

## **REENGINEERING IN THE MODELLING AND THE BUILDING OF A PRODUCTION SYSTEM**

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### **ABSTRACT**

*Applying of business process reengineering in redesigning of business processes is connected with radical change of the core business processes, linked systems and structures of organization with the purpose to achieve improvements in the performance of the respective business subject.*

*The study of production systems is not an easy task because of their scope and complexity because a suitable method for examination, such as modelling of the business process must be insured. Modelling of the business process is a method that will contribute possibility for understanding and visualization of the system, by means of exact description and activities which are done within it.*

*Keywords: reengineering, business process, modelling, production system.*

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### **INTRODUCTION**

In a complex and rapidly changing business environment organizations find it increasingly difficult to create and maintain competitive advantages. This necessitates a constant search for more advanced approaches and methods in management, directed towards greater adaptability and prompt reaction by the management team, as well as towards increased management efficiency. Reengineering of business processes is conceived as a new approach in management, a new technology of finding new meaning and redesigning the processes and activities of organizations with the purpose of achieving higher results. It implements considerable changes in the basic business processes within business organizations by bolstering their overall efficiency. As a result of this a new mode of doing business is formed and a new production system, which maintains the new business processes arises.

Modelling business processes is a method, which makes possible the understanding and visualization of

the manufacturing system by means of its precise description, along with the activities performed therein. Through modeling, improvement is achieved in the functioning of the system, with elimination of redundant activities that introduce parallelism and useless effort; indeed, in some cases of reengineering, the processes may be totally reorganized, so that numerous activities are joined into one single.

Simulation is a basic means of designing business processes, owing to the complexity of manufacturing systems and their behavior.

### **RESULTS AND DISCUSSION**

The initiation and implementation of reengineering of business processes in the organisation are dictated by a number of factors, the basic one of which is related to the success achieved by the reengineering applied by competitors. The second in importance is the factor related to the top-level management, where it is possible to see and evaluate the

prospects arising from the radical changes and development of the organization. Reengineering of business processes concentrates on the key, or so-called central business processes, i.e. such processes that have to do with the strategy and are defined as critical for business. The fundamental scheme by which reengineering is effected consists in the identification of these business processes, i.e. the selection and assessment of their significance, and the realisation of their redesign and change.

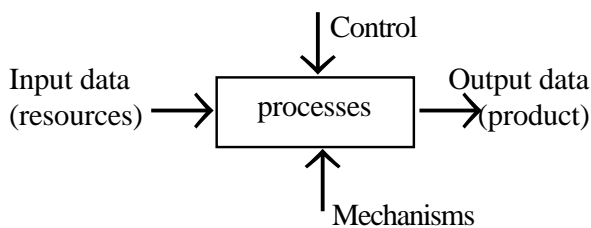


Fig. 1. Model of a business process.

Business processes reengineering goes hand in hand with the creation of completely new and more effective business processes. Typically, this is not influenced by what the process was previously. Indeed, we start from a zero basis. The traditional structure of the organization is put in effect, yet it is predominantly concentrated on the unification of functions on the macro-organizational level; which means that sub-processes can be contained in the framework of one function or subdivision, and reengineering can also be applied to them.

The redesigning of business processes must be put into effect on the grounds of the mission, thus affecting all units of the economic entity. Meanwhile the striving to protect the consumer remains in the center of the effort. In that sense processes play a key and decisive role in building the redesign process. Regardless of the fact that the production process is fundamental for every industrial enterprise, when building models of business processes redesign, these must be considered jointly and in conformity with the vision and mission of the organization.

**Modelling and building the manufacturing system**

Each individual manufacturing system consists of several processes encompassing the overall production activity, which makes it considerably complex. It consists of three subsystems, namely [1]:

- A processing subsystem that is connected with the realisation of work to transform input resources into output products, and that characterizes the immediate production of the enterprise, where the basic technological processes take place. The building of this system requires considerable capital to ensure long-term material and non-material assets, short-term and financial assets.

- A supporting subsystem – it is connected with the auxiliary functions of providing services to the main production and it characterizes the manufacturing infrastructure of the enterprise, formed by repair, transport, power, warehouse and other units and activities, which help the normal functioning of the key technological processes. It is not directly related with the manufacture of the product.

- A planning and control subsystem – related to the processing of a considerable amount of information coming from the internal company environment, arising from the realisation of goals, policy, tasks, etc., of the enterprise, a data coming from the external environment as a result of product market demand, the cost of resources, the relevant hardware and technology, trends in their development, etc. This system receives information on the state of the processing subsystem which serves as a basis for taking of operational decisions as to the necessary relations between individual units, such as production capacities planning, material stock management, quality, etc.

The design of manufacturing systems consists of two phases [6] – the conceptual model phase and the phase of detailed design. The first phase concerns the development of the basic principles under which the

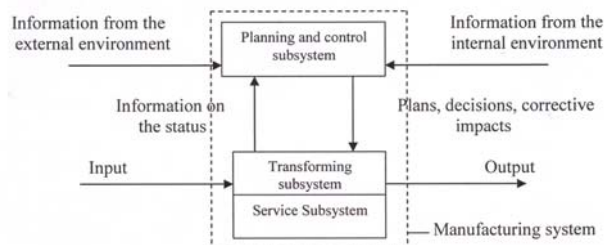


Fig. 2. A Manufacturing system.

system will operate, whereas the second one is related to a detailed description of what is necessary in order to realize the normal operation of the system.

Business modelling technology, if it is to be successfully applied in the manufacturing systems of enterprises, requires a broad knowledge of their processes, as well as the manifestation of considerable creative thinking, which has to join objects and ideas in one whole. Organizations need to have highlighted the number of criteria, which are connected with the processes in the manufacturing system, namely good knowledge of processes, experience and intimacy with work processes, precision and context familiarity and communication. The activity related to business modeling of production systems is based on a hierarchical principle and comprises the following stages [5]:

- identification of the vision on business processes
- description of the operations performed within the manufacturing processes (Is-Is analysis)
  - presentation of the operations
  - assertion of the new activities (To-Be analysis)
  - data modeling

It is necessary to identify the vision because of the separation of contradictory alternatives that can be of functional, technological and organizational character, such as, for instance, provision of resources, creation of a reengineering team, etc.

The purpose of the Is-Is analysis is a comprehensive analysis of operations comprising business rules, work flows, job description, external interface, forms, communications, documentation. The aim is to establish the ways of applying new technologies in order to achieve higher efficiency in future operations.

The purpose of the To-Be analysis is to study in detail the Is-Is model and to ensure a description of how activities will be implemented in the future, in order to increase effectiveness and the application of the relevant technologies.

The modelling of data is connected with a description of the necessary information in order to fulfill any activity that complements the business process, with its results being the clear outlines of business rules and processes performance.

Business modeling makes possible the description of the correlation between functions and the busi-

ness processes related thereto. In this manner a full and precise description is achieved of the organization, necessary for the adoption of the relevant decisions. Business processes realisation requires the observance of a definite sequence, namely:

- building a functional and structural model of the economic entity;
- transformation of the functional model into a process one by attaching input and output parameters to each function;
- transformation of the structural model into a so-called 'role model', i.e. defining the role of individual positions

The realisation of this all must be connected with development and testing of the data base, the development and testing of manufacturing systems, procedures and relevant documentation.

The part comprising the procedures and testing of the new process, realized during the phase of prototype or control test, is a multi-step effort that includes the testing of the smallest to the largest units of the manufacturing system, until the entire system starts operating as one. It is necessary to carry out additional testing with the aim of establishing the status of the system in its full volume or loading. Then the results of the new system ought to be compared against the results of the old one. In this way any respective shortcomings will become evident. All pre-suppositions must be stated in the process of building the new model. In this manner the relevant differences in viewpoints will be concerted with the purpose of arriving to an exact solution.

Modelling and simulation make possible the presentation of the forthcoming influence of the requested changes, and even if these prove impossible, the results will make evident even the tiniest existing hope to further things, and therewith the predictability and behavior of the system will be enhanced.

Simulation models realized through the initiative of reengineering can contribute to the development also of other means and methods of testing; even in some cases the older system may continue to work in parallel with the new one and thus support the respective product or service. In that case the new system will ignore the shortcomings or unexpected delays. New results can be compared against the back-

ground of the projection, and they can guarantee in this manner the new implementation measures.

## CONCLUSIONS

The necessity of establishing a flexible and adaptive organization, respectively competitive both on the regional and global scale, calls for the creation and maintenance of simulation models in manufacturing systems. These will present their work operations in time, as well as the means of production, the products and changes in processes.

The application of reengineering in modelling and building the manufacturing systems will ensure the possibility of a full and precise description of new models, this allowing the identification and discovering of the problems of principle within the manufacturing system and its links.

Business modelling will allow the identification of key indicators of production control and management, while at the same time making possible the training of personnel to operate the new system. The identification of the overall status of the system will allow the creation of fundamental principles on which to build

the new system that will open the way to higher work efficiency, low costs, high quality and lower prices.

## REFERENCES

1. I. Dosev, D. Milcheva, "Organization of the production", Sofia, 2001 (in Bulgarian)
2. D. Milcheva, B. Nikolov, "Ontological orientated systems for modeling and management of the business processes in the chemical and metallurgical enterprises and sustainable development, 3-4, 2005 (in Bulgarian)
3. Business Process Improvement (Reengineering), Handbook of standarts and Guidelines, Version 1.0, Office of Information Technology (AIT), November 30, 1995
4. Enterprise modeling and simulation applications in reengineering - sidebar to "Enterprise Modeling and Simulation: Complex Dynamic Behavior of a Simple Model of Manufacturing", Hewlett-Packard Journal, Dec, 1994.
5. [www.workforceatm.org/sections](http://www.workforceatm.org/sections), (2004) Business Process Planning.
6. [www.informs-sim.org](http://www.informs-sim.org), Flexible Modeling of Manufacturing Systems.