

# DEMANDS MADE ON THE IT ORGANISATION BY BUSINESS PROCESS RE-ENGINEERING

**Reino Myllymäki**

Head of IT department, YIT Corporation, Finland

## ABSTRACT

Collaboration between information technology (IT) staff and construction managers is a basic condition for a successful business process re-engineering project. Since such collaboration is not always free from problems, this paper focus on preparations that will assist the IT organisation to meet the challenges of a business process re-engineering project. The viewpoint taken is that of the IT manager.

The material in this paper is based on experience gained in YIT Corporation in the period 1989-1997. During these years the writer participated in several information system development projects as project secretary or project manager, and has been responsible for IT matters in YIT Corporation since 1995. YIT Corporation is a company which has a variety of interests and it is the largest construction company in Finland.

## INTRODUCTION

Together with other industrial sectors, the construction industry has frequently been faced with new "isms" (e.g. management by objectives, total quality management (TQM), the environment, teamwork, and multi-skilling as a requirement for teamwork). The present "ism" is business process re-engineering (BPR). None of these "isms" have been wide-ranging solutions to the problems of the global construction industry but every one of them has had an effect on the information systems used and the methods of operation employed.

Every "ism" has an effect on information systems (IS). Every information technology (IT) organisation likes to continuously improve its systems on the basis of feedback from end-users. After several waves of improvement and new system versions a company's information systems can become too complex to understand, too massive to update further and too difficult to support. One influential factor is poor general understanding of the processes involved.

Although several enablers (e.g. organisational enablers, human resources and TQM) in re-engineering have been noted (Love 1996), information technology plays an important role in BPR. The ability of the IT organisation to meet the needs of BPR should be reinforced.

## 1. THE EFFECTS OF BPR ON INFORMATION TECHNOLOGY

Hammer & Champy (1993) have described BPR by using some telling terms. Definition of these terms from an IT viewpoint can help in explaining the effects that BPR has on information technology.

*Fundamental* means that it is necessary to consider the fundamental questions which concern the enterprise and its methods of operation. What does the enterprise do and why does it do it? Is everything that is done actually necessary? This kind of survey consumes both time and resources. If the IT organisation has not been invited to participate in a BPR project at an early phase, it is less likely to be fully committed to project development efforts at a later stage.



*Radical* means that through the re-engineering project an enterprise will abandon old processes and commission new ones instead of just improving or patching-up what already exists. When the need for process re-engineering is noticed, it is quite usual that the usability of the corresponding information system is also called into question. In spite of that, an information system is often able to serve and support several kinds of process and actions. The problems usually lie in the processes, not in the information system. Although a new process could be tested in pilot projects or business units by using the existing information system, a BPR project can result in the initiation of several large IT development projects. Often it is only the IT staff that have experience of the management of such large development projects (Li et al. 1996).

By using BPR an enterprise may attempt to achieve improvements which are *dramatic*. To do this, an enterprise may make considerable investments in a BPR project and also in the information system which will support the new methods of operation. As a counter to this, resistance from personnel can be considerable; dramatic improvements can cause redundancy or major changes in employment tasks.

Rather than concentrating on functions, re-engineering pays attention to *processes*. Such a viewpoint is novel and maybe not be common among the personnel of a construction company; construction is commonly known as a project-oriented industrial sector. If the organisation of an enterprise is function-oriented rather than process-oriented, organisational change will be required. The flow of information through the process, sub-processes and activities can only be managed by using information technology.

Many people do not have a clear understanding of the meaning of BPR and the difference between BPR and the other "isms". Belmiro et al. (1997) suggest that the differentiation of BPR from the other "isms" (e.g. management by objectives, TQM) is a matter of urgency if it is to avoid being overtaken or cast aside in just a few years. Martinsons et al. (1997) suggest that BPR is now commonly associated with two things: (1) inflated consultancy bills and (2) slash-and-burn corporate "downsizing". However, they believe that BPR is not dead but it is also not for everyone.

## **2. RESPONSIBILITIES OF THE IT DEPARTMENT IN A BPR PROJECT**

Since a BPR project focus on business processes and construction managers are legitimate leaders of a BPR project (Li et al. 1996), the IT department can easily be forgotten. There are several important reasons to invite IT staff to participate in the BPR project at a very early phase but it is possible to distil these reasons into a single sentence: Effective re-engineering requires the innovative implementation of information systems.

Building innovative implementations of information systems is a large and complex task. It is possible to give the IT manager seven guidelines:

- a) Crystallise the IT visions, architecture and standards into IT strategies and policies
- b) Adjust the IT organisation to meet the needs of the business
- c) Put the information infrastructure into order
- d) Match the BPR project migration strategy and the IT strategies and policies
- e) Transfer the best IT practices to the BPR project
- f) Manage information system development projects
- g) Secure the operation of existing systems during the BPR project.

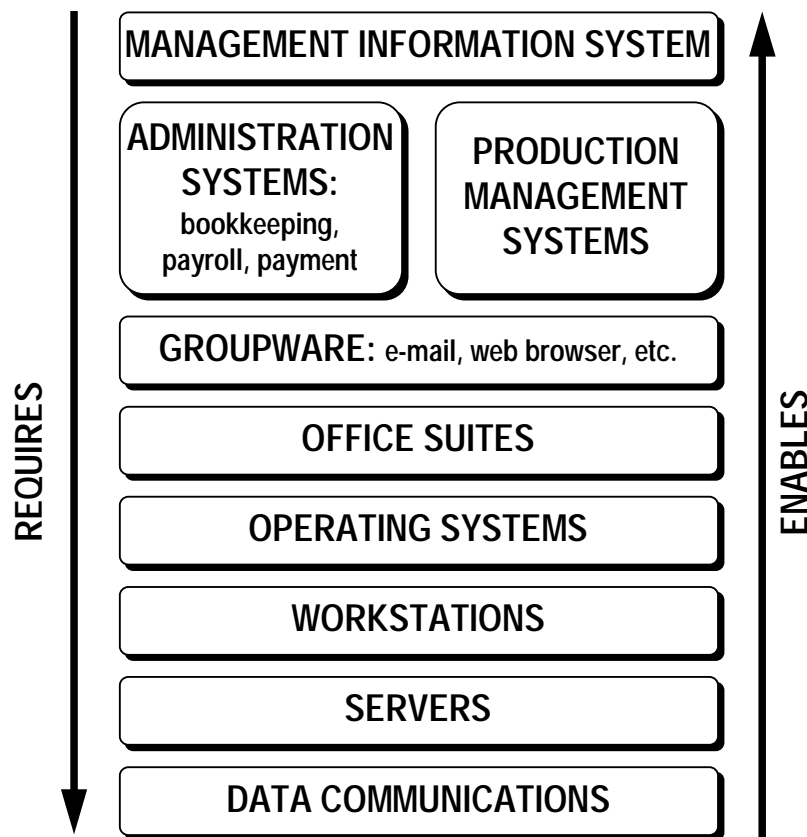
The problems of equipping the IT organisation to meet current challenges are handled in the references in a variety of ways. Ross et al. (1996) have identified three IT assets; the human asset (technical skills, business understanding, solving business problems), the technology asset (technology architecture, standards) and the relationship asset (shared risk and responsibility, establishing IT priorities). Rockart et al. (1996) have established eight imperatives (achieve two-way strategic alignment, develop effective relationships with line management, deliver and implement new systems, build and manage infrastructure, reskill the IT organisation, manage vendor partnerships, build high performance, redesign and manage the Federal IT organisation).

## 2.1 Definition of IT strategies and policies

IT managers make their visions of the enterprise-wide information infrastructure concrete in the form of IT strategies and policies. These are always the result of compromise. Even though every single business need could be met, availability of money is usually the limiting factor. It is therefore important:

- a) to establish the *vision of an information infrastructure* which meet most of the needs of the business
- b) to find a *cost-effective route* from the present state to the target state
- c) to earn the *commitment* of top management, construction managers, developers, and IT staff for both the IT strategies and for the speed of implementation of developments in the information infrastructure.

IT strategies and policies should not be allowed to contain any specific goals for individual information system development projects. Such goals must be included in the plans for each individual project. In spite of this restriction, areas of company focus - i.e. where new information systems will be developed - can be specified. This will be of assistance when defining the level of investment required during the strategy period.



**Figure 1. Requirements for the information infrastructure come from management systems but it is the data communication and other systems that enable the operation of these management systems.**

Interest in IT strategies and policies has grown during in recent years (Philip et al. 1995). The area covered by IT strategies and policies is quite large and a division into three or four components is advisable. In the *IT strategy* the information technology department highlights the desired target state of the information infrastructure in an enterprise. In addition, the present state of the information infrastructure must be analysed and an outline of the architecture for the new

infrastructure must be presented. The IT strategy serves as a guide which controls the working of the IT organisation and the development of the information infrastructure. The working out of an IT strategy is made simpler if the information infrastructure is divided into parts. One possible method of division is shown in Figure 1.

The second component of IT strategies and policies is the establishment of a data communication strategy since the communication of data plays an essential role in the information infrastructure. The third component is the IT tool policy, in which standards and accepted software (e.g. programs and databases) are specified. The fourth component can be the Internet policy since use of the Internet results in a variety of data security risks as well as business possibilities.

## **2.2 Adjusting the IT organisation to meet the business needs**

There are several methods of improving the ability of IT staff to meet the needs of the business, especially the particular needs of a BPR project. One is the organisation of the IT department (or by organising collaboration between IT departments, see Chapter 3). This method can be given a boost by encouraging collaboration between IT staff and construction managers. Good relationships between IT staff and construction managers are an essential requirement for a successful BPR project (Rockart et al. 1996) (Ross et al. 1996).

Another method is reskilling IT staff. New technologies - programming languages, databases, operating systems and communications protocols - must be learned and activated (Rockart et al. 1996). This means a major education and training effort for the IT organisation which must continue to maintain the old system at same time. To help in achieving this Martinsons (1995) stated that "IS developers must change their thinking. They are now empowered to become systems analysts - to study and recommend fundamental changes in the business." This means even more demands on the IT organisation; every BPR and information system development project requires its own qualified analyst. IT staff, especially analysts, should therefore be educated in the skills of a project manager.

An understanding of business helps IT staff and analysts to participate in BRP projects and introduce appropriate information technologies from elsewhere into a project. A good understanding of business also helps when evaluating the stated business needs.

The implementation of information systems demands considerable programming resources. If there is no possibility of dividing a large project into smaller ones, and the need for programming resources is not continuous, there is little sense in employing a large number of programmers. Two better ways are building high performance (Rockart et al. 1996) through education and the use of powerful tools, and by managing software vendor partnerships.

## **2.3 Putting the information infrastructure into order**

Information technology and especially the new information technologies and information systems are a key enabler in BPR. Since the focus of BPR is on the processes, the information flow in these processes must be enabled by data communication. Since the processes can transfer information from the construction company to partners (e.g. customers, clients, designers, suppliers and even to authorities) and from offices to sites, an enterprise-wide network (a so-called intranet) which links offices is one possible solution. Connections from the intranet to the Internet must exist, as must some safe common areas for partners (a so-called extranet). Construction sites should be allowed to join the intranet and access the services provided by that network.

Communication of data is the foundation for all other information systems (Figure 1). The other technological elements (e.g. servers, work stations, operating systems, office suites, groupwares) are also important and must be put in order. The choices for these technologies and the architecture of the whole information infrastructure should be defined in the IT strategies and policies (see Chapter 2.1).

## 2.4 Fitting the BPR project and IT strategies together

IT strategies and policies is a tool for IT managers when directing the operation of the IT organisation. The needs of the business must be taken into consideration in the definition of IT strategies even though such an examination of business strategies is by no means easy for IT managers. It is good idea to earn the acceptance of top management for IT strategies but it is worth remembering that top management is seldom familiar with IT. This means that it is unreasonable to expect top management to make decisions about matters that they do not fully comprehend. Therefore the IT strategy must be written in the most popular form possible.

Construction managers and developers are very keen to to use the latest information technologies and tools and IT staff are happiest when using the most reliable and most mature IT. The information technologies to be utilized in the implementation of an information system in a BPR project will always be examined in the beginning of every project. Every BPR project needs a road map (e.g. an IDEF chart) in which the process being re-engineered is sketched and divided into smaller parts which are then scheduled. This scheduled road map is called the migration strategy.

If the migration strategy is well made, it offers a cost-effective route from the present state to the target state. Here, cost-efficiency means here that all development actions are scheduled so that benefits are achieved as soon as possible and investments are made as late as possible. In particular, all matters which will either become cheaper with the passage of time or which have high maintenance costs must be properly scheduled. Because the IT strategy may limit the speed of development, it must be taken into consideration not only in the BPR migration strategy but also in each individual development project. Both construction managers and IT managers must be committed to the goals of the BPR project and to its associated migration strategy.

## 2.5 Transferring the best IT practices to the BPR project

Construction managers think in a *deductive* way. They have problems and they want to find solutions (Hammer & Champy 1993). In a construction company which has several business interests, it is unusual for the different business areas to enjoy good connections with one another. The solutions employed are often business-oriented their innovations are difficult to produce without a good understanding of the systems.

IT staff, especially system analysts and construction developers, think in an *inductive* manner. They have solutions and they seek problems to solve with these solutions. Since the IT department collaborates with all business areas of the company, IT staff can dissect the system or process at a conceptual level, identify an innovation and transfer it to the BPR project. Also, IT staff can transfer a great deal of useful, detailed information about processes and systems from other business areas to the BPR project (Martinsons 1995).

Software vendors are keen to market the benefits of their own individual systems to construction managers without assuming any responsibility for matching them to the information infrastructure of the target company. IT managers must be given the power to select the information technologies employed (Li et al. 1996). The IT department can also have good connections to other companies in other industries. Useful innovations can be found by using these connections.

## 2.6 Managing information system development projects

The successful implementation of new information systems requires collaboration between IT staff, construction developers and managers, and system end-users. The implementation is often a major effort if the whole range of a project is taken into consideration. The most important phases in a development project are system definition, programming and introduction.

System definition starts with an analysis of the existing system and visioning of the target one. In this phase IT staff are permitted to transfer innovations from other business areas, enterprises and industries. It is good idea to sketch out several alternative and innovative solutions during the visioning phase, but it is important to kill the flow of incorrect information among end-users. The visioning team must therefore be small; easy to manage and flexible in operation.

A large information system development project always takes more time than a smaller one. An information system being developed as part of a BPR project can be divided into modules just as a process is divided into separate activities. By using this methodology it is possible to divide the project into smaller tasks, use ready-made computer programs as modules and shorten the system delivery time. Information flow between modules must be managed by using common databases or database interfaces. It is important to understand that nowadays a total system delivery includes not only system development but also the activities of procurement and integration (Rockart et al. 1996).

In a BPR project, process definition is the primary task and system definition is the secondary one. Construction managers are responsible for the complexity and details of the process being redesigned while IT staff are responsible for management of the system and decisions about database architecture.

If database modelling is carried out in parallel with process redesign, system development can be carried out rapidly by using RAD or 4GL tools (Martinsons 1995). In spite of this, the programming phase is large and risky even when the technologies and tools used are well chosen, progressive and mature. For this reason, one member of the IT staff must take the role of *analyst* and manage the programming phase by selecting the technologies to be used, planning the programming effort and allocating resources.

Programming should be carried out in short steps. The results of programming activity should be examined at a meeting in which IT staff, construction managers and end-users collaborate, programming should then continue, another meeting should be held, etc., etc.. IT staff must arrange for technical testing of the developed system but construction managers must arrange for operational testing, this can take place in a pilot project or unit.

In the introduction phase one construction manager must be given the role of the system *owner* but IT staff must support the person given this role. The major responsibility of the owner is to arrange for the education and training of end-users in collaboration with the *supporter* of the system. The supporter, chosen from among the IT staff, arranges end-user support, system installation for new users and installation of new corrected system versions.

## **2.7 Securing the operation of existing systems during a BPR project**

During the development of new systems in a BPR project existing systems are often forgotten. This situation can be dangerous if the system (e.g. a tender system) is critical to the success of the company. Existing systems must be secured and maintained for the whole timespan of a development project i.e. until the new system has been properly introduced and the existing system abandoned. It is the task of the supporter to take responsibility for the existing system while the analyst focuses on the development of the new one.

## **3. POSITION OF THE IT ORGANISATION**

The importance of IT has increased in recent years. IT is now a great deal more than computers and programs for bookkeeping and payroll calculation. Nowadays IT is thought of as an *integrator* which combines *systems* by enabling and managing the *information flow* between them, amassing *knowledge* in databases and offering this *reusable information* for use. These features make it possible to both renew and reinforce construction processes and operations. It should however be remembered that information technology itself has no intrinsic value, it is only useful as a tool.

### **3.1 The scope of IT**

The range of IT matters in a large construction company is wide. The following list is not an exhaustive one:

- a) Definition of IT strategies and policies (e.g. IT strategy, data communication strategy, IT tool policy, general information infrastructure)
- b) Management of IT contracts and purchases (e.g. data communication, computers, programs)

- c) Administration and operation of data communications (e.g. LANs, routers, modem pools, telecommunications)
- d) Administration and operation of servers (e.g. LAN servers and mainframes) and information systems (e.g. bookkeeping and groupware) running on these
- e) Installing and servicing work stations (e.g. PCs, printers, peripherals), operating systems and programs (e.g. word processing, groupware, management systems)
- f) End-user support and education (e.g. operating systems, office working systems and groupware)
- g) End-user support, education, collection of feedback and development of management systems.

The importance of individual IT items varies. Rough definitions follow:

- a) *data communication* is important since it is the basis for all the other systems
- b) *continuously operating administration systems* (e.g. bookkeeping, payroll calculation and payment systems; item d) above) are important; they belong to the group of “musts” (e.g. they are legal requirements)
- c) *powerful production management systems* (item g) above) are important since they offer business benefits
- d) innovative and possibly risky *development projects* are important since they can create new business or offer fundamental benefits; BPR projects belong to this group.

### 3.2 Arranging IT matters

The administration of IT matters in construction companies can be arranged in different ways. Two major categories of arrangement have been defined; centralisation and decentralisation. Many IT organisations have been struggling with these arrangements for decades (Rockart et al. 1996). The “centralisation-decentralisation question” is usually a problem for large enterprises.

Centralisation means that the IT organisation carries responsibility for all or almost all IT matters in the enterprise. Centralisation may cause an unresponsive, too-independent, uncontrolled and unsatisfactory IT organisation (Hodgkinson 1996). On the other hand, centralisation brings benefits (e.g. in costs) via economies of scale. But an IT organisation can grow too big to manage. Traditional centralisation is a conceivable solution for a solid, medium-sized enterprise.

Decentralisation means that all or almost all IT matters have been divided between several business units and only some IT matters that are common to all units are centralised. Decentralisation may cause unreasonably high total IT costs, a loose information infrastructure, inadequate technology transfer and a lack of synergy and integration (Hodgkinson 1996). Since some leaders of business units are technology oriented and some are cost-efficiency oriented, the management of IT matters is often short-sighted. Strict decentralisation is one possible way of managing IT in incoherent and extensive organisations.

Since neither traditional centralisation nor strict decentralisation are comprehensive solutions for the mass of enterprises, centralisation and decentralisation must be combined. This combination has been termed the Federal IT organisation (Hodgkinson 1996) and can of course be achieved in several ways. One possible way is by reorganising the IT department and another is through collaboration between separated IT departments. Outsourcing is not to be seen as a method of organisation; it is a solution to demands for cost-efficiency and affordability (Rockart et al. 1996).

### 3.3 Model 1: A reorganised IT department

The reorganisation of an IT department is an efficient method if IT matters have been centralised and the service level of the department has been felt to be too low. A large IT organisation can be divided into independent units but the number of these units should be limited and the division should be well explained. The viewpoints that must be taken into consideration are:

- a) end-user groupings (e.g. several business interests, professions and management methods)
- b) information technologies (e.g. data communication, mainframe computers, personal computers and programming)

c) skills (e.g. analysts, programmers, data communication experts, computer and equipment service staff, production management system supporters).

Every individual unit should be large enough (i.e. skills should exceed the critical mass) but cannot be too large (i.e. be too difficult to manage). The whole IT department should have common goals which correspond to the business goals of the enterprise, every independent IT unit should also have own goals. The sum of the goals of all units should be same as the goals of the whole IT organisation. Everyone should be committed to these goals but the achievement of these goals should not lead to wasted effort.

### **3.4 Model 2: Collaboration between independent IT departments**

Responsibility for IT matters can be shared between independent IT departments. This can be a possible and powerful alternative for incorporated or incoherent enterprises. An enterprise level IT department takes care of common IT matters (e.g. IT strategies, data communication and telecommunications, e-mail systems). Operation of mainframe computers, purchasing of computers, equipment and supplies and the negotiation of IT contracts can be centralised into this IT department to achieve cost-efficiency.

The remaining IT matters, in particular the support and development of production management systems, can be shared between several business divisions. These IT departments can operate together with R&D departments or financial departments. In all cases enterprise- and business division-level IT departments should collaborate with each other.

The division of IT matters between several IT departments can lead to IT organisations which are too small. A small IT department cannot achieve a critical mass of skills and the power of a small department will not be sufficient for BPR efforts. Since the business needs of each area are different, the IT solutions for each business area can be radically different. This can, in turn, result in the information infrastructure of the enterprise being loosely-connected and weak.

## **CONCLUSION**

Business needs and IT requirements are especially highlighted by a BPR project. The abilities of the IT organisation to meet these needs and requirements must be strengthened in several ways. IT strategies and policies are a basis for development of an information infrastructure. Reorganising and reskilling of IT staff augments the power of the IT organisation. Finally, IT staff must be legitimate participants in BPR projects and they must be assigned to the management of tasks of which their understanding is sufficient and where their skills and knowledge are important.

## **REFERENCES**

Belmiro, T.R., Gardiner, P.D. & Simmons, J.E.L. (1997). Business Process Re-engineering - A Discredited Vocabulary? *International Journal of Information Management*, February, Vol. 17, No. 1, pp. 21-33.

Hammer, M. and Champy, J. (1993). *Reengineering the Corporation: A Manifesto for Business Revolution*. HarperCollins Publishers, Inc., UK.

Hodgkinson, S.L. (1996). The Role of the Corporate IT Function in the Federal IT Organisation, in M.J. Earl, ed., *Information Management: The Organizational Dimension*, Oxford University Press.

Li, H., Young, W., Yang, J. and Mohamed, S. (1996). The Role of the IT Manager in the Re-Engineering of the Construction Process. *Proceedings of the International Construction Information Technology Conference (InCIT-96)*, Sydney, Australia, pp. 63-66.

Love, P.E.D. (1996). Enablers of Process Re-Engineering. *Proceedings of the International Construction Information Technology Conference (InCIT-96)*, Sydney, Australia, pp. 77-83.



Martinsons, M.G. (1995). Radical Process Innovation Using Information Technology: The Theory, the Practice and the Future of Reengineering. *International Journal of Information Management*, Vol. 15, No. 4, pp. 253-269.

Martinsons, M.G. and Revenaugh D.L. (1997). Re-engineering is Dead; Long Live Re-engineering. *International Journal of Information Management*, Vol. 17, No. 2. pp. 79-82.

Philip, P., Gopalakrishnan, M. & Mawalkar, S.R. (1995). Technology Management and Information Technology Strategy: Preliminary Results of an Empirical Study of Canadian Organizations. *International Journal of Information Management*, August, Vol. 15, No. 4, pp. 303-315.

Ross, J.W. & Beath, C.M. & Goodhue, D.L. (1996). Develop Long-Term Competitiveness through IT Assets. *Sloan Management Review*, Vol. 38, No. 1, pp. 31-42.

Rockart, J.F. & Earl, M.J. & Ross, J.W. (1996). Eight Imperatives for the New IT Organization. *Sloan Management Review*, Vol. 38, No. 1, pp. 43-55.