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Information - Technological Decisions in the Process Engineering for Company Management

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Abstract - **In the following paper is discussed the necessity of new information-technological solutions in engineering the processes of company management in a dynamic environment. The interest shown to Business Process Reengineering (BPR) is not accidental. It is motivated not only by technological but only by economical premises. Characteristic feature of traditional reengineering is that it is directed exclusively to the inner company's processes and is being accomplished within the organizational borders of the establishment. But it is already exhausted and the look must be focused on its improvement in the form of a new, more refined kind – called X-engineering. Basic information-technological solutions, used within the borders of X-engineering are the Enterprise Resource Planning systems (ERP systems). Their base is integration of all data and processes into a combined, unified platform with database for all processes.**

Keywords-ERP systems, company management, reengineering, X-engineering, business processes

I. INTRODUCTION

In the world of constant change there is a need for means and methods, with the help of which the activity of the organizations becomes more effective and competitive. The engineering of company management processes is undoubtedly a powerful means used to achieve these goals. That is why the interest in it will grow in the near future. It is related to designing and realization of solutions concerning the information and technological relations between the structural units of the business system. According to, this is a process that unifies the analysis of the existing system of management processes (diagnostics or reverse engineering) and the design of new management processes (straight engineering)[3]. The general scheme of engineering of the organizational structure of management can be described in the way presented in Table 1, which illustrates the content of the analysis in the field of straight and reverse engineering.

TABLE I. GENERAL SCHEME OF MANAGEMENT PROCESS ENGINEERING

Diagnostics (Reverse Engineering)		**Information source**	**Projecting (Straight Engineering)**	
Direction of the analysis	***Content***		***Tendency***	***Content***
1. Identification and analysis of the management processes team	Identification of: -management processes team and their borders -clients -general, structural and logical relations.	Organizational and other documentation, observations, interviews, inquiring, analysis results of the organizational structure of management.	1.Management process modeling	Determination of the team, content and technological relations between management processes, their quantitative and qualitative indexes.
2. Analysis of technological relations between the processes	Modeling and analysis of management processes		2. Modeling of the information system of management	Projecting of the management information structure, team and the kind of the management documents, routes of information spates.
3. Analysis of the information relations between the processes	Analysis and structuring of the information, circulating in the company, determination of the information spates.			

II. BUSINES PROCESS REENGINEERING

Business Process Reengineering (BRP) represents creating/projecting of new business processes, dramatically increasing the efficacy of a business establishment activity [8]. It is based on the general methodology for process management. In this sense, BRP has similar features with some of the methods for improving of the processes or/and the quality. Unlike refinement, reengineering is connected with a cardinal change of processes rather than their gradually improvement.

According to the reengineering founder Michael Hammer, there are four tendencies that distinguish the economic processes specificity.

First, he considers that they focus on the results and not on its end. The effectiveness of whichever establishment is

identified by the obtained results – material, moral, etc. This means that even if the work is organized in the best possible way, if the desirable aims are not achieved, it makes no sense[4].

Second, a new corporate culture is needed, as result of which fundamental matter is given to the client. With business globalization, the organizational culture change may be fatal for high-technological establishments. Therefore, it is imperative to apply modifications (e.g. reengineering), which can be accomplished in a short-term interval and through small projects. In this way is changed not the organizational culture but the critical processes. The hierarchical structures and bureaucracy are eliminated by multi-functional inner teams and delegation of decision-making rights.

Third, the process thinking requires horizontal principal of business management activity. It leads to maximization of usefulness, which means it creates additional value for the client. This method of approach can be realized when the hierarchical structures are substituted by process-orientated teams, working for the common aim, which is the user.

Fourth, business processes are premise for realization of corporate aims. According to Hammer, this activity stems from well-designed ways of working. The organization and the management of the business processes is an activity that is connected to the challenges facing modern organizations. The latter is necessary to determine the key processes and eliminate the ones that are not adding value. Of course, overcoming of traditional thinking about business management activity requires the organizations to adapt quickly to the market developments and concentrate totally on "processes, results and clients". Otherwise, the part of the traditional functioning organizations that would not be able to survive in the conditions of the dynamic business environment is not small.

Until the reengineering conception appears, business organizations functioned based on traditional approaches, methods and techniques. In most of them is accepted the idea that the industrial manufacture is an action, which is fragmented into components. In the contemporary economic conditions are needed new rules for organization and management of corporative processes. Many of the old-fashioned ways for organization and management of the economic activity no longer correspond to the organizational aims. Usually they serve only for process improvement but not for their radical alteration. This necessitates vanguard conception to be introduced, which is due to provide for drastic changes in the team and the structure of economic processes. Reengineering unites the economic operations in one complete process, and the essence of this doctrine is at the heart of one of the ways of realizing the new industrial revolution.

M. Hammer defines reengineering as fundamental reconsideration and radical redesigning of economic processes in order to obtain dramatic alterations in the critical performance of the organizations – cost, quality, time and customer service" and defines four concepts - fundamentalism , radicality, drasticity (increase in performance through a one-time but large leap) and processability[4].

The reengineering is a fundamental concept of a radical change in economic processes. Its features are as follows:

- reengineering is a concept that should be associated not with the improvement of economic processes but with their radical alteration;

- reengineering ignores the principle of subdividing the operations in order to unite them in one complete process.

- reengineering requires fundamental reconsideration of business, through transition from functional structures to process teams, creative potential, modeling and automation of the processes;

- reengineering imposes avant-garde method of approach for economic activity realization. It is suitable with the new tendencies in economy and specificity of the high-technological establishments.

III. BUSINES PROCESS REENGINEERING METHODOLOGY

Business process reengineering methodology should be perceived as avant-garde management tool. It can be used for adaption of our high-tech enterprises to the global alterations in the business environment. It aims to provide concrete solutions for:

- Determination of expert team and the level of importance of economic processes during realization of the establishment's purposes;
- Determination of the significant business processes;
- Determination of the degree of adequacy of the significant business processes and organizational departments, part of the current economic situation;
- Determination of the possibilities for engineering of selected economic processes;
- Defining the scope of the reengineering performed;
- Redesign of the selected business processes and the interactions between them;
- Simulation of the designed economic processes;
- Appropriate changes in the control subsystem when business processes reengineering;
- Planning and as effective as possible accomplishment of the reengineering alterations;
- Analysis of the results when reengineering and outlining of future possibilities for rational alteration of the economic processes.

IV. X – ENGINEERING

There is currently a new wave of interest in the reengineering of business processes in that its principles and methods that are relevant to system engineering as a whole can be applied to the development of inter-company relations, the effectiveness of interfaces between several independent actors in a collaborative activity. Reengineering is not obliged to be limited to the walls of an office or enterprise, but it must also affect processes running between the company and its users,

suppliers and partners. This new, more-refined look of reengineering is called "X-Engineering" [10]. “X” means the crossing of the company’s borders. As equivalent Bulgarian-language versions can be used "extra engineering" (from Latin Extra-external), "ex-engineering", "hiks-engineering" or just "X-engineering". The main driving force of all the transformations is the modern information technologies, which enables the company to adapt quickly according to the changes and the dynamics of the external environment.

The dynamics of the environment, in which the companies function, determines also the necessity of new means and incomes of the management engineering. The customer orientation becomes more and more obvious, and the competition gets a new look - the race is not between individual companies, but between whole chains of manufacturers and suppliers. The integration of processes is now critically important. Interest in business process management (BPM) and the means for business process managing is not accidental. It is motivated not only by technological but also by economical premises. A new stage in the development of the Reengineering methodology is the so-called Reengineering of External Processes (X-Engineering). Among the modern engineering methods of management, "General Methodology of X-Engineering" is distinguished. Every initiative for X-engineering should start with answers to the three key issues:

- How the company is supposed to alter?
- What benefits should be expected from the alterations.
- Who should the company increase the level of integration of activity and cooperation with?

Having exact-formulated answers to the questions asked, what is necessary is that the activity of initiated alterations from the position of “The Three P” be considered.

Process - it includes methods and technologies for interacting with external counterparties such as consumers, suppliers, distributors, shareholders and other stakeholders. To ensure business success in the future, the company must identify the ways and means for such a change in external processes that would lead to the most cost-effective quotations. The company must constantly assess these processes from the client's point of view.

Proposition - is a formulation of the composition of the production and services (and the conditions for acquiring them) that are as close as possible to the customer's needs. The company needs to know the expectations, values, problems, needs and behavior of its client. Only this will allow to formulate the most interesting and profitable offer to the client.

Participation - is an extension of cooperation between different independent business subjects based on the creation of common, integrated processes. The company has to look for and find partners whose cooperation will lead to truly mutually beneficial results. The management of the company should determine how the activity can be improved by integrating the processes with one or the other company, and how to organize these processes.

The famous scientist J. Champy [10] initiates the fourth P in the organization of the X-engineering, which is:

Place - This aspect embodies the future, target positioning of the company. It is sufficiently traditional in terms of both organizational-management engineering and strategic management. The only difference within X-engineering is that target positioning implies its accomplishment not only by the company itself but also by all its partners. To this extent, the company should go to business only with other business partners, and that is why this aimed position should be, if not common to all, at least coherent and not controversial.

X-engineering uses information technology systems to achieve a significant improvement in business integration processes of the different companies and to create effective integrated processes between the company, consumers, suppliers, competitors and partners. Basic information-technological decisions used within X-engineering are the ERP-systems.

V. Enterprice Recourse Planning

ERP-systems appeared in the mid-1970s and were successfully adapted to changes in the architecture of information-calculating systems. These systems aggregate information of all enterprise functions and operations, track spates of materials, orders, and finished production between the borders of all processes. One of the factors for the popularity of ERP-systems is that they can be used to make more effective purchase and delivery solutions based on request spate control, starting with their formulation and ending with the delivery of the finished product.

Although the functionality of these systems has long surpassed their abbreviation, it can still be used for a simple check. Which means that the company needs at least one of the following: *Enterprise*, *Resource*, *Planning*. Let's look at them one by one:

• *Enterprise* is used in the sense of a large enterprise corporation. This often means a holding company or a large company where many people and activities have to be combined.

• *Resource* - when the company's resources become so numerous that their thinking is difficult, it needs an ERP system.

• *Planning* - The ERP system becomes vital when planning and performance control processes become so difficult that they need to be placed in an information system that monitors, guides, and alerts when it fails. At this point, the availability of a initiated and well-functioning system can allow the company to continue growing without any resentments. In spite of the increased number of orders, the larger number of people to control, and the greater variety of external factors that influence, the ERP system allows the company to continue to execute on time and quality customer orders. The system allows for easy planning of resource constraints (commodity, human, monetary, etc.) in a wide variety of activities and enables constant control of everything that happens.

VI. Functional Modules Of The ERP System

There is no single opinion in the literature on what are the core modules of an ERP system [13], but most authors, as well as observations on practice, show that they are limited to the following "Fig. 1":

A. Fig. 1. Functional Modules of the ERP System

A. *SCM /Supply Chain Management/* The system is a network of links with different distributors that allows the company to receive supplies of materials on time and in the necessary quantity to transform them into production materials, transform into intermediate and end products and delivered to consumers . The systems are equally suitable for both manufacturing and service companies.

B. *FRM /Financial Resource Management/* The financial modules of ERP systems reflect the financial and accounting dimensions of the company's business. They should integrate financial and accounting activities with cash and budget management activities, as well as with the preparation of reports and analyzes. The integration of financial modules with other modules in the ERP system allows many of its operations to be set up automatically.

C. *HRM /Human Recourse Management* include many functions performed by the organization's leadership and responsible professionals, whose goal is to increase employee efficiency through economic, informational and governance interactions. The Human Resource Management module in an ERP system includes all aspects of staff management when performing tasks within the organization.

D. *CRM /Customer Relationship Management/* have critical significance to customers satisfaction in a long-term plan because they create values for them and besides they increase the incomes and profits of the company. The more CRM applications integrate into the company's management system, the greater these values become. This creates an environment that allows us to study and satisfy the needs and desires of our clients. As a result, there is greater customer loyalty and a steady increase in company earnings and profits.

E. *MRP /Manufacturing Resources Planning* is a methodology for managing manufacturing enterprises, planning production capacities and material needs. The subsystem is intended for medium and long-term production planning and the need for resources, as well as an analysis of the facts in the implementation of the production plans.

VII. Standart Metodology For Introduktion. Of An ERP – System. Stages:

Stage 1- Business Survey - is the initial stage from which the introduction of the ERP-system starts. The most important thing is to conduct a detailed study of the company analyzed, as well as the entire subject area, and provide all the necessary information for the next stages. In general, the planning of the entire introduction project is in progress, for this purpose the business environment and the analyzed company's specifics have to be examined, the customer's desires and necessities are also being examined. The main participants and managers of the project are identified. A schedule is being prepared and key users are selected to identify the core business processes in the system. Another important point is to educate end-users so that the implementer and the client can speak one language with respect to the system.

Stage 2 – Analysis is the second major step in the introduction process. It aims at a detailed research and in-depth analysis of the existing business processes and their impact on the end result of the introduction. A detailed work schedule should be prepared and the scope of the project properly determined. The latter sets the framework for the whole introduction. It specifies what will introduce and describe in detail the introduction results. There is also a need for further developments to the system. A more detailed plan for important events during the introduction period, a communication plan for meetings and information exchange between the participators in the implementation team and customer, a project change management procedure, and a testing plan are being prepared.

Stage 3 - Design and Introduction - builds on what has been achieved from the analysis stage on, and one of its goals is to produce complete design documentation on the introduced ERP system. Specific settings are made for the needs of the particular company. The database starts filling with specific nomenclatures and being set according to the particular needs. An elaboration of the projects for its design, an elaboration of the additional functionality of ERP system and one of development of the scenarios for the main cases testing are done. They are used to test the system and must be approved by the client. Settings are made by the introducers, which customers are testing and then return information. Detailed user guides are also made.

Stage 4 - ERP system installation - its main task is the designed and realized ERP system to be installed in accordance with the plan and to become a fully operational software application. Here we need to complete the end-to-end system readiness, planning and conducting end-user training, productivity testing and user acceptance. Once the results of these tasks have been achieved, we can go further to installing and resetting of ERP system as a step leading to realization of full system acceptance. Attention should be paid to controlling

changes in the environment and to accomplishment of the planned at the previous stage migration data. Once these tasks have been accomplished, we can move on to the actual use of the finished system.

Stage 5 - Use of the ERP system in real-world conditions, maintenance and development - aims to ensure that the system is finally introduced and delivered to the client and to move to its real-life operation. Fundamental attention should be paid to the completion of project activities, planning the use of the system under real conditions, creating conditions for project support and review of the results achieved. All this creates prerequisites for managing development and change.

VIII. ENTERPRICEONE®

EnterpriseOne is a full-fledged ERP solution that includes complete modules for united communications and call center, CRM (Customer Relationship Management), BI (Business Intelligence) and is fully optimized for mobile devices and touchscreen interface. The presence of an Application Programming Interface (API) allows EnterpriseOne to create additional functionalities and services easily. [12]

ERP.BG (ARP Bulgaria Ltd.) is a Bulgarian developer of business management systems with over 19 years of experience. Since its establishment, the company has set as its main aim to increase the competitiveness of its customers through the capabilities of the software technologies - a goal which determines the direction of development of ERP.BG to this day.

Working in the cloud. EnterpriseOne® is available as the SaaS (Software as a Service) model, which is introduced much faster and easier, and guarantees a higher level of security and reliability than traditional on-premise versions. The "cloud" model of work provides consumers with 24-hour access to the company‘s information resources seven days a week, and furthermore from each spot connected to the Internet. Another important advantage is the cost savings for a server, server operating system, database, network infrastructure, and administration.

Unified version. The SaaS offering model guarantees our customers that they will always work with the latest version of the ERP solution. The same EnterpriseOne® version is used by the smallest to the largest clients, with the differences in the editions being based only on "scalability".

Openness to external applications (APIs). EnterpriseOne® is one of the first ERP systems with its own Application Development Interface (API). The ERP system can be connected to a various applications which complement the basic solution. Connected systems run in real time with EnterpriseOne® on a single database server, storing all of the data in the ERP system.

EnterpriseOne® is a unified, integrated software solution for the entire company and in this sense is not organized as a simple set of separate modules. However, to make the solution as clear as possible and what the results of its introduction and use are, it is divided into basic functional subsystems and applications as well as in different departments in a manufacturing, commercial or distribution company:

CRM (Customer Relationship Management) subsystem - designed to provide better customer service and the need for in-depth control and improved efficiency in the company's marketing and marketing department. With EnterpriseOne® CRM, there is a better look at the business and marketing department, optimizing task allocation, tracking the development of marketing campaigns, and making informed decisions based on the financial results of these departments.

Subsystem Manufacturing - brings together several important benefits. It contains powerful tools for material planning and monitoring the load of production capacities. The subsystem allows each produced product to designate technologies and to facilitate the management of multi-step production.

Logistics Subsystem - Manages the movement of commodity-material values, connects and coordinates various logistics activities - customer service, forecasting demand, inventory management, order processing, transportation, warehousing, location, etc. It makes it easier to get the necessary products and materials in time.

The Finance subsystem - fully complies with the requirements of a modern, well-structured finance department, combining the tracking of incoming and outgoing cash flows. With this subsystem, it is easy to manage multiple companies in a single basis, including multi-business operational reports. It includes mandatory statutory requirements and information required by management.

Project Management Subsystem - information on stock availability, delivery and delivery times, payment deadlines and delays, resource load schedule, project risks, and discussion of their overheads are available.

Business Intelligence Module is a powerful tool for extracting, analyzing and presenting company data in a handy graphic format.

IX. CONCLUSION

The dynamics of the environment in which companies operate also determines the need for new means and ways of approach to management engineering. Customer orientation becomes more and more obvious, and competition is redefining - the race is not between individual establishments, but between whole chains of manufacturers and suppliers. The integration of processes already has critical importance. The interest shown in the Business Process Reengineering - BPR methodology is not accidental. It is motivated not only by technological but also by purely economic prerequisites. The characteristic feature of "traditional" reengineering is that it is directed exclusively towards the internal processes of the company and takes place within the organizational boundaries of the enterprise. Notwithstanding the fact that some companies have been able to achieve substantial outgoes recution, increase profits and turnover, increase quality and productivity, accelerate response to market changes, and improve customer service, but the comparison of the enormous amount of energy, money, and effort that are invested in traditional business process reengineering projects should be acknowledged that it does not justify the hopes the companies' management relies on. Thus, in spite of the attempts of the

founders of this tendency: "give it a second life", we should agree with some researchers and admit that the business process reengineering is already exhausted and the look must be focused to reengineering the external processes or the so-called X-Engineering [1].

Modern information technologies are practically one of the main subsystems of each enterprise and a basic unit within complex organizational reconstructions. The Internet and related technologies are currently being successfully used to overcome the communication barriers between the company and its external partners, suppliers, sub-contractors, customers and other stakeholders, transferring authority to lower levels of governance, and improving management and production processes. Major IT solutions used in X-engineering are ERP systems [2]. Their use in managing the organization has the following advantages:

- complex reconsideration and re-evaluation of company organization, policy and practice;
- awareness of the interrelation of the actions of all employees, real co-operative creation and optimization of all working processes - industrial, commercial, management;
- improving the quality of arbitrary management decisions as a consequence of abrupt improvement in the awareness of their decision making and the reliability of the data used;
- rapid and adequate response to changes in market, technology and financial conditions;
- a strong reduction to the elimination of the negative consequences of delays, overstocking, deficits, deviations from standards, lack of trend reporting, etc;
- improving collection of receivables and return on investment;
- reducing the prime cost of products;
- improving the resources using efficiency, assets and staff;
- professional growth of staff by redirecting from routine to creative activity - analyzes, prognosis, decision making;
- full control of all processes in the enterprise.

Transformation of organizations from chaotic into perfect presupposes adequate cultural attitudes, empathy and active project focus on all system levels (organization - team - individual). Naturally, there is no universal formula and simple solutions. Achieving the maximum potential of the human factor is a major challenge in governance in the new millennium. The basic principles and models explored in the article are the means by which high management will meet these requirements. None of this is obligatory. It all depends on the choice. There is no law that says the chaotic organization must be transformed into a sustainable or perfect one. This is a voluntary choice. A survival question.

REFERENCES:

[1] Panayotova, T. (2010) *Engineering of Dynamic Management Processes*, TU-Varna;
[2] Panayotova, T. (2004) *Modeling of organizational relations in the elaboration of complex project tasks in competitive engineering: Dis. and autoref. on dis. / Tanya Panayotova*, TU-Varna;
[3] Macedonska, D. and Panayotova, T. (2008) *Industrial Engineering*, TU-Varna;
[4] Hammer, M. and Champy, J. (1993) *Reengineering of the corporation* - Mossausetz Institute of Technology
[5] Zabrodin, Yu., and Kurochkin, V. (2009*) Management of the engineering company*, Omega-L;
[6] Kalyanov, N. (1997) *Consulting for the automation of enterprises*, M:Integ;
[7] Maklakov, M. (2001) *Modeling of processes with BPwin*, M:Jupiter;
[8] Oichman, G. (1997) *Business Reengineering*, M:Jupiter;
[9] Davenport, H. (2003) *Business Inovation: Reengineering Work through Information Technology*, Boston.
[10] Champy, J. (2002) *X-engineering the Corporation: Reinventing your Business in the Digital Age, Warner Books*, New York, NY.
[11] I&CMedia, Special Application, (2008), *BPM, Business Process Management, www.bea.com/bpm;*
[12] *https://erp.bg/products/EnterpriseOne/general-presentation*
[13] *https://erp.bg/Information/WhatIsERP.aspx*