Competitive production networks through software-based reengineering and added value networks

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Abstract

The globalization of business processes as well as innovations in information and communication technology and a continuous organizational change have led to increased competition, which is accompanied by a concentration on core competencies and the creation of company networks.

As corporate targets, dynamism and flexibility are becoming more significant. The turbulent business environment confronts companies with rapidly changing demands. Suitable strategies to improve a company's innovative capabilities and competitiveness in such a situation include:

1. the software-based reengineering of business processes,
2. co-operation with partners or customers in company networks and
3. tapping into new and promising business areas.

Keywords

Business process reengineering, modeling, simulation, production planning and control, company networks, supply chain management, electronic commerce, tele-service.

1 INITIAL SITUATION

Modern information and communication technologies provide global access to markets that have been to-date inaccessible. Saving time and increased flexibility are corporate targets that are gaining more and more significance (Wallace, 1999). In general, the demands on companies are dramatically changing due to the dynamics of the business environment and its turbulence.

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Possible measures to improve a company's innovative capabilities and competitiveness include a software-supported reengineering strategy, co-operation with partners or customers and the creation of new business fields with promising future prospects.

2 SOFTWARE-BASED REENGINEERING

Business process reengineering

Many companies respond to the above-mentioned demands by redesigning processes and restructuring the whole organization in a process-oriented way. This software-based reengineering enables for a strong process and customer-orientation and is further characterized by a focus on core competencies and the consistent use of information and communication technologies. Fraunhofer-IPA carried out a variety of reengineering projects with medium-sized and large companies from various industries. Its extensive experience has led to the development of a field-tested six-stage approach, briefly outlined below (Figure 1).

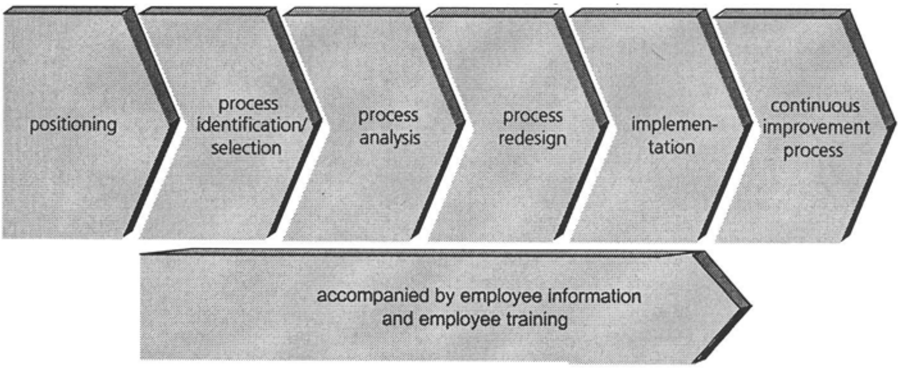

Figure 1: Procedure in software-based reengineering

Fraunhofer-IPA's project experience shows that software-based reengineering allows for a quantum leap in improving today's crucial performance indicators i.e. time, cost, quality and service. Reengineering is the right means for companies to drastically reduce their lead times, cut costs, increase customer satisfaction, support the entrepreneurial thinking of employees and to achieve larger market shares.

Modeling and Simulation

The use of a BPR (Business Process Reengineering) tool helps to systematically collect, evaluate and illustrate information. With this tool, the models are quickly and easily updated, making the current and the targeted organization state visible to

all employees. The BPR tool makes even complex situations transparent. Process accounting and simulation runs in the BPR tool help to facilitate decisions during the process redesign. In addition, it is possible to use the models for the selection and customization of workflow management systems, PPC (Production Planning and Control) and ERP systems (Enterprise Resource Planning). In future, it will become more important that applications such as PPC-/ ERP-system are compatible not only with the BPR tool in order to carry out modeling, simulation and animation, but also with the workflow management system to control, monitor and organize the workflow. In this context, the object-oriented corporate model takes on the role of an integration platform.
There exists a wide range of BPR tools available for modeling and calculation, and often for simulating business processes (Figure 2).

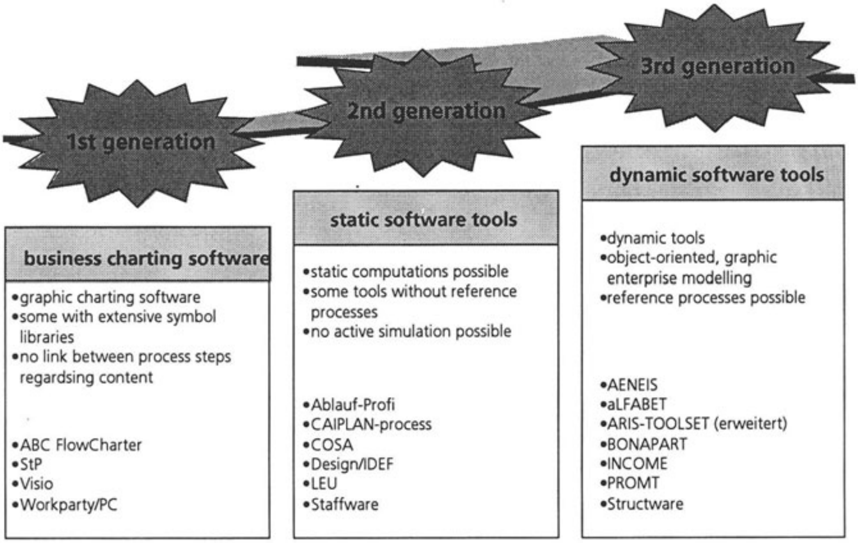

Figure 2: Market survey of BPR tools

BPR tools of the 1st generation (Business Charting Software) are used for drawing up charts and often contain extensive symbol libraries to map processes and organization structures. BPR tools of the 2nd generation enable static calculations, although most do not include reference processes or support active simulation and animation. BPR tools of the 3rd generation are dynamic tools based on an object-oriented modeling process. Apart from the fore-mentioned BPR tools, there are a few workflow management systems that can also be used for modeling, for instance Flow-Mark and ActionWorkflow or data processing CASE-tools.
The user chooses the appropriate tool according to the requirements and modeling effort.

3 COOPERATION WITH PARTNERS OR CUSTOMERS IN COMPANY NETWORKS

Building company networks

To keep up with the constantly changing market dynamics many enterprises must react more rapidly to changes and cooperate more closely with both suppliers and customers. Current trends, such as lean production, outsourcing, just-in-time, single sourcing, etc. increasingly lead to the industry-wide networking of value-adding activities. The global availability of technical infrastructure for the electronic exchange of information results in new forms of cooperation such as the Virtual Enterprise.

Cooperative work and company networks offer many opportunities for acquiring knowledge, cutting costs, tapping into new markets and, thus, ensuring the competitiveness of a company.

The Added Value Networks (AVN) approach is based on a typology by Fraunhofer-IPA devised according to real life examples (Sihn, 1998). The name Added Value Network points to the additional and measurable economic value provided by the network. AVNs confine themselves to structures in the value creation process that are relevant for a network. To describe and design company networks, a distinction is made between four types of networks: tree, bus, star and ring network. It is, however, possible to mix these types when building a network. The AVN-concept can be applied to different network phases and used for various tasks (Figure 3).

Companies that have never been part of a company network will be supported in initiating and building an Added Value Network. Companies already cooperating in a network without achieving the expected added value will be supported in changing the network type. The most suitable type for a given constellation has to be chosen from the four basic network types. Existing company networks can be described by six characteristics: network borders, dominance, market access, product/ service variability, variability in cooperation and added value. According to these characteristic features and work methods, based on the operative and strategic processes, it is possible to compare the actual and the target states of a company network and to identify development potential. Individual work methods can then be improved by software-based reengineering. The AVN concept is useful, together with scenario and portfolio techniques, if a strategic realignment of the company network becomes necessary.

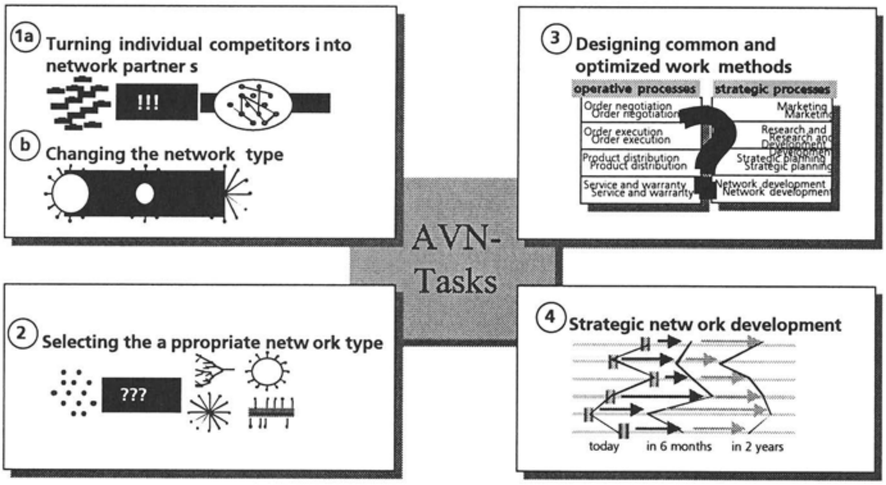

Figure 3: Added Value Networks - four different tasks

Goal DESIGNING SUPPLY CHAINS

The results of a study done by the consulting firm KPMG show that 85% of European firms are presently planning the reengineering of their supply chains. The of the latter being to achieve greater profit or decrease total costs in order to become more competitive.

The information flow between supply chain partners becomes increasingly important with the tapping into of operational rationalization potentials. The key problem lies in the lack of transparency in inventory data and delivery deadlines. The results of the latter are not only high inventories in the supply chain, but also the risk of insufficient supply, inadequate response to short-term changes and the late recognition of supply bottlenecks. Although an increased number of efficient work tools for complex supply chain control are made available with Supply Chain Management Systems, reengineering project reports show a lack in the application of such tools in designing logistics co-operations.

To support the exchange of information in the supply chain, IPA developed the Supply Chain Information System (SCIS), an Internet tool based on Java for multi-stage supply chains (Figure 4). With this software tool, the data exchange regarding inventory, delivery deadlines and needs between partner companies can be supported. In addition, each partner in the supply chain can independently carry out data analyses on a regular basis, including analyses of critical supply parts. Through this system, deadlines and quantities between the companies can be controlled, enabling the precise and systematic co-ordination of contingency plans.

User-friendly input masks make it easy for the partners to enter the inventory data of pre-defined production stages into the SCIS. Moreover, production and delivery dates and the requirements of particular components are entered into the system. Entering and exchanging data among partners occurs via web clients on the Internet. All partners are able to access a central www-server with the use of a

password. This allows for the quick, flexible and unproblematic integration of new partners into the supply chain (Hezel, 1998).
In day-to-day business activities, the supply chain's operating data are collected in a central server and automatically analyzed according to pre-defined rules. The results are immediately made available to all partners in the supply chain. In the case of an emergency situation, possible contingency plans are then presented. These contingency plans include, for example, links to the appropriate contact person and a step-by-step list of the tasks to be followed.

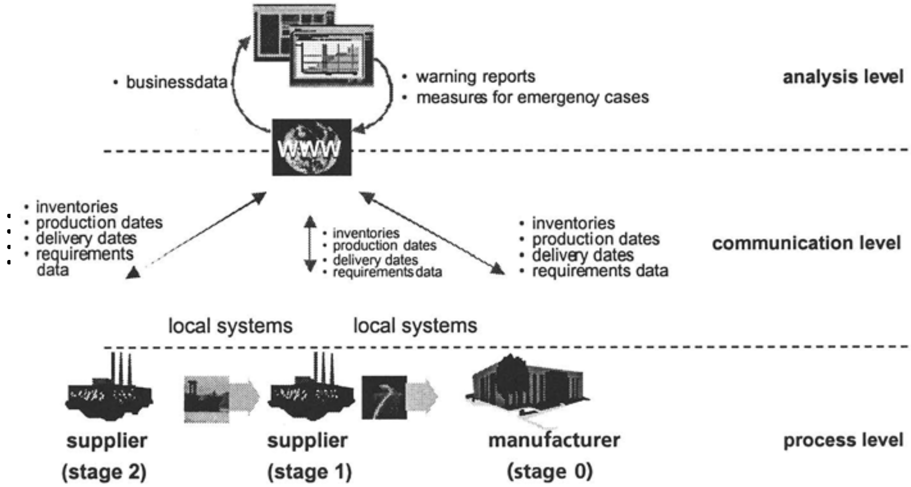

Figure 4: SCIS – Work Tool Support for Logistics Management

4 TAPPING INTO NEW AND PROMISING BUSINESS AREAS

Modern information and communication technologies and the high internal rate of computerization through PCs and laptops, networked via LANs and WANs, contribute to the development of an infrastructure which is the source of future company organizational forms. Electronic marketplaces create new markets in which goods and services are exchanged via tele-shopping, tele-banking or tele-service. Together with these new markets, networked enterprises with vertical and horizontal cooperation structures evolve.
Electronic marketplaces are the basis for the flexible and automated handling of business transactions. They excel real markets with their market transparency, prompt conclusion of contracts, unlimited business hours and world-wide accessibility. In Electronic Commerce, the trade relations between suppliers and customers are coordinated by means of information and communication technology. Since all information required for a transaction is numerically available, it is possible to employ intelligent software systems, so-called agents. Acting on behalf of those wishing to take part in the electronic marketplace, agents are able to independently carry- out business transactions. The World Wide Web

(WWW) offers a global base for Electronic Commerce. At present, Fraunhofer-IPA develops and prototypes an Internet concept for Electronic Commerce with mobile agents. This agent-based system is intended to support the market participants in establishing contacts and negotiating, executing and paying for business transactions. A mobile agent gains access to the electronic marketplace through a defined gateway. A contact network protocol controls the automated negotiations. To participate in global business, one needs only a connected telephone, an Internet address, a computer and an Internet browser. The implementation of the prototype in the semiconductor industry will prove that mobile agents are able to coordinate the various production stages in a company network which processes wafers.

The machinery and plant manufacturing sector places great emphasis on additional operation and maintenance services, for example tele-service, due to the fact that their customers expect global presence, short response times and qualified service. To fulfil these demands, modern control technologies are required, facilitating the link to tele-communication networks and enabling remote access to a machine's control system. Tele-service offers even more as its tools improve communication in such a way that enables much better service handling. For instance, the tools used for video transmission can help to overcome language barriers and on-line access based on Internet protocols allows to resort to multi-media engineering documentation. If the respective technologies are available, the functions can be easily expanded - from tele-service to process management or even tele-manufacturing.

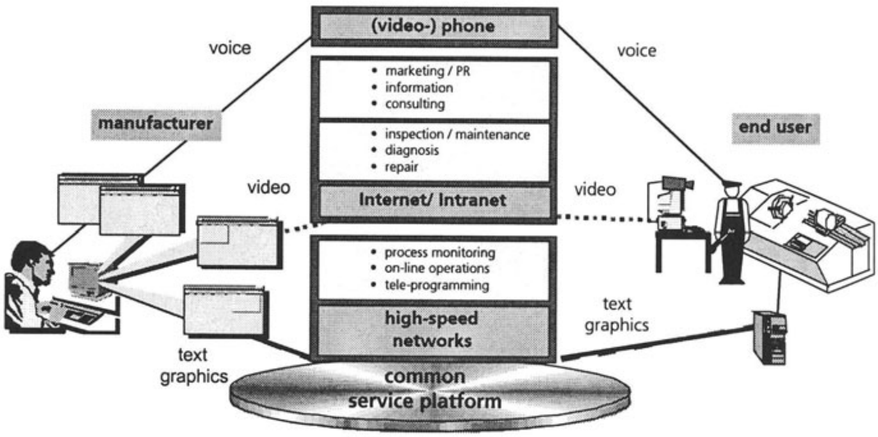

Figure 5: Internet-based tele-service base

Fraunhofer-IPA has initiated an industry-wide service cooperation platform together with four mechanical engineering companies (Figure 5). This platform is used as a service-content-provider which supports machine operators regardless of the origin of their machinery and acts as a contact for various services. The provider takes the role of a service broker between machine manufacturer and operator. In addition, the provider offers tele-communication services such as video communication at short notice. This concept enables even small and medium-sized machinery builders to provide their customers with a reliable tele-service without the need to establish their own global service stations.

5 CONCLUSION

A company's competitive success will increasingly depend on its ability to react quickly and flexibly to the developments in the market, in competition and technology. Only those enterprises that are able to reengineer their business processes in an efficient and customer-oriented way, create flat and process-oriented organization structures and concentrate on their core competencies will be able to survive in the face of global competition. In addition, they have to cooperate with partner companies and, above all, these measures must be supported with advanced information and communication technologies.

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7 BIOGRAPHY

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