Business Process Reengineering and Information Systems Renovation Projects: Problems and Assessment

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The following paper points out problems encountered in several business process reengineering (BPR) projects in Slovenia in the last five years and provides an assessment of BPR's strategic impact on the quality of information systems (IS). Based on his own experience and his knowledge of the opportunities offered by the BPR concept and the use of new information technology (IT), the author assesses of the strategic relevance of reengineered processes and consideres the impact of BPR projects on the quality of an organization's information systems management.

1 Introduction

Technical progress together with the opening of a global market are definitely among the primary factors playing roles in modern society. One of the consequences of recent development in the fields of information technology, communications, and transportation is an ongoing process of standardization in both the business and government arenas. In national economies, the global characteristics are becoming localized, and vice versa the local ones are becoming globalized. The modern global society is becoming more and more universal.

Only businesses that are able to adjust their mass production and generalized marketing approaches to more dynamically serve clear market niches will survive in the future. By individualizing and personalizing their products or services, businesses can adjust to the needs of their customers. Producing for a known customer and satisfying him as much as possible are the goals of each progressive organization. The best way to achive such a goal is thrugh reorganized business processes.

Organizations react very differently to projects or attempts of renovation of business processes, though the purpose is clear: reduction of costs, shortening the business cycle, and improvement of quality. The difficulties in the public sector are larger than those in the private sector. The increased employment in the public sector during the past few years has further entrenched bureaucracies; the problems of efficiency are then most often solved through purchasing computer hardware and software. Moreover, if managers feel the corporation they work for is successful at the present time, they usually reject the idea of renovating the business. Of course, when a company faces trouble,

there are never seem to be enough financial or human resources to start such a project.

Coping with these problems while working on BPR and IS renovation projects in the last few years, we have noted a strong correlation between improvement of overall corporate culture and strategies, and the quality of IS within an organization. This paper explores these relationships.

2 BPR and IS renovation

We cannot forget the role that information technology plays in business process renovation, as we must also keep in mind that an incorrect use of information technology can deliver partial solutions which do not consider the system a whole and are by all means unsatisfactory. Generally speaking, we should use a two-step approach by which the described problems can be eliminated. First, we should renovate existing processes with respect to the necessary characteristics of business; and second, we should provide a proper organization and informatics to support the new processes.

One of the main ways of connecting the difficulties of our enterprises is the implementation of the Business Process Reengineering (BPR) method. BPR is a new method of improving the operation and therefore the outputs of organizations (private and public). It means analyzing and altering the business processes of the organization as a whole. For a thorough and effective reengineering project, organizations should first meet certain conditions before starting such a project. First, the management should abandon all the obsolete rules and procedures that have been used up to that time. In addition they should abandon other inadequate organizational and production principles. At this point, the

design of a renovated and redesigned organization should start.

BPR was first introduced in a research program at MIT (Massachusetts Institute of Technology) in the early nineties. The term was used in the description of Davenport and Short's 1990 research project. They found out that the implementation of modern information technology in organizations means not only automation of managerial and production tasks but also has an enormous and direct effect on the means and quality of the work done. This point was further discussed and developed by Hammer in his "Reengineering Work: Don't Automate, Obliterate", Harvard Business Review, 1990.

In Slovenia, there have been several recent symposiums on the subject of business process redesign and IS renovation. Numerous papers can be found about this topic in publications that cover this area. In everyday practice the first attempts to implement techniques mentioned above usually employed modern CASE (Computer Aided Software Engineering) tools which unfortunately more or less merely automate existing processes. In the worst cases the primary objective of the renovation projects was to buy new equipment (mostly PCs). Slovenian experts follow the current trends and try to integrate them in our projects of informatization and business reorganization. However, most (approximately 90of current projects of informatization are still oriented to automation of existing business procedures and activities.

On the other hand, organizational projects are mostly oriented to ISO 9000 standardization (documentation), so there is no room for important simplification and organizational changes. There were also some attempts to move companies from rigid hierarchical structures to flat, dynamic structures that can rapidly regroup in response to changing requirements. In some cases traditional departments have been transformed into ad hoc teams or "centres of excellence".

3 Projects and open problems

The best way to understand the situation in the field of business process reengineering and informatization is to analyse open problems and situations in some typical projects. We empirically analyzed the most recent 5 projects on which we have worked. The analysis shows various results and implementation problems. We think that some of these problems are specific for the Slovenian business culture and the others are not. For further analysis and assessment we grouped the problems and possible solutions by strategic/business cultural aspect and from the strategic IS impact point of view.

3.1 Projects

The author of this paper has worked or participated as senior consultant or project manager on more than 25 consulting and engineering projects in different industry branches and in the public sector. He has developed a methodology of business renovation and informatization. The methodology has been successfully implemented in different organizations. The projects selected for further analysis in this paper are listed below:

Project A

Initial goal: Shortening of business cycle
Type of business: Metalwork production
Duration: 1,5 years
Main results: Time and cost reductions, business process model, proposed IS renovation

Project B

Initial goal: BPR and IS renovation
Type of business: Paper industry
Duration: 2 years
Main results: Reengineering of logistics, new IS developed and implemented

Project C

Initial goal: IS auditing and assessment (starting project: Process assessment and renovation)
Type of business: Insurance
Duration: 2,5 years
Main results: Modeling and standardization of key business processes, strategic IS planning

Project D

Initial goal: IS development
Type of business: Energy supplier (electricity)
Duration: 4 years
Main results: Reengineering of key business processes, new IS being developed and implemented

Project E

Initial goal: Management consulting
Type of business: Construction & housing
Duration: 2 years (still in progress)
Main results: New business model, proposed organizational changes, new IS developed

We can see that particular starting points or goals of the listed projects most often lead to different results. But if we look at the results more carefully we can group them into BPR and IS oriented steps. In the BPR step strategic problems from the organizational culture point of view should be solved. Any unsolved problems in the BPR step have a direct (and negative) impact on the quality of results from the IS renovation or IS development project step.

3.2 BPR strategic problems

Organizational strategic problems come mostly from aspects related to the way the firms operate, the scope of BPR projects, and strategic and operational modeling and benchmarking.

The way the firms operate. Most Slovenian experts subscribe to the traditional organization theory beginning from Adam Smith and followers. They see organizational structures and work as a collection of tasks, each of which can be described by a precise procedure whose steps are particular motions and activities of a worker. Problems related to corporate costs, quality, and the business cycle are the result of a cross-functional dispute where nobody has total control of the whole process. These input-process-output models or models of individual specialization are no longer sufficient, however. They do not represent human commitments and the business processes view of an organization in which people request work and agree on what will be done, who will do it, and when it will be done (Denning and Medina-Mora, 1995).

We see the workflow or the business loop as a closed cycle in which the fulfiller (performer) completes action leading to the satisfaction of a request by the requester (customer). The business loop begins with preparation and formulation of a customer's request and culminates in a delivery (proposal) to the performer. The second step is negotiation, culminating in an agreement between customer and performer. The third step is performance, resulting in the requested product or service and the performer's declaration that the work is done. The final step is acceptance, culminating in the customer's declaration of satisfaction. Figure 1 shows the workflow loop adopted by Action Technologies and Lei Yu (Yu, 1996).

On our BPR projects we find various kinds of problems we must solve:

- The transition from the traditional, functional, and departmental way of work on organization focused on business processes is very difficult to achieve. We cannot literally say that "People who work in different functional areas hate each other" (Palermo's law, see: Watson, 1994 p. 60), but nonetheless we found a strong resistance to a cross-functional way of work.

- We see that the way the firms operate cannot be changed without some kind of redesign of its business processes. Such redesign can include rationalization, simplification, and standardization of the procedures, as well as the introduction of important organizational changes and modern information technology. We should also indicate that the information infrastructure enables the growth of the firm.

- Many BPR projects lack the fourth, satisfaction step of the main workflow loop (see Figure 1). This should in practice trigger a new set-up of missing workflow activities.

Scope of BPR projects. A "business process" is defined as a system of logically united executive and control procedures and activities that end in the desired result, product, or service. The efficiency of a business process is measured through the outputs we get from the transformation of the input resources. The resources are often measured by the time consumed or the costs of the process. Effectiveness of a business process can be defined as the compatibility of the given results with the results that we desired from the process.

BPR projects can differ depending on their scope. The scope of a project increases as more processes, people, and information are included in the project. On the basis of our experience we must take into account the following defining criteria of scope of the project: the questions of **process automation, business efficiency, and business effectiveness**. The meaning of the word "efficient" means "to do things in a correct way". It is an internal characteristic of the company's ability to do what it is supposed to do in a limited period of time. It is a function of availability, adaptability, and capacity. It is often measured with some kind of output/input ratio. The term "effectiveness" means "to do the right things". By its nature it is external to the firm, measured by the rate of satisfaction of all kind of needs.

Process automation projects are normally influenced by modern information technology and focus on one process, usually within the department. They do not radically change any existing procedures but merely automate existing procedures. In such cases (applying technology) the focus of the reengineering project is narrow; only the limited procedures of the particular process will be changed.

By contrast, **business process redesign** projects focus on the underlying business reasons why certain processes exist in their current form. Reengineering questions are related to efficiency and correctness of certain processes under consideration.

It can be stated without any doubt that the corporate-wide **business process reengineering** projects cannot be seen only as a problem of automation and implementation of modern information technology or efficiency improvement of existing processes. Such a project begins by asking the questions related to business effectiveness, "Why are we even doing this?" (Kubeck, 1995). The project focuses on the underlying vision of the corporation, drastically changing corporate culture and realigning corporate goals, changing organizational structure skills and processes.

The first one to consider this issue was Leavitt (Leavitt, 1965) who noticed that there is more to organizational changes than just the technological view. To ensure optimal results, we must define all correlated key business elements: **structures, people** and other resources that enable the business processes and help us meet objectives, the **business processes**, and finally the **technology**. The structural view is more or less the organization of the corporation. He presented a diagram (Leavitt's diamond) that exposes the need to recognise the connection of business process redesign with all other factors that form the socio-technical frame of the organization. If we add the factor of corporate culture, the diamond looks as presented on the following diagram (Figure 2) (Adopted from: Galliers, 1995, p. 124):

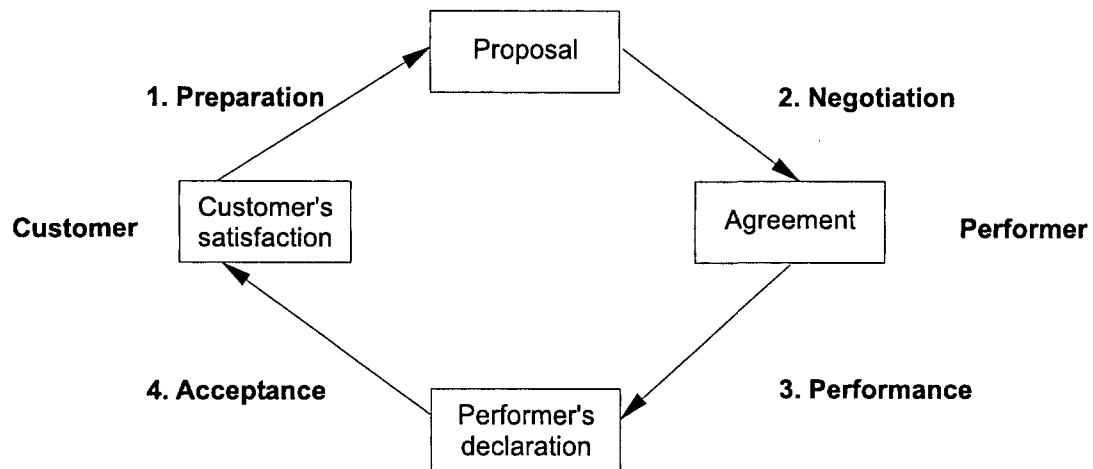The culture is one of the key factors of business renova-
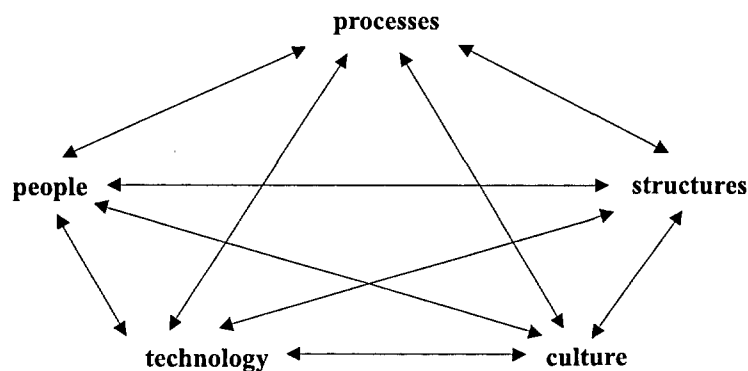
Figure 1: The Action Workflow loop

Figure 2: Amended Leavitt's diamond

tion. The appropriate business culture is required to enable the changes in the firm and in the whole society. Without the recognition of culture as an important factor, it is impossible to predict the chances of success of the project, as it is hard to form the objectives and strategy of the renovation project. Because of its complexity, the culture should be considered from the individual, corporate, and society point of view. From the corporate point of view, the scope of the project depends mostly on the particular organizational level involved in the project and its interrelationships. In general, the levels are Enterprise (strategic), Business (tactical), and Operations (operational) (Watson 1994, p. 47).

In our experience, the relatively slow process of privatization of the Slovenian economy has caused a weak "voice of ownership", and the impact of shareholders on changing the corporate culture toward business renovation has been limited. Most corporations that have existed for more than 10 years have retained hierarchical and "self management" features in their corporate culture. The enterprise and business levels are weak compared to the operations level. The results in terms of renovation have been automa-

tion and information technology projects that have embedded ineffective or inefficient work processes. The number of successful corporate-wide BPR projects has been low and the successful ones have been primarily in "private" corporations. In Slovenia and in other developing countries of Central Europe experts also have recognized that transforming opportunities into business success requires managers with insight, flexibility, and decisiveness (see: Janson and Wrycza, 1996).

We consider the change from a functional to a process type of organization to be of the utmost importance in the business renovation projects we have worked on. Our single unsuccessful project failed in the moment of implementation because agreed upon organizational changes were not carried through. We expect to overcome these types of problems through working with people, not only raising their availability, flexibility, or productivity but also improving their knowledge, managing their natural resistance to change, and helping to convert that resistance into commitment. It is also easier to deal with people that have better education and are prepared and skilled to use new information technology. Progressive organizations build on

the potential of their emplyees by ensuring that they know more, work better, and do more. So the employees should meet certain conditions to be able to perform: They should be skilled and well- informed, with the possibility of further education when needed, they should use right tools and technology, and they should be personally stimulated and motivated.

Strategic and operational modeling and benchmarking. Business modeling should be divided into strategic and tactical/operational levels (Krallmann and Derszteler, 1996). Strategic modeling includes the analysis of corporate strengths, weaknesses, and culture, the assessment of information systems in the organization, and organization and management competencies. It is the basis of all further actions and is carried out by corporate management. Corporate goals, strategies, and critical success factors form the basis for selecting and modeling core business processes on the global level of description. Such a model together with information on the organization's current state is fundamental for evaluating and benchmarking compared to other corporations. Benchmarking is a business practice that leads "reengineers" towards implementing strategic change initiatives in key business processes (Watson, author of strategic benchmarking). The benchmarking effort focuses on measuring other corporation processes to determine where excellence of performance exists, learning what those corporations did, and then producting excellence in those processes.

Detailed modeling of the processes or workflow structures takes place on the tactical/operational level. Workflows are refined and modeled at the level of particular interdependent business activities that are performed by actors (subjects) in an organization in order to achieve common goals. On this level, the more exact and certain information about workflow is, the better the modeling results will be. The problem lies in the conflict of aims between the need for accurate information and the difficulties of obtaining it due to the often obsolete documents describing flow structure, varying or even contradictory statements from employees, and time constraints (Krallman and Derszteler, 1996). On this level of detail, the benchmarks in the field of workflow modeling can be called reference process models. Reference process models are developed and evaluated on the basis of best practice for several selected types of business.

When working on our projects we discovered several problems related to business process modeling and benchmarking. Many Slovenian corporations are not willing to put their energy and time into business process modeling and to invest in benchmarks on the strategic level. They want quick and tangible results like many other companies from all over the world. Owing to a lack of national benchmarks, we also found that some international benchmarks would be suitable for problems of our corporations. Result: the number of corporate-wide BPR projects is trifling in Slovenia. We have recognised that business process modeling "from scratch", based on several decomposition

iterations from the strategic level to the appropriate level of detail of the process is a time consuming and risky job. We can say that our work relies mostly on our intuition and experience.

The situation on the tactical/operational level is not much better. Only a few Slovenian software houses produce application software solutions based on their own reference process models. On the operation level of modeling and benchmarking we have noticed a strong impact of ARIS designed EPC (Event-driven Process Chain) models (mostly produced for SAP R/3 application packages). But we recognized that many of the models are not appropriate for our corporations' way of work.

3.3 The actual role of IT

Information technology plays the key role in business process renovation. We should point out again that mere automation of procedures brings more or less negative results. Even if some of the achievements of such actions are positive, they prevent us from seeing all the opportunities that are offered by the informatization of a redesigned business process and an infrastructural role of informatics. That is why we first have to analyze the business process in order to find out if it is well-defined, adequate, and ready for the implementation of new information technology. Only if we do all this correctly can we expect an improvement of quality, lower costs, and shorter performance times of renovated business procedures and activities.

Our experience on BPR projects shows that the informatization of business processes should cause several changes and enhancements such as:

- data entry and concurrent control is performed only once in the process, at the beginning, so the users in later stages only update these data,

- data entry and control is performed by the user, who is responsible and able to have his/her part of the activities of the process under control,

- wherever possible, the workflow activities are triggered, performed, and controlled automatically,

- the focus of managerial accounting is no longer on ensuring the quality of information, but it moves towards its controlling function.

We can find the "right moment" or starting point for the implementation of modern information technology on BPR projects, if we borrow some experience from Total Quality Management (TQM) theory. Figure 3 (adopted from Watson, 1994) shows a model of a natural process improvement sequence that occurs as the corporation applies TQM to its work processes.

Watson sees this model as a road map for process improvement and application of basic quality tools and quality improvement processes before there is a need to automate work processes or seek IT solutions. We can add that
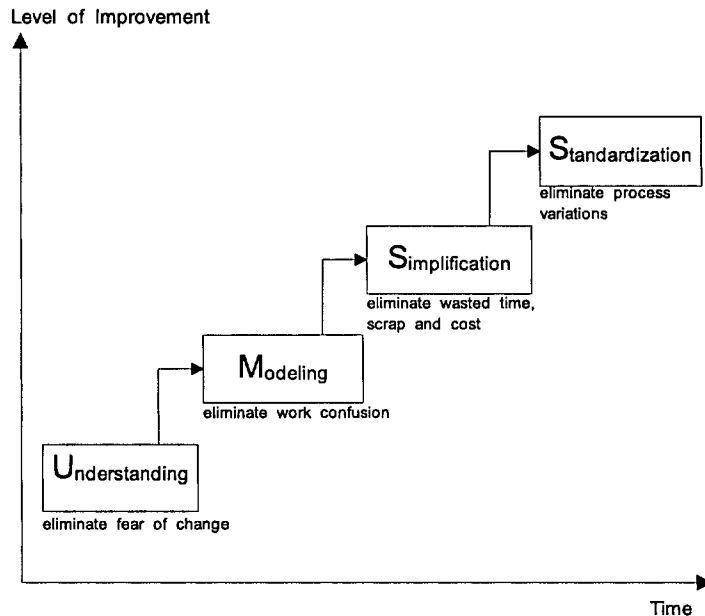
Figure 3: Process improvement sequence

IT has the strongest impact on standardization or elimination of process variations. We recognize that informatization cannot start before the first three levels of work process improvement have been successfully implemented.

4 BPR and IS project assessment

This section attempts to answer the question: What role and impact might BPR play in changing the quality of an organizational IS? In order to answer this question in our research we must first evaluate or assess the projects listed in the previous section from the following points of view: **strategic relevance and progress of the reengineered processes** and **improvement of the quality of the organization's IS management**. Although the terms evaluation and assessment are often used synonymously in regard to BPR and IS projects, there are slightly different connotations associated with each word. Evaluation is the act of placing an exact value on the object. In the context of BPR and quality of IS the ideal evaluation is not possible. Rather than evaluating, our aim in this paper is to derive a set of measures for assessing the strategic results of BPR projects and the quality of IS. For both parts of further analysis we will assign the following values to the answers given:

$$
\begin{aligned}
\text{none; ignore} &= N \\
\text{very low} &= 1 \\
\text{low} &= 2 \\
\text{moderate} &= 3 \\
\text{high} &= 4 \\
\text{very high} &= 5
\end{aligned}
$$

4.1 Strategic relevance and progress assessment

While assessing the impact and results of a BPR project in the light of organizational efficiency and effectiveness, the evaluator must address several critical questions (more about strategic assessment in: Revenaugh, 1995). The strategic relevance of the reengineered process should be assessed through:

1. Cost displacement or cost reduction (COSTS)

2. Development and offering of new or improved products or services (PRODUCTS)

3. Development of new administrative control and planning processes (CONTROL)

4. Offering significant tangible benefits (e.g., business cycle reduction, inventory reduction) (BENEFITS)

5. Offering new ways of competing and customer-supplier relations (COMPETITION)

6. Obtaining organizational changes (shift toward process organization) (ORGANIZATION)

7. Work quality improvement, focusing on the organizations key measures and possible outsourcing (QUALITY)

4.2 IS assessment

Assessing the information system function within organizations has been identified as one of the most critical issues of information systems management (Dickson et al.,
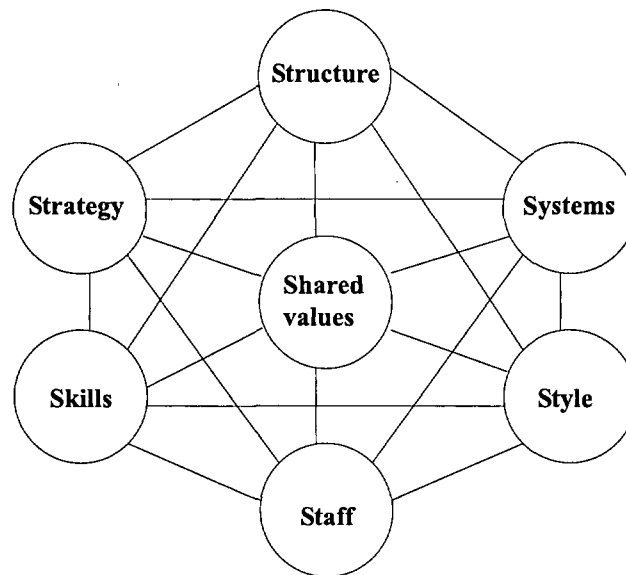
Figure 4: The McKinsey model

1986). We believe that a more comprehensive assessment can be achieved through a model provided by Galliers (1995). This model combines the wellknown Nolan's stages of growth with the so-called '7S' analysis pioneered by McKinsey and Co. (Morris and Haigh, 1998, p. 381) (4).

The premise behind the McKinsey model is that to function effectively organizations have to rely on the interdependence of the seven variables: **strategy** - the plan leading to the allocation of resources; **structure** - the organizational chart showing lines of authority and responsibility; **systems** - procedures, guidelines, and control mechanisms; **staff** - people employed; **style** - the management style of the organization; **skills** - the strengths and capabilities of employees; **shared values** - the goals of all employees (Morris and Haigh, 1998, p. 381).

Galliers model is illustrated in outline in Table 1. It is best used in a workshop environment where key stockholders can debate their different perceptions about the current state of affairs becouse there will almost certainly be different perceptions expressed. Certain elements of the 7S framework will almost always be at different stages of growth. The resultant profile will help to identify where particular urgent action is required (Galliers, 1995).

5 Results and concluding remarks

Comparing the current corporate state in terms of reengineered business processes and IS management to the state that existed when starting a particular project (listed in section 3.1) gives an indication or an assessment of the rate of progress that has been made.

a. Assessment of the strategic relevance of reengineered process. To recognize where the projects are on the development continuum we employ transition analysis. The progress (or changes) that has been obtained on the analyzed projects is assessed in Table 2. The first value of each result provides the starting position or state of the assessed strategic element whereas, the second value presents the obtained status (values are presented in section 4). Wherever possible, the strategic relevance parameters of the previous and attained states are compared or benchmarked against an industry average and not against the most aggressive competitor. These assessments are particularly appropriate in the field of cost reduction (COSTS), business cycle or inventory reduction (BENEFITS), shifting toward a process organization (ORGANIZATION), and quality improvement (QUALITY). The previous state of the other parameters are in most cases estimated by the researcher, with improvements evaluated by comparing to the planned values.

b. Changes in the quality of corporate IS management (assessment has been made by the model proposed in the previous section). Similar to Table 2, results are presented with starting and final values, so the comparison and the progress can be seen. Table 3 summarizes these results.

Comparing the final results presented in Tables 2 and 3, we can find both expected and unexpected results and relationships:

– The analyzed BPR projects have no negative impact neither on the BPR strategic relevance nor on the IS quality improvement parameters.

– The analyzed BPR projects show a significant impact especially in the development of new organizational control and planning processes and the shift toward a process organization; some positive changes are also obtained in cost displacement or cost reduction and work quality improvement.

STAGE ELEMENT Values:	I N	II 1	III 2	IV 3	V 4	VI 5
Strategy	acquisition of IT	audit of IT provision	top-down analysis	integration coordination	strategy linkage	interactive planning collaboration
Structure	informal	finance controlled	centralized DP department	information centre(s)	departmental coalition	coordinated coalitions
Systems	ad hoc, operational accounting	gaps/ duplication; large backlog; heavy maintainance	uncontrolled end-user comp. vs. centralized systems	decentralized approach, some EIS	coordinated centralized and decentralized IS some strategic IS	inter-organizational systems: IS/IT-based products & services
Staff	programmers, contractors	system analysts, DP manager	IS planners, IS manager, DB specialists	business analysts, information resource manager	business & IS planners integrated	IS/IT director (board level)
Style	unaware	"don't bother me (I'm to busy)"	abrogation, delegation	partnership, benefits management	individualistic (product champion)	multidisciplinary teams (key themes)
Skills	individual: technical low level	system development methodology: cost-benefit analysis	IS awareness product management	IS business awareness	entrepreneurial marketing	lateral thinking (IS/IT potential)
Shared values	obfuscation	confusion	senior management concern, DP defense	cooperation	opportunistic	strategy making & implementation

Table 1: Amended Galliers' model: Assessing the quality of an organization's IS management

PROJECT:	A	B	C	D	E
Costs	2 ⇒ 3	2	1 ⇒ 2	1 ⇒ 3	2 ⇒ 3
Products	1 ⇒ 2	N	2 ⇒ 4	N	N
Control	2 ⇒ 3	1 ⇒ 3	3 ⇒ 4	2 ⇒ 3	1 ⇒ 4
Benefits	3 ⇒ 4	3	2 ⇒ 3	1 ⇒ 2	3 ⇒ 4
Competition	1 ⇒ 2	3	2 ⇒ 4	N	3
Organization	N ⇒ 1	1 ⇒ 3	1 ⇒ 3	1 ⇒ 2	2 ⇒ 5
Quality	2 ⇒ 3	1 ⇒ 2	1 ⇒ 3	2 ⇒ 3	2 ⇒ 4

Table 2: Results of the progress on key performances

- The impact on the quality of IS is quite similar across projects, though the projects had different objectives and duration and were performed in differend types of businesses.

- The progress of BPR project has (in average) a stronger impact on the quality of IS management than on the key BPR performance elements (Figure 5).

- IT enabled BPR projects to have a strong impact on the quality of IS management only from particular aspects. These aspects are: strategic position of IS management, organization of IS organizational unit (e.g., DP department, Information Centre) and systems concerned (dealing) with new planning and control procedures (Figure 5).

We discovered a strong two-way correlation between BPR and IS project activities, leaving aside the question 'what is cause and what are consequences'. Recent BPR research and papers state that information technology represents the key role in business process renovation. But in our research we also point out an impact in an opposite direction, toward the quality of IS management.

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PROJECT:	A	B	C	D	E
Strategy	2 ⇒ 4	2 ⇒ 4	1 ⇒ 4	N ⇒ 3	1 ⇒ 4
Structure	2 ⇒ 3	2 ⇒ 3	2 ⇒ 4	2 ⇒ 4	2 ⇒ 3
Systems	1 ⇒ 3	1 ⇒ 3	2 ⇒ 4	2 ⇒ 4	2 ⇒ 4
Staff	1 ⇒ 2	1 ⇒ 2	1 ⇒ 3	1 ⇒ 2	2 ⇒ 4
Style	1 ⇒ 2	1 ⇒ 2	2	1 ⇒ 2	1 ⇒ 2
Skills	1	1 ⇒ 2	1 ⇒ 2	1	1
Shared values	1 ⇒ 2	1 ⇒ 2	1 ⇒ 2	1 ⇒ 2	1 ⇒ 3

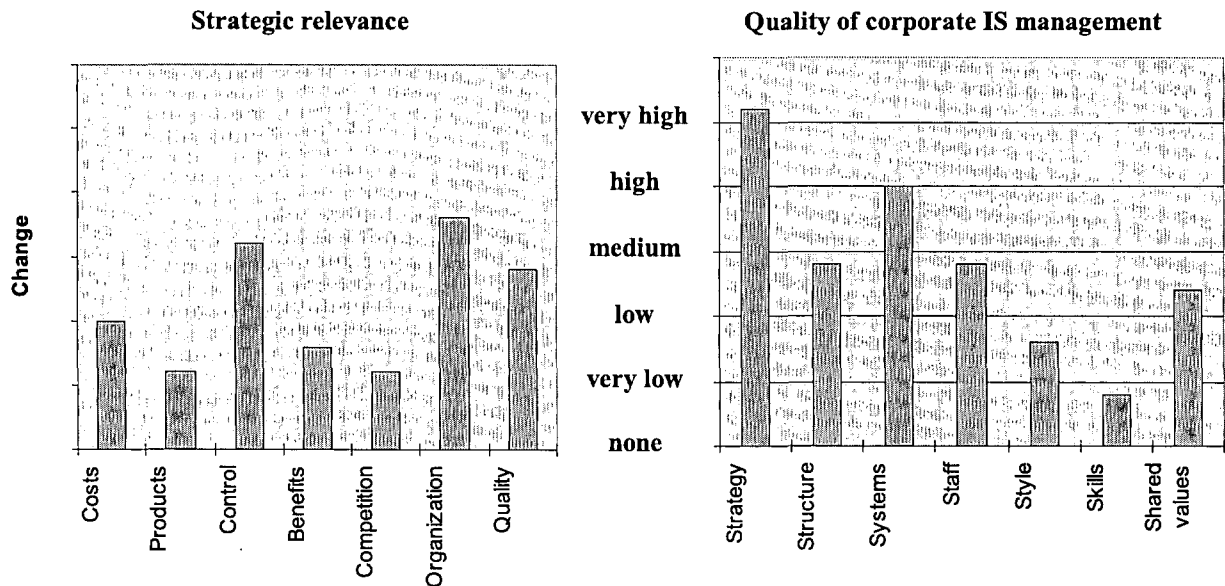Table 3: Progress on the quality of organization's IS management

Figure 5: Impact of BPR projects on strategic relevance parameters and quality of IS management compared

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