**Conclusions and Problems**

The legal framework seems to be clear, all parties in an electronic market will have to establish state-of-the-art security measures. But there are still many open questions about the ways of how these measures have to be implemented. As soon as processing of personal data takes place, the data privacy law has to be taken into consideration. In order to achieve a secure environment, the security framework has to be discussed between the PTT and all other parties. ■

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# Research Issues

## Process Authority Redesign and Electronic Markets

**European businesses today are showing a significant interest in the concept of business process redesign, not in the least because its advocates promise a dramatic decrease in costs and a similar increase in sales. Since information and communication technology seem to play enabling roles, one can expect electronic markets to be significantly contributing to the effects of business process redesign.**


** by Hans van der Heijden, Prof. Dr. Jo van Nunen and Prof. Dr. René W. Wagenaar Erasmus University*


Formulated in a simple way, process redesign encompasses the radical redesign of organisational processes in order to increase efficiency and/or effectiveness dramatically. Information and communication technology are being viewed as necessary enablers [1] [2]. Basically, the idea is to review the organisational processes, the organisational participants and the organisational information systems in such an innovative way that a maximum increase in effectiveness is gained. However, many redesigns fail, primarily because of their radical nature [2]. Radical changes in an organisational design imply major organisational changes, that, above all, require careful preparation, the commitment of top management, and the willingness to change by all relevant members of the organisation. The change part is often isolated from the process redesign research area and termed process implementation [1].

**Process Redesign**

Process redesign and process implementation together have been called process innovation [1] and process re-engineering [2]. If we focuss on the process redesign area, we see that typical questions of practitioners are: "What should a process redesign look like?" and "How can I measure benefits a priori, in order to balance the new designs against their costs of implementation?". In order to answer these questions, academic researchers find themselves confronted with questions such as "In what way can we generalise over particular process redesign examples, i.e. what particular dependent and independent variables seem to be involved and how do they interrelate?" and consequently, "What modelling techniques are suitable to evaluate changes in those variables and to quantify and qualify results?". At the Rotterdam School of Management we have begun to address these questions, for example with the development of two tools: the decision support system Edialysis, which provides managers insight in quantifiable costs and benefits of Electronic Data Interchange (EDI) and the management game Port of Rotterdam, which provides managers with insight on the qualitative, long term effects of EDI.

**Classes of Redesign**

There are several organisational research variables relevant to business process redesign:

- In the first place, the *sequence* of the processes can be changed. By decoupling processes which depend on each other, sequential processes can be carried out partly in parallel. Similarly, processes that do not directly depend on each other can be coupled at later stages. A famous example of sequence redesign, implemented at a large American car company, is releasing payment without invoice [2]. Rather than waiting for the invoice, the company decided to pay when the goods had arrived. Information technology was used to compare and prepare the necessary documents.
- In the second place, the *location* of the decision processes may change. Communication technology strips the word 'distance' from most managerial decision making. Processes are no longer hooked to particular locations, because data or knowledge can be made readily accessible at almost any site. This can eliminate, for example, the need for regional offices, since field personel, equipped with proper communication technology, can be allowed to process data directly to and from the head office.
- In the third place, the process *authorities* can be changed. By using information and communication technology, organisational members can be authorised to perform or govern a broader range of processes. Of course, all three major classes of redesign, sequence, distance and authority, may require subprocesses to be added, deleted, or modified.

**Electronic Markets**

We would like to focus on process authority redesign and the role of electronic markets therein. Electronic markets can be defined as information systems that input bids and offers submitted by buyers and sellers and output trades for which those bids and offers have been matched [3]. Electronic markets can be found in industries such as tourism, insurance, finance and transport. In transport, electronic market systems frequently pay significant attention to the logistical side of the transaction, for example by allowing the user of the electronic market to coordinate and control the entire transport process from shipper to consignee. The rise of such advanced control systems puts the existing industry structures in transport under pressure: a major question here is whether the authorities to arrange transport will shift due to these advanced options - eg. from a shipper to a forwarding agency, from a forwarding agency to a consignee, etc.

## Theoretical Analysis

The possibilities of electronic markets on process redesign can be analyzed theoretically from at least two perspectives. These are: first agency theory and second the contingency approach. The first perspective stems from organisational economics and deals, among other things, with the effects of information access on economic behaviour of organisational participants. The second perspective is explicitly concerned with questions of organisational design and redesign. Some of the work done in this area provides insight into the role of electronic markets.

## Agency Theory

Agency theory assigns two different roles to organisational participants: principals and agents. Agents perform the process, eg. a forwarding agency arranging transport. Principals request the process, eg. a shipper requesting transport from the forwarding agency. The particular collection of principals and agents and the set of processes performed and governed, determine the way the organisations and industries have designed their authority structures. Information asymmetry is a major variable determining how much, or how little an agent is supposed to do.

It might seem a bit of an 'academic' variable, but the idea is simple: the better a particular organisational unit is informed about performing the process, the more authority he can be given to perform it. On the other hand, the more information a particular organisational member can obscure, the better he or she should be controlled by his or her principal, or the agent should not be given the authority. There is a trade-off in the redesign of authorities here, with the information costs on the one hand and the agency costs on the other [4].

Electronic markets, being primarily used for trading processes, in general reduce information search costs significantly [5]. They allow for more potential trading partners, and they allow for more transparancy of the market. Furthermore, electronic markets sometime match supply and demand themselves and consequently may reduce process costs even more. Agency theory therefore predicts that accessibility of an electronic market by principals might result in a shift in authority from agent to principal.

Accessibility of an electronic market by agents might result in a shift in authority from principal to agent. If an electronic market contains better mechanisms to control the behaviour of agents than a traditional market, i.e. by publishing trading results at a more rapid pace, the agents might be given more authority.

## Contingency Approach

The contingency approach deals with varying contingencies as independent and their appropriate organisational structures as dependent variables respectively. Major independent variables are size, turbulence of the environment and usage of production and information technology. Most contingency researchers dealing with the effects of information technology view organisations and industries as sequences of decisions that need to be performed and authorised by organisational units. Since information technology allows more organisational units to be informed about decision processes, more organisational units become candidates to perform a decision process. For example, the arrangement of transport might be carried out by the shipper instead of the forwarding agency, due to the availability of advanced information and communication technology. Likewise, in decentralised organisations, i.e. where authority is at lower levels in the hierarchy, information technology usage might result in more centralised operations. In centralised organisations, i.e. where authority is at higher levels, this might result in more decentralised operations [6].

Following most research that falls within the contingency approach, the availability of electronic markets can either shift authority to the agent or to the principal. Electronic markets in essence formalise the trading process, simplify it and lower process costs and coordination costs. Both agents and principals might benefit from this. As an example, consider the purchasing process at a large computer manufacturer [2]. It used to purchase at a central department because of the economies of large purchase orders. With communication technology, purchasing is done locally, and the orders are grouped centrally. By combining the orders at a central level, the manufacturer is still able to acquire the economies of scale. It is an example where trading authority is moved downwards due to information- and communication technology.

## Theoretical Basis for Process Redesign

Summa summarum, the theoretical perspectives on organisational design do not contradict each other on the main effects of electronic markets on process authority redesign. These effects can be expressed in agency terminology. If the agent is inhibited to obtain authority to perform a process by the amount of process costs or coordination costs, any application of communication technology that results in a lowering of one of these costs may result in a shift of authority from the principal to the agent. For example, an electronic transport market that contains a goods tracking and tracing facility (see figure 1) allows the shipper to control good flows at a more detailed level, in which case he might be willing to delegate more transport arrangements to the forwarding agency. If, however, the principal is forced to give authority to the agent because of the amount of process costs, any application of communication technology that results in a lowering of these process costs may result in a shift of authority from the agent to the principal. For example, using an electronic transportation market a shipper might decide to arrange the transport of a shipment himself, rather than to outsource this to a forwarding agency.

At the Rotterdam School of Management, we are carrying out a research project where these perspectives are blended with explorative case studies and a model is built to generate falsifiable hypotheses, predicting authority shifts within and between organisations due to information and communication technology. ■

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