PRODUCTION MANAGEMENT THROUGH ENTERPRISE RESOURCE PLANNING (ERP) INSTRUMENTS

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Abstract: Adopting IT tools or IT systems in companies is explained through the research of a global vision of production systems and the wish to improve the transmission speed and information coherence. These ERP (Enterprise Resource Planning) permit the coverage of the functional necessities of the company. They are characterized by a real time management, a synchronization of the physical, financial and accountability fluxes treatment and the exploitation of coherent data because of multidimensional data bases. Implementing an ERP can be a complex project from the point of view of time and cost, involving as well collaboration within a project team. In this paper will be presented the methodology of implementing an ERP and the effects of applying ERP can be analyzed through function. Sometimes, ERP is based on a capitalization of the most proficient processes, identified by those who have conceived these instruments, what makes them attractive for companies, bringing them international benchmarking elements. Moreover, the conception of an information system becomes a process which corresponds to a situation by required configuration.

Keywords: management, planning production, logistic

1. Introduction

ERP means *Enterprise Resource Planning*, representing an integrate administration software. Its concept has its origin in MRP method *(Material Requirement Planning)*, used essentially in production management. An ERP is:

- *A pro-soft:* an application realized by an editor, a quite general one in order to respond to the necessities of more customers. It includes a standard base and it is a part which can be personalized through parameters.
- *A management application:* conceived first of all in order to get transactions in a company automatic: accountability, supplies management, monitoring orders and production program. The application does not contain optimization instruments, which can help you, make a decision or automate decision tools.
- *An integrate product:* takes into account the assembly of functions – company processes, in integrate and automate manner. This architecture allows solving classical interface problems, synchronization and double inputs.

After the specific evolution period and of the first management software in a unique domain, in the 1990s ERP developed, and they can be described like this: a functional coverage in more domains, industrial companies (commercial, production, purchase / logistics, accountability and finances, human resources, etc.); an integration of functions around a unique data reference system; a strong transactional management in real time. Sometimes, ERP is based on a capitalization of the most proficient processes, identified by those who have conceived these instruments, what makes them attractive for companies, bringing them international benchmarking elements. Moreover, the conception of an information system becomes a process which corresponds to a situation by required configuration.

2. Global information management through ERP instruments

ERP correspond to IT applications made of standard functional modules, related directly to a unique data base, covering the assembly of company processes. An ERP constitutes, most of the times, a solution of international dimensions, able to administrate contexts, multi sites, multi legislations, more languages, more currencies; he allows thus information accumulation coming from branches of a group in different countries. This characteristic is fundamental at the globalization moment, because the linguistic and the legal environment represent the levers which structure a company.

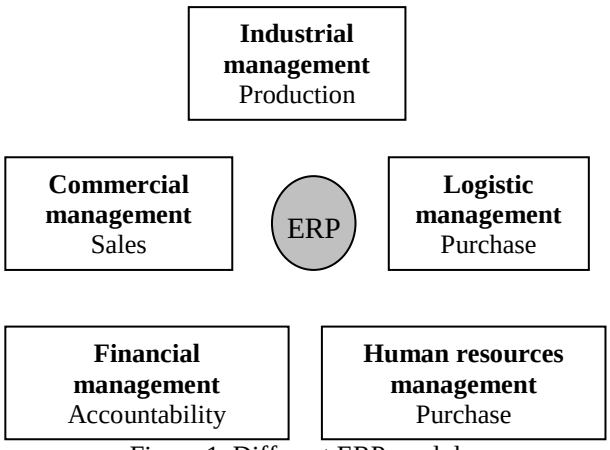

Figure 1. Different ERP modules

ERP represents a common system in the assembly of management functions of a company (figure 1):

- research and development - conception - study office;
- industrialization methods - methods office; marketing/sales;
- purchase/supply; manufacturing, production coordination, supplies;
- accountability, finances (general accountability, analytical accountability, suppliers and customers accountability, treasury, and so on);
- human resources;
- maintenance; quality.

In figure 2 there is presented the relationship between the three processes (sales, production and purchase), as well as their other different functions.

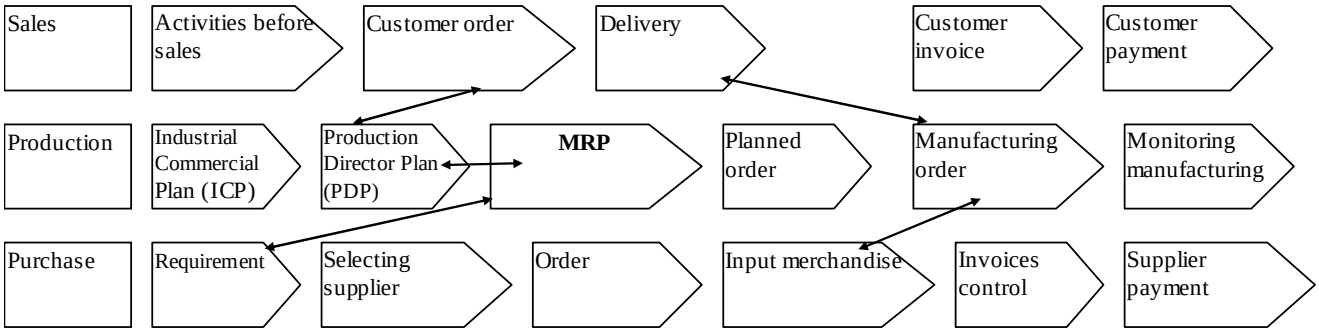

Figure 2. Examples of ERP processes

3. ERP implementing

Implementing an ERP can be a complex project from the point of view of time and cost, involving as well collaboration within a project team. This implementation work needs as well different competences:

- A good knowledge of the company, necessary to adapt the IT system to activities.
- A knowledge of the pro – soft which must be implemented, indispensable, on the one hand in order to know what it can do, and on the other hand, in order to be able to parameterize it. The integrated pro – soft belonging to more domains, the same person can't be involved upon all the pro – soft possibilities, in detail. Some people have a general vision upon functionalities offered; others are focused upon one or two functional modules.
- Management competences of the project, because implementing an ERP is a project which needs, in order to be finished, a coordination implementation and an adapted organization.

In general, companies appeal to different experts [1]:

a. the supplier of the material which is necessary: PC, servers, network;
b. pro – soft editor (the most important are: SAP, Oracle, People-soft, Baan, JD Edwards). SAP is nowadays the global leader on the ERP market.
c. the integrator: it is a counselling office for parameterization and pro – soft installation;
d. possibly, an IT society, in order to do some specific supplementary programs.

Thus, the company which wants to install an ERP must not only choose the editor of the application, but also the integrator and the supplier of the material. ERP selection is performed, in general, according to the following process: the company launches an offer, describing quickly its need. The integrators respond, on the basis of a given ERP. The company does a quick selection which allows it to get a short list of two or three proposals, made for example of a couple SAP + Cap Gemini, Oracle + Accenture and JD Edwards + Unilog, and so on. A quick rate setting allows then the company to choose one of these couples.

The idea of not having an elaborate task notebook is preferable according to integrators. The organization and the target system of the project will really depend on the ERP which has been chosen, in order not to make an oversized system. As far as need definition is concerned, it often constitutes even the project object. In general, the modules retained must be adapted to necessities and implemented. The time gained while applying the decision depends on the "distance" between the actual situation and target processes. Regular surveys evoke an average implementing time of about 2 years.

Target process definition is performed within the project team, made of representatives of different functions, making sure that the point of view of a service is not predominant reported to the others and that the parameters chosen accept to be reflected in a processes global improvement perspective. In general they don't have any knowledge in the domain of processes modelling, but they can be formed through an integrator. (figure 3).

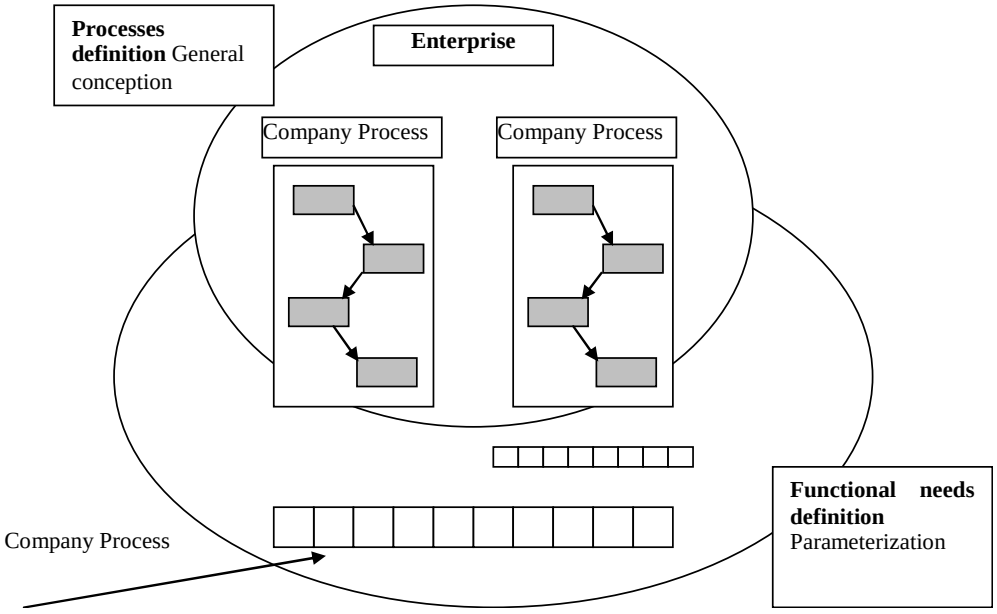

Figure 3. Elaborating specific processes of the company and their resemblance with ERP standard processes

Industrial experiments of implementing an ERP show that it is often preferable to start with simple processes then to increase gradually their complexity.

3.1. An ERP advantages

ERP instruments get out nowadays of their simple image of transactional back office tool in order to pass into a system, which is open to the exterior, in the service of an extended company. Approaching an ERP presents many advantages, among which [1]:

- Suppressing interfaces and eliminating multiple introductions;
- Bringing the processes to a constant level and optimization;
- Choosing some better management practices.

ERP contributes to some improvements in the company:

1. Economic: maintenance costs reduction through tasks automation; inventories reduction; management costs reduction.

2. Administrative objectives: reducing coordination terms of company information fluxes; reducing delays; integrating physical and financial

fluxes in order to change them into a decisional support, in the same time, for operational managers and financial managers; information availability in real time and reaction capacity starting from any work post, require an integration of information system.

Reported to a specific development solution, ERP instruments allow a sensible reduction of time necessary to define a new solution, based on the best processes, being the beneficiaries of the best expertise. ERP bring the advantages of a pro – soft whose development is assured by specialized editors and it is amortized on a large number of companies, including in the standard the best practices.

The effects of applying ERP can be analyzed through function.

A. Purchase function. The earnings refer to reducing the errors in issuing orders: lack of information or false information, un-controlled validation cycle, orders which are not issued in due time, etc.

Financial earnings come from the information which is consolidated through ERP as elements of purchases increasing through suppliers or number of suppliers per product. This information allows the start of an optimization cycle of the purchase function. The optimization concerns the standardization and the selection of the products purchased and of the suppliers.

The availability offered by ERP, of measure instruments and suppliers performance monitoring, allows a significant increase of negotiation capacity. Purchase centralization constitutes as well one of the frequent sources of increasing administrative productivity, related to internal management costs optimization, thanks to automation and integration. Reducing the suppliers' number can allow an important reducing of administrative taxes.

B. Production function. Qualitative earnings refer to programming cycle fluidity, supply, manufacturing and storage. These earnings come from the integration in the commercial domain and in the purchase one and they are perceived as a better conformity between provisions and a production cycle achievements.

They come as well from the singularity of the articles, nomenclature, and a better planning tasks distribution between services. Financial earnings come on the one hand from the optimization of the production instrument and the capacity to sell more or to have a higher per cent of the service, but also through the optimization of the semi – finished and raw materials supplies.

3.2. ERP limitations

Enterprise Resources Planning (ERP) implementation can face more difficulties [2]:

1. ERP forces the most often the company to adapt to standard processes, which is not possible without many problems. This aspect is extremely sensible when one makes the decision to work with a high detail level (re-grouping loads or resource for example), which means very complex hierarchic nomenclatures.
2. Trained rationalization through these reference processes presents a restrictive character, which can have a strong impact upon the economic and social aspects of the company.
3. The dependence of the company reported to its supplier, both concerning its monitoring capacity of the technological evolution and the adaptation to the evolution of needs and pro – soft successive versions.
4. Approaching standard and optimized processes tends to adjust the competitive advantages through their generalized use.

3.3. The budget

The studies, in ciphers of costs expected are rarely performed seriously. Indeed, under commercial pressure, the currencies proposed by integrators in companies are often very optimistic reported to certain costs. Thus, if the licenses costs are known before, the costs of materials and recommendations are often underestimated. As far as the temporary or definitive interfaces costs are concerned, as well as the synthesis conditions performances, they are ignored at the beginning and they can be much higher at the end of the project. In some cases, the budgets refer to reorganization projects, greater than the unique implementation of an ERP and they include therefore costs which are not directly related to ERP project. However, one can give some suggestions concerning these costs: the license cost can represent from 0.5 to 1.5 M euro, the cost of services almost 15 M euro, to which one has to be added, the study of necessities, selection, conception, prototype and parameterization as well as formation, the restart of the existent one, data migration, specific developments and maintenance. These costs vary naturally according to the perimeter, the company size (number of users) and number of locations.

4. Global decision through supply chain management tools

As you have just seen, ERP are instruments which register information and simulate for example the feasibility of a production plan. S*upply chain management* instruments have as ambitious vocation the combination of ERP instruments with decision support modules and globalization concern, integrating distribution logistics and industrial logistics. ERP editors have integrated progressively in their offers, modules which recalculate automatically production and distribution director plans, according to real time information transmission, through ERP data bases.

Nowadays, suppliers market exceeds inevitably national borders and the purchasers have to act on a market which is enlarged to the exterior, the so called global market, a market which has become global, worldwide. When the problem of currency exchange or that of an efficient logistics is not a problem anymore, there is left in the act only the classical report between the total purchase price (including the merchandise price, the transport price, insurances, taxes, etc.) and the merchandise quality as well as the delivery term problem. Global Sourcing means, therefore, supply, in a worldwide context, as the world is a great supply market which includes all the national markets. One looks all over the world the most suitable merchandises or services as far as quality, costs and delivery terms are concerned. In this context you must not forget the distances, sometimes great, between customer and supplier (which make necessary the provision of large safety supplies), linguistic and cultural differences as well as other aspects too. There are obviously, in worldwide supply, advantages and disadvantages, and all these must be considered by purchase management. In Romania, where the problem of foreign currency availability does not exist any more, once with the solution to the economic stability problems, global sources must be taken into account more carefully, as the only valid criterion of a company is getting as much profit as they can, under the conditions of assuring corresponding quality to the products and services launched on the market. In a competitive market, supply chain administration is nowadays a major strategic stake for industrial and commercial organizations. It is an important potential for creating value for the customer: service quality, performance concerning the term and the reactivity. It represents as well, one of the main places where it is disputed a part of the organization profitableness, through rationalizing costs related to supply chain or through focus upon new distribution channels. This tendency has already been consolidated in an economic context dominated by exchanges globalization, diversifying and shortening products life cycles, developing partnerships between organizations. In the same time, new opportunities have been offered through the evolution of technologies and methodologies, especially in the information systems. Traditionally in an organization, different flux phases have been established: purchases which used to treat inputs flux, commercial service, of outputs fluxes, production, which has been mainly based on own restrictions and technical efficiency and productivity objectives. Its logistics has been limited to transport and distribution. In the 1980s, many organizations have gathered in the same service all the functions, which used to treat the flux: from supply to distribution, passing through the production administration and resources planning. In the same time, the concept of «due time» was developed in order to extend these fluxes and to increase in the same time the service quality and the supply decreasing.

A supply chain is the set of physical fluxes, of information and financial fluxes which connect suppliers and customers. It leads on the one hand to the idea of chain in which different characters in an industrial production system, are interdependent and on the other hand to a larger definition of the supply (flux between organizations, flux between a supplier and a customer, flux between two work posts) [3, 4].

For an important number of organizations responsible staff, supply chain constitutes a major interest topic.

These information systems also called *Advanced Planning System (APS)* which is like a set of boxes with tools which approach the set of fluxes related to the logistic chain:

- Sales provision and requirement planning;
- Networks optimization, warehouses localization, of platforms, and different products families' production localization.
- Detailed planning of the transport, arbitrage and resources dimensioning;
- Movements definition and distribution planning;
- Dynamic supply management.

Table 1. APS functionalities

Strategic
Requirement planning Logistic chain optimization
Tactics
Sales point's management Requirement planning and management Director Production plan under constraints Distribution planning
Operations / Execution
Detailed production planning. Dynamic supply management Detailed planning of means of transports load

The integration and the coherence of different aspects are supposed that they allow a rapid reaction towards an unexpected event. For example, a production delay, because an interruption will be immediately felt within the plan of the end products supply, at the level of the supply, in organizing deliveries to customers and in the transport plan. These instruments are based in general on charts traced on geographic maps. The update and the consideration of logistic constraints of different delivery points are performed directly on the geographic representation of the nodes or the arches of the network. The optimal solutions proposed through different APS modules are the result of applications of linear programming models, of *Branch and Bound* models, of finite capacity heuristics, like taboo research. These mixed algorithms to the IT tool permit the solving of highly important problems. These approaches lead to optimal solutions in a very short time reported to MRP methods *(Material Requirement Planning)*. But they remain essentially determinist. The random aspects are taken into account through the calculation of the security supplies which is performed starting from historical provision errors.

The integration of ERP and APS systems concerns an optimized management at international level of production fluxes within the same company. Nowadays there is on the market software having as purpose the ambition to analyze, to conceive, to administrate on operational plan the internality of the logistic chain between suppliers and end customers. In this approach, the logic of coordination combines the approach based on sales provision with the approach which exceeds the final production and the delivery, only if the need is expressed as order. Starting with the planning integration and with the operational, there have been made *supply chain management* tools (figure 4) [5].

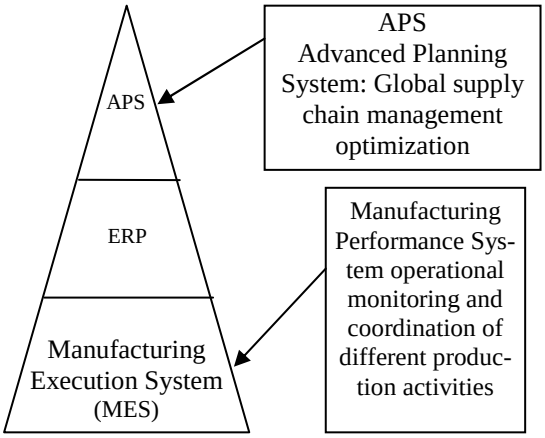

Figure 4. Integrating different systems

5. Conclusion

Taking into account the data volume and their numerous interactions, it is necessary to be used IT ERP software in order to perform different calculations. Starting from physical data (available supplies, expected deliveries, predictable requirements, production capacities and so on) and financial data (production costs, supply, interruption), these instruments establish thus a production plan which determines for each time interval the quantities which must be produced, the level of the supplies in semi – finished and finished products and resources use (human and machines). Production management assisted by computer permits thus the automation of a difficult series of calculations respecting the data which concern the product and the fabrication range.

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