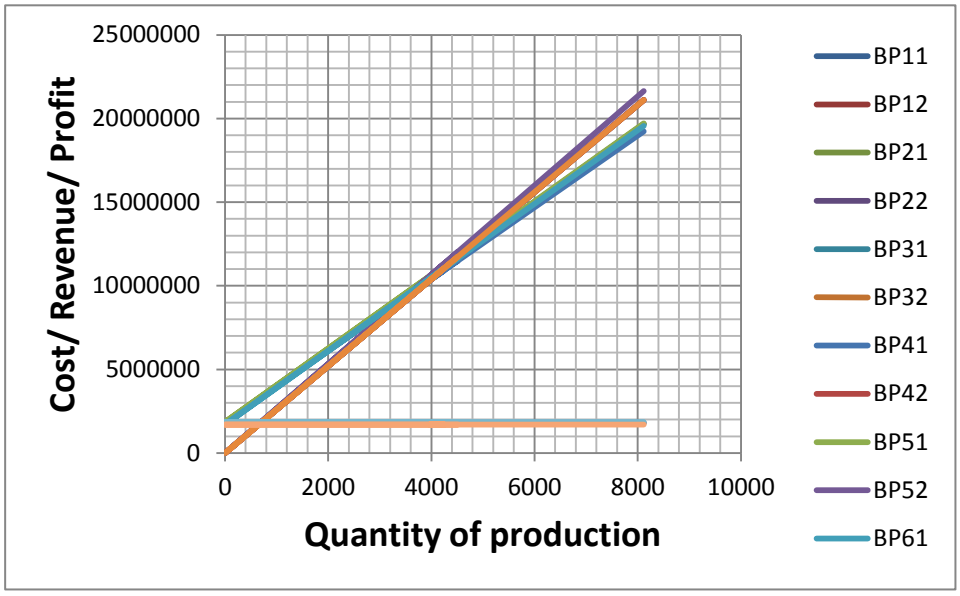


Fig.7. The break-even diagram, taking into account incorporated BPs (Cost/ Revenue/ Profit is in BGN)

Fig.7 shows the break-even diagram, taking into account the proposed six business processes. The markings on the chart are as follows: BP_{i1} – total costs for i-th BP; BP_{i2} – total revenue for i-th BP; BP_{i3} – the level of fixed costs for i-th BP.

IV. Results and Conclusions

The present article reviews the possibilities for managing the enterprise e-business system efficiency, by the use of special software designed for this purpose. The software is developed on the basis of an established ontological model, describing the subject area of the enterprise e-business system, and of a specially developed methodology for assessing the effectiveness of this system. The opportunities for application of the developed software enable it to be used by the management staff, not only at the stage of developing a strategy for e-business of the company, but as well as for the assessment of the already existing systems for e-business. In the last case, the software would allow for optimisation of these systems. The main advantage of the software is the ability for the assessment of the effectiveness of the enterprise e-business system, as part of its corporate governance system. Additional advantage is the possibility for assessment based on the set expertise and accumulated knowledge in the software that makes it extremely suitable also for smaller companies that are unable to maintain large teams of IT professionals. The use of standard tools for building the graphical user interface facilitates the users, by allowing them to use their intuitive experience gained from working with other information products.

The future work is related to extension of the scope of the set information in the database concerning the individual members of base classes. The development of an appropriate interface to connect to servers on the Internet would help keep the database updated. Implementation of other external ontologies, such as those associated with the detailing of the information on the description of the business processes or in the field of communications would affect the present software in terms of detail of the designed decision. Using the ontological model on the basis of the developed software tool would help solve the problems associated with the localization of the developed software in different languages. The localization of the software as a future task would help test it under different economic conditions.

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Galin I. Milčevs, Radoslavs I. Miltčevs. Programmatūra uzņēmuma e-biznesa sistēmas efektivitātes kontrolēšanai

E-bizness ir saglabājis savu pievilcību un ir spējis atgūt pozīcijas par spīti *dot-com* kompāniju sabrukumam laika posmā no 1995. līdz 2000. gadam un pašreizējai globālajai ekonomiskajai krīzei, ļaujot uzņēmumiem veiksmīgāk attīstīt savu klātbūtni globālajā tīmeklī. Diemžēl daudzi uzņēmumi nevar atļauties algot e-biznesa ekspertu komandu vai arī uzturēt paši savu komandu. Šie novērojumi liecina, ka ir nepieciešams izstrādāt specializētus līdzekļus, lai atbalstītu lēmumu pieņemšanu sakarā ar jaunizveidotu uzņēmumu e-biznesa sistēmu efektivitātes izvērtēšanu. Raksts izskata iespējas uzņēmumu e-biznesa sistēmu efektivitātes kontrolei, izmantojot speciāli izstrādātu programmatūru. Programmatūra ir izstrādāta, balstoties uz pašizveidotu (self-established) ontoloģisku modeli, kas apraksta uzņēmuma e-biznesa sistēmu, un speciāli radītu metodoloģiju šīs sistēmas efektivitātes izvērtēšanai. Programmatūru augstākā līmeņa vadība var izmantot uzņēmuma e-biznesa stratēģijas izstrādāšanā, kā arī esošas e-biznesa sistēmas izvērtēšanai. Programmatūra palīdz arī šīs sistēmas optimizēt. Galvenā programmatūras priekšrocība ir tās spēja izvērtēt uzņēmuma e-biznesa sistēmas efektivitāti, kā tās korporatīvās pārvaldes sistēmas daļu.

Галин Милчев, Радослав Милтчев. Программное обеспечение для контролирования эффективности системы э-бизнеса

Э-бизнес сохранил свою привлекательность и сумел восстановить позиции, несмотря на развал компаний дот-ком в отрезке времени с 1995 по 2000 год и экономический кризис в наши дни. К сожалению, многие предприятия не имеют возможность нанимать или содержать команду экспертов по э-бизнесу. Эти наблюдения свидетельствуют о необходимости разработки специализированных средств для поддержки принятия решений связанных с оценкой эффективности э-бизнеса нового предприятия. Статья рассматривает возможности для контроля эффективности системы э-бизнеса, используя специально разработанное программное обеспечение. Программное обеспечение разработано, используя онтологическую модель, которая описывает систему е-бизнеса на предприятии и специально разработанную методологию для оценки эффективности этой системы. Программное обеспечение может быть использовано высшим руководством для разработки стратегии э-бизнеса на предприятии, а также для оценки эффективности существующей системы э-бизнеса. Программное обеспечение также позволяет оптимизировать эти системы. Главное преимущество этого программного обеспечения – возможность оценить эффективность системы э-бизнеса, как составную часть корпоративного управления.