10 IT Based-business process redesign: theoretical foundations, examples and critical assessment

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In order to cope with an increasingly turbulent business environment many organizations are rethinking their management and their business processes. They aim to simplify working procedures and improve their communications and co-ordination both internally and with their business partners. Information technology (IT) is used increasingly as an integral part of such business process redesign (BPR) efforts. Beyond simply supporting existing processes, it is applied to create new process design options. Despite many failures, there are numerous organizations especially those that have used IT to redesign customer-driven processes, which have benefited enormously. They have improved their product/service quality, respond faster to customer demands and to competition and, in some cases, have increased their innovation capabilities.

This chapter provides an overview of the BPR concept, addresses the role of IT in business process redesign and discusses pertinent management issues. Selected illustrative examples from different business sectors are presented. Finally, a critical assessment of the BPR concept and its practical impact are provided.

Introduction

The increasing complexity of the business environment presents organizations with new threats and challenges. The need to maximize the performance of interrelated activities rather than individual business functions, combined with the opportunities offered by IT, means that a new approach to the co-ordination of processes across organizations is necessary to achieve sustainable competitive advantage. Consequently, organizations need to ensure the close alignment of IT with business strategy; the latter being formulated in the context of a changing commercial environment.

Organizations have initiated change in traditional internal structures and cultures that are incapable of responding fast enough to a fluid competitive environment. Focusing on the needs of major customers, they redesign their processes along core business lines. Functional hierarchies are replaced by cross-functional business units based on product groups, market segments, or customer services, each with their own profit responsibilities. These are backed by redesigned information systems.

BPR: what, why, how

Business processes are sets of logically related tasks performed to achieve a defined business outcome. They have two important characteristics: they have customers, who may be internal or external to the firm; and they usually cross organizational boundaries, that is, they occur across or between organizational subunits. Examples of business processes include the development of a new product, the ordering of goods from a supplier, the creation of a marketing plan, and the writing of a proposal for a contract. A set of such processes forms a business system.

The essence of BPR is a radical change in the way in which organizations perform business activities; 'the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service, and speed' (Hammer and Champy, 1993, pp. 31–2). The model of business process redesign developed by Hammer and Champy describes the characteristic of redesigned processes as one in which several jobs are combined, with a 'case worker' responsible for a process. 'Case teams' develop innovative ways to improve service, quality, and reduce costs and cycle times. Process integration means that fewer controls and checks are necessary, and defects are minimized by those responsible for the finished product participating in the entire process.

Under BPR initiatives, sequential operations involving reporting lines and rigid procedures are rationalized into parallel processes. Concentrating on value adding activities, critical business processes are automated, and a

number of activities eliminated. Customer service teams are created to maintain and develop the focus on future business. Team facilitators have a role in coaching team members, resolving conflicts, and rectifying operational problems. Continuous improvement is the prevailing philosophy, and empowerment of the workforce pushes responsibility down the organizational hierarchy. Frequently, the basis of redesign is established through a team building approach, continuous improvement, training programmes, and resultant workforce empowerment.

Bui (1995) outlines the integration of three 'redesign' efforts currently being undertaken:

1 Business scope redesign' represented by business networking activities, frequently resulting in more or less virtual enterprises.
2 'Business network redesign' following the notion of any time and any place and leading to electronic market places.
3 'Business process redesign' which he characterizes as capability teaming, resulting in lean, agile and robust companies.

Venkatraman (1990 and 1994) places IT-based BPR as the third level of IT-induced business reconfigurations which range from localized exploitation, internal integration, BPR, business network redesign, through to business scope redefinition. As a major BPR success factor he stresses the need for aligning the IT infrastructure and business process.

According to Oesterle (1996, p.16), business engineering is a 'method-based approach to transformation with the goal of incorporating the transition to the networked enterprise within the business strategy, as well as implementing the strategy within processes and providing it with information support systems'.

In general, organizations redesign for four reasons:

1 They face commercial difficulties and thus have no alternative.
2 Competitive forces present problems unless the organization takes radical steps to re-align business processes with their strategic position.
3 Management sees redesign as an opportunity to steal a lead over the competition.
4 Tremendous publicity about BPR prompts some organizations to attempt that which has purportedly been undertaken successfully by others.

To achieve BPR-objectives, Davenport and Short (1990) suggest the following steps:

- *Develop business vision and process objectives*
  Instead of simple task rationalization, a redesign of entire business

processes should be considered with a specific business vision and related, prioritized objectives. Such specific BPR objectives may be, but are not limited to, cost reduction (important in combination with others, but insufficient in itself), time reduction, quality improvement, and/or employee empowerment, learning, and improved quality of work life. It is rarely possible to optimize all these objectives simultaneously. However, tangible and measurable benefits can and have to be achieved in order to make any BPR exercise successful.

- *Identify processes to be redesigned*
  Organizations should select a few key processes for their initial BPR efforts. They may decide on those experiencing the severest problems; those with the greatest impact on customers; or, those in which success is likely to be achieved most quickly. However, redesign remains a continuous programme; once the organization starts to redesign and achieve success, the process of continuous improvement must be a constant focus.
- *Understand and measure existing processes*
  The major reasons for understanding and measuring processes are:

  1 That problems must be understood so that they are not replicated.
  2 That accurate measurement can serve as a baseline for future improvements.

- *Identify IT levers*
  The common traditional approach consists of, first, determining the business requirements of a function or a process and then developing appropriate IT systems. However, an awareness of IT capabilities can and should influence the process design.Therefore, the role of IT in a process needs to be considered in the early stages of its redesign. IT is a powerful enabler and thus it deserves its own step in the process redesign. IT can create new process design options beyond just simplifying or supporting existing ones.[1]
- *Design and build a prototype of the process*
  The idea is to design and implement a prototype of a new process, perhaps first in parallel with existing processes. The prototype should then be examined for problems and achievements, and modified as necessary. Only as new process approaches broad acceptance and measurable improvements will it be phased into full implementation.

The role of IT in BPR-initiatives

According to Davenport and Short (1990), IT and BPR have a recursive relationship. On one hand, IT use should be determined on the basis of how well

[1] For the organizational impact of IT capabilities, see Davenport and Short, (1990) p.17.

it supports redesigned business processes (that is, IT as tool and infrastructure to support BPR). On the other, BPR should be considered within the realms offered by IT (that is, BPR as a management approach to improve IT). The combination of IT and BPR presents organizations with an opportunity to change radically the way in which business is conducted (Bjorn-Andersen and Chatfield, 1996; Cash et al., 1992).

Table 10.1 presents an overview of IT-based changes to the work process as suggested by Hammer in 1990. Many of the aspects – old rules, disruptive technologies, and new rules – have in the meantime been discussed in-depth, experimented with, fully implemented, and perhaps already eliminated (for example, expert systems have never or not yet achieved their promise). Nevertheless, the table provides a valuable starting point by outlining the concepts and technologies to consider in potential BPR projects: maturity in the literature does not necessarily imply the same issues are outdated in practice.

Pertinent management issues

Management leadership skills, knowledge, and ability are regarded as key success factors (Hammer and Champy, 1993). However, the estimated 70 per cent of redesign programmes that fail to achieve the desired results (Bashein et al., 1993) should serve as a warning to those organizations that may attempt redesign without anticipating the many potential problems, not least that resistance to change is likely.

Following redesign, organizations have encountered problems which require resolution to ensure the long term impact of BPR. These include that: continuous process improvement is vital to the future of the organization, changes are necessary in organizational structure; new skill requirements arise as a result of extending the scope of workforce activities and responsibilities; the responsibility of monitoring IT-enabled BPR should remain in the hands of process owners, but should be co-ordinated by IT strategists and; the future direction of IT infrastructure should be ratified at the highest levels to ensure that an adequate commitment of financial resources is made (Visick, Powell and Avison, 1999; Davenport and Short 1990).

General management and human resource management are key issues concerning both employee groups – those having to cope with the redesigned business processes and the IT personnel. 'Business as usual', a poor selection of key managers, group pathology, and low morale endanger the success of IT-based BPR (Bui, 1995). To avoid such problems in striving for the long term success of BPR efforts, organizations therefore need:

- To have BPR assigned as a top priority by senior management.

Table 10.1 *Changes in work through IT (adapted from Hammer, 1990)*

Old rules	*Disruptive technologies*	*New rules*
Information can appear in only one place at a time	Shared data bases	Information can appear simultaneously in as many places as it is needed
Only experts can perform complex work	Expert systems	A generalist can do the work of an expert
Businesses must choose between centralization and decentralization	Telecommunications network	Businesses can simultaneously reap the benefits of centralization and decentralization
Managers make all decisions	Decision support systems, data base access, modelling software	Decision making is part of everyone's job
Field personnel need offices where they can receive, store, retrieve, and transmit information	Wireless data communication and portable computers	Field personnel can send and receive information wherever they are
The best contact with a potential buyer is personal contact	Interactive video disk, world wide web	The best contact with a potential buyer is effective contact
You have to find out where things are	Automatic identification and tracking technology	Things tell you where they are
Plans get revised periodically	High-performance computing	Plans get revised instantaneously

- Leadership; exhibited as ownership of responsibility, intelligence, commitment to a shared vision.
- Repeated and thorough communication and discussion; involving future directions – risks and opportunities, expectations of people and organization(s), and clear management plans, even when things go wrong.

- To create a team of winners; requiring increased discretionary decision making authority, increased access or control over resources, and improved opportunity for upward mobility.
- To select good leaders; these need vision and proper priorities, sufficient interpersonal fit, to promote team work – participation, to promote productive empowerment.
- To design and implement a monitoring process.

Examples of IT-based BPR-initiatives

The long-term and radical nature of IT-based BPR has resulted in a diversity of experiences. The role of IT differs in accordance with the business sector, the ambition of management to utilize IT capabilities in the redesigned business processes, as well as the extent and sophistication of IT application prior to redesign (Visick, Powell and Avison, 1999). This section presents illustrations from three IT-based BPR initiatives that differ in these three dimensions (see Table 10.2).

Table 10.2 *Examples of IT-based initiatives*

	Business sector	*Management ambition to utilize IT*	*Extent of previous IT-application*
CompuNet	System services	high	high
Gerling	Financial services	medium - high	medium
KHD	Manufacturing	high	low

IT-based BPR in the service sector: the example of CompuNet[2]

CompuNet is the leader in reselling, networking, maintaining and supporting personal computers in Germany. With nineteen subsidiaries in eighteen locations, operating under the umbrella of a holding company, CompuNet has a turnover in excess of DM1 billion (1996). Around 75 per cent of CompuNet's approximately 1200 employees work in service-related positions, including the technical customer service division. Since CompuNet clients increasingly consider their IT infrastructure as a competitive necessity (a quasi commodity), the company pursues a strategy of cost leadership, focusing on delivering quality service at low cost.

[2] For a more detailed discussion of CompuNet's BPR efforts see Loebbecke, C., Jelassi, T. (1997a), an in-depth company background is provided in Loebbecke, C., Jelassi, T. (1996).

As a multi-vendor system integrator and maintenance company, CompuNet has recently managed several BPR efforts to prepare itself proactively for the competitive environment in the fast developing system service market. As Jost Stollmann, CompuNet's Chief Executive Officer, states 'the goal of our business process redesign effort is to provide top-quality service in system support as a standardized, industrialized product.

The baseline: SAP, Lotus Notes and competitive pressure

In 1988, CompuNet first installed SAP, and soon after this application package was turned into a company-wide IT platform for all business processes (accounting, inventory control, invoicing, purchasing, etc.). The system's ability to provide real-time information on all relevant business processes tremendously enhanced the transparency of corporate transactions.

Further, CompuNet was one of the first extensive Lotus Notes users in Germany. All employees use the package as the basis for their inter-office communication. Crucial for CompuNet's decision to implement Lotus Notes was its ability to support integrated work processes (document management, process monitoring, and 'workgroup computing'). Hence, geographical dispersion loses importance and departments are turned into logical units.

In order to compete in a demanding business environment, CompuNet recognized the need to streamline its business processes not only internally, but in relation to its customers and suppliers. They realized the potential of providing customers of multi-vendor systems with a comprehensive guarantee and efficient support management.

Rebundling customer service processes

In early 1992, CompuNet started to redesign completely its value chain through simplification of its core service activities. The approach consisted of redesigning business processes to follow standardized SAP procedures for all business transactions. The central concept was to purchase all products without any guarantee rights at lower prices in order to remove CompuNet's obligation to process individual reimbursements of guarantee claims with the manufacturer, and to introduce the concept of 'guarantee bundling'. Since October 1992, all CompuNet products have been delivered with a new 'Life Cycle Guarantee'. It runs for 48 months, which corresponds to the expected life cycle of the hardware and covers repair, travel expenses for technicians, spare parts and all other costs related to equipment damages. When CompuNet's service centre agents key in a given PC serial number, information about the corresponding product and customer is automatically extracted and displayed. Thus, the PC serial

number has become the customer's entry 'ticket' to the service centre, and every customer has only one contact person within CompuNet.

The benefits are that time-consuming searches for delivery notes and invoices are eliminated. Cutomers benefit from a real-time guarantee application within contracted time windows which simplifies their guarantee procedures and reduces their overall IT management costs. For CompuNet, the BPR effort has simplified significantly its core activities. Various guarantee-related transactions within the company, as well as with suppliers and customers, are eliminated, thereby reducing CompuNet's maintenance costs by 66–75 per cent.

Reshaping internal service management processes

With the introduction of the Life Cycle Guarantee and the resulting process simplifications, CompuNet's service business has dramatically increased. Offering service as a standardized 'product' is difficult. The main challenge is to maintain a cost-efficient customer-oriented approach to service management that encompasses physically-dispersed support personnel.

CompuNet developed a service management concept, called CallAs (Call Administration System), that integrates SAP and Lotus Notes. When a customer calls CompuNet's decentralized service department to report a PC problem, they only need to provide the serial number of the broken machine. This data item allows CompuNet's service staff to access the customer information immediately and to take the necessary service action. It is also possible to find out directly when an engineer with the necessary know-how will be available, so that the customer can be informed about the date and time of the repair. The schedule of support staff is managed and the necessary spare parts allocated.

CallAS allows CompuNet to monitor pre-determined service levels and to allocate its technical field personnel accordingly. The automation of most steps in the support value chain reduces order processing time and provides continuous on-line information and control of any service activities. To leverage further its new service management application (currently under development) CompuNet aims at increasing the percentage of remote services from today's level of 50 to 80–90 per cent in the near future, a figure which is already common in the US.

Conclusion

CompuNet's outstanding positioning in the PC and network integration market and its shift from sales to service orientation is built on two successful BPR-results:

1 The new packaging of products offered (e.g., the Life Cycle Guarantee).

2 The efficient and creative management of internal and external logistics based on the development and implementation of several state-of-the-art IT applications.

CompuNet, IT provides options for new service offerings and a more efficient handling of service-related business processes.

IT-based BPR in the financial sector: the example of Gerling[3]

Gerling is a family-owned, multinational insurance company encompassing primary insurance income of about DM7. 1 billion and the world's eighth-largest reinsurance company with a reinsurance income of about DM6.8 billion in 1993. Gerling's organizational structure in Germany consists of four hierarchical levels:

1 Corporate headquarters based in Cologne.
2 Twelve regional centres located throughout Germany.
3 Two to fifteen local branches per regional centre (giving to a total of 180 branches) each employing ten to twenty staff members.
4 Mobile field-service staff.

Across the different levels, Gerling communicates mainly within 'vertical communication clusters', for example, the headquarters communicate with a regional centre, which in turn communicates with its branches.

The baseline: corporate network and logical call centre

Gerling has focused its recent IT-based BPR initiative on implementing a 'logical call centre' and the resulting corporate network as the organizational backbone and technical enabler. The core of the system consists of an automatic number identification and the automatic call distribution system (ACD). This helps determine whether the incoming call is the result of a life or property insurance promotion or whether it is to claim a loss. Further, following the receipt of a phone call, it is possible to display relevant contract information on the service agent terminal. Incoming calls are evenly dispatched by an automatic ACD system among a group of service personnel. A system controller can monitor on the screen the capacity usage and the wait line. This feature allows him/her to increase staff during peak times by 'bringing in' non-service personnel or service personnel from other areas (for instance, life and

[3] For a more detailed discussion, see Loebbecke, C., Jelassi, T. (1996 and 1997b).

property insurance). The incoming calls are then automatically re-routed to them without re-dialing.

Benefits and constraints

The initial motivation for the corporate network was to reduce telephone costs. Phone calls within the geographically-spread group become just 'in-house' calls. 'Least cost routing' led to additional savings since calls to external parties are operated through the closest telephone exchange. Productivity increased through a company-wide central exchange that serves all branch offices. Economies of scale and cost advantages for all branch offices were achieved through the efficient use of net capacity and centralized appropriately dimensioned servers. More importantly, the network allows drastic shrinking of both time and distance and thus enables a better flow of information along logical dimensions among employees and between the company and its customers. Gerling has improved its service availability and quality, and achieved great synergy among employees. A centralized claim department at corporate headquarters allows customers to contact the company through a single phone number, 24 hours a day, seven days a week. Furthermore, to cope with the large number of incoming customer calls resulting from a natural disaster (like icy rain or hail), the service centre receiving the calls can redirect them so they get evenly distributed among all call centres. The new processes also allow remote access and use of scarce expertise in solving specific customer problems. Experts can be consulted rapidly from other geographical areas in order to resolve a customer problem. Finally, the 'logical' central office registers every customer complaint and thus monitors the company's image and its perceived service quality.

From a management perspective, implementing the organizational changes has been slow. According to Gerling's Dirk Nouvortne, 'we know how to do the hard side of things, but still need to learn how to go about the soft matters. To reap the full benefits from new technologies, we've got to be prepared and willing to reorganize the structures. We need to work harder on changing the mindset of our employees. It is primarily a people issue and that's why the process is political and slow.'

Plans for continuous improvement

In the near future, Gerling aims to allow every staff member to identify him/herself at any phone within the company by inserting a 'personal phone card'. Thus, they would have all their calls directed to them and be able to make phone calls 'on their card'. The latter functionality is required for caller

identification, billing, and security protocols. Furthermore, Gerling plans to extend the current voice-based corporate network by remote image-processing capabilities in order to share, on a real-time basis, documents such as electronic files containing 30 year-old correspondence (a normal feature for life insurance) among all employees, and to allow remote access of image-databases related to technical, transportation or art insurance categories. Another route for continuous BPR will be mobile communication technology for data applications. Almost permanent availability of sales personnel will enhance service quality and reduce the processing time of insurance applications. Each employee will have a single 'communication number' regardless of where they are located or which telecommunication infrastructure is used.

The next generation of customer-oriented business processes at Gerling will be based on digital television. While the telephone as a communication medium is a first step towards a dialogue with customers, reverse communication will be more fruitful with digital TV. Finally, Gerling's management believes that a move from passive to active call centres will strengthen further company's sales. For example, selected customers will be automatically called – the calls initialized by the active call centre – when new products that suit their specific needs become available. 'Active after-sale service' will result in automatically calling a client a number of weeks after they have signed a new insurance contract

Conclusion

For Gerling, the introduction of a logical call centre and the accompanying new business processes are a reinvention of the way of doing business. The company perceives it as a revolution that has already brought important improvements, mostly in customer-related areas. The corporate network makes knowledge and information readily available and integrates them into the company's structure. This allows employees to focus on customer needs and expectations, a key dimension of any sustainable competitive advantage.

IT-based BPR in the manufacturing sector: the example of KHD[4]

KHD (Kloeckner-Humbold-Deutz) is a leading engine manufacturer.[5] Its strength is based mainly on technological innovation and technical expertise.

[4] For a more detailed discussion, see Loebbecke, C. (1996).

[5] The development in 1876 of the four-stroke engine by Nikolaus August Otto (who was also the founder of KHD) was the starting point for world-wide motorization.

The company's sales volume puts it third in the world as an independent (i.e., non-captive) engine manufacturer. Their water-cooled diesel engines represent a completely new production line.

KHD has concentrated its recent IT-based BPR initiative on internal and external logistic processes in its new engine production facility which is considered one of the most modern in the world. The company aims to standardize its production programme, ensuring a maximum percentage of common parts, and to gain from synergy effects in world-wide procurement. It wants to intensify collaboration between development and manufacturing, materials management as well as control and logistics. All sectors are involved throughout the process from the initial product idea to the finished goods/service, including the determination of target costs.

The baseline: a new engine factory with an outsourced distribution centre

In addition to the advantages of large-scale serial production (low cost and short delivery times), the business processes in the new factory – combining stand assembly and progressive assembly – increase speed and flexibility. Limiting the production to only four key components, manufactured in-house, enables KHD to cope with the complexity of the production process (lean production).

In the progressive assembly, robots are used for difficult or monotonous processes that require high levels of precision, such as tightening screws, measuring or controlling, and they also offer high process security. Using experience and intuition, employees ensure speed, flexibility and quality.

In the stand assembly where engines are manually customized, automation is very low. Each engine has its own container with all the parts needed to complete it. To compensate for the different assembly times of the approximately 4000 engines, a buffer zone for 170 engines (i.e., equivalent to 50 per cent of production volume) was added before the test floor.

There are no timed assembly lines. Employees work in small teams which control a certain process and largely organize their own workflow. All the data required for certain tasks is displayed on monitors and the necessary material is ordered on-line via electronic data interchange (EDI). Data throughput is almost fully automated. Employees control the production quality so as to deliver only 'perfect' material to customers – who are often the next group in the production process just a few metres away. Maintenance staff are also integrated into the teams. Team-members' wages differ depending on the quality and quantity achieved by each.

KHD has opted to outsource components' purchase and distribution. 'Stute', the forwarding agent, built a distribution-centre 12 km from the factory specially designed for KHD's diesel engines. Every 20 minutes a truck shuttles

back and forth between the centre and the factory, and each day approximately 2000 boxes and numerous engines are moved. The centre is electronically connected to KHD and manages the stocking of purchased parts and self-made components as well as the shuttle to the factory. It is also responsible for collecting finished engines, storing them, and then distribution to customers.

Continuous material flow at the core of new logistic processes

Assembly components are delivered just-in-time by 'Stute' with special roll-on/roll-off shuttle trucks: the trucks dock directly to the loading-ramps of the distribution centre or the factory. A transportation line on the truck moves the goods on or off the loading ramps. The whole loading and unloading process takes just five minutes. Data exists only in electronic form, delivered components are identified by bar-code scanners and automatically transported to the progressive assembly. The scanners also transmit components' information to the assembly host system where it is first checked and then forwarded to the material handling system. A transportation-order is generated and transmitted via infra-red light to an automatically-guided vehicle (AGV). The AGVs move through the factory taking boxes to the assembly and buffer areas.

The material flow within the production processes is completely automated, the average material turnover in the factory is four hours. Without hidden material buffers, material flow is constrained by the small store capacity. From entering to leaving the factory the actual material processing time is approximately 50 per cent.

The new internal logistic processes are based on five key elements:

- All necessary material for an engine is available before production.
- The maximum realization time between a material order (from external stock at the distribution centre) and the beginning of assembly is 3 hours.
- The material stored in the containers next to the assembly lines is included in the material stock.
- The inventory is managed by stock- and assembly-quantities.
- The material buffers next to the assembly lines cover a maximum of 4 hour.

The smooth functioning of the logistics substantially contributes to price-sensitive, rapid, and customer-oriented production. However, the tight interdependence between the processes increases the risk of interruptions, caused either by man or machine. In particular, the interfaces between logistics and the other production processes require a strong degree of co-operation and co-ordination. The completely automated material flow in the factory demands a detailed planning of containers (including their size, weight and label) during process planning. The short production lead times require a precise delivery

of purchased goods (in terms of time and quantity). Hence, each component is marked using short codes so it can be easily handled in the factory.

There are few other businesses which have automated their material flow so thoroughly and with so much impact. KHD's new approach to logistics follows market/customer needs. The development of new engines requires production processes tailored to logistics and the mangement of variants becomes crucial. A compromise between conflicting objectives – mainly customer needs and competitive pricing – is needed at all stages

Conclusion

KHD has shown remarkable creativity in its BPR efforts. It integrates a vast amount of logistical know-how in combination with state-of-the-art IT. The high degree of customization offered by the stand assembly provides the company with a sustainable competitive edge since most competitors only offer 'off-the-shelf' engines.

While EDI-based business processes are not yet widely applied within the production chain of machines with diesel engines, KHD demonstrates the potential of EDI-based business processes within a company or even within a production facility. This potential also occurs if adjustments at the company's boundary is to be achieved 'manually', engine by engine.

Critical assessment of IT-based BPR-initiatives

Critical success factors, used to evaluate the success of redesign initiatives, usually comprise: customer satisfaction; net profit and return on capital; expertise in credit and risk management; staff satisfaction; and asset valuation. In a business case, evaluation of the redesign programme's progress largely uses financial measures; net profit, return on sales, and return on capital.

In terms of production processes, cycle times, stock levels, and work in progress usually fall, and the quality of finished goods improves. However, often the expected financial results do not appear because senior managers lack the ambition for organizational change (Hammer and Champy, 1993). Further, many companies fail to comprehend the degree of change required, not only in business processes, but also in managerial behaviour and organizational structure. Gains in individual processes fail to translate into improvements in the performance of the organization as a whole. Also, redesign often addresses non-critical business activities. Only when the value proposition has been set – a statement of the distinctive value the organization proposes to deliver to customers (McKinsey) – can the core business processes be defined accurately. Short run financial pressures, often accompanied by a lack of allo-

cated resources (Moad, 1993) mitigate against the longer term returns of redesign; profit and earnings per share take precedence over market share and competitive positioning. Successful redesign implies consideration of jobs, structure, values, beliefs, and management and measurement systems. Unless all these features are considered together, the necessary change cannot be achieved throughout the organization.

Hence, measuring the success of BPR initiatives has proved problematic. Indeed, whether organizations who say they are undertaking BPR are actually doing so is a matter of subjective assessment (Visick, Powell and Avison 1999). However, if BPR is a long term phenomenon, the results of which may take ten years to become apparent, the results of rather recent initiatives are too early to evaluate.

Outlook

IT-based BPR has been theoretically examined and widely endorsed by the research community, consulting firms, and many organizations in various business sectors, sizes, geographical locations, and strategic visions. However, the theoretically sound approach to IT-based BPR still raises major problems in the real world. 'Knowing how to do it' and 'actually doing it' are still worlds apart. While information and communication technologies for new business processes have been available at least since the early 1990s, practice shows that restructuring organizations who attempt to implement innovative information systems and employment schemes have set themselves a challenging task. The redesign of organizations and complete economies is an on-going effort that often takes significantly longer than planned or expected.

Nevertheless, IT-based BPR initiatives are in progress in most sectors, though sometimes under a different name. In the long run, there seems little doubt that IT will lead the industrial society into an information society. On the way, it will profitably reshape internal business processes and inter-company processes.

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