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Business Process Reengineering, The Creation and Implementation of a Methodology[1]

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Abstract

Business Process Reengineering (BPR) advocates the fundamental examination and redesign of business processes, recognising that the legacy of scientific management has been the excessive fragmentation of work practices in organisations today. This is reflected in the hierarchical structuring of organisations around functional departments, with individual and departmental goals displacing overall organisational goals. This paper discusses the development of a specific methodology for BPR. The practical application of this methodology in an actual BPR project in one organisation is discussed and some of the findings and lessons learned from the project are presented.

Keywords: Business process reengineering, business process redesign, business reengineering, methodology, manufacturing, electronics industry, case study, action research

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Business Process Reengineering, The Creation and Implementation of a Methodology

Introduction

The Business Process Reengineering (BPR) concept is quite new, emerging in the work of writers such as Davenport and Short (1990), Hammer (1990), Hammer and Champy (1993), and Harrington (1991). The concept is currently very topical, however, and is ubiquitous in recent organisational, management and information technology literature. The extent of the widespread popular interest in the BPR concept can be gauged from the fact that Hammer and Champy's recent book on BPR featured at the top of the US best-seller lists. This popularity is also reflected in the fact that many organisations claim to be undertaking BPR projects and many software vendors are offering products to support BPR. However, several studies have recently appeared in the literature which have critically examined the BPR phenomenon (e.g. Earl, 1994; Coulson-Thomas, 1994; Strassman, 1993). The progression of a concept from theory to sustained practice is dependent on the development of its theoretical base, and the introduction of methodological approaches that are capable of being used by practitioners. This paper reports on a study in which a specific methodology for BPR was developed and applied in one organisation.

BPR: Basic Principles and Concepts

While BPR is usually portrayed as a new concept, a number of the principles and concepts underpinning BPR have their antecedents in other disciplines. For example, Strassman (1993) identifies the contribution of the industrial engineering discipline in which methods such as process analysis, activity costing and value-added measurement have been around for about 50 years. Earl (1994) also discusses the contribution of a number of fields, including the operations management domain (e.g. Juran, 1964), sociotechnical systems thinking (Leavitt, 1964) and systems analysis. However, BPR is now coming to the fore in a different business environment. Certainly, the technological infrastructure is now very different, offering capabilities that were not feasible in the past. Also, BPR attempts to reorient the axis of the organisation away from the traditional vertical management control of employee up to management, and towards a horizontal value orientation of vendor to customer (Orr, 1993). The latter orientation is one where real value may be added for the enterprise.

Definitions of the term business process vary, but most researchers suggest that it comprises a number of interrelated activities that cut across functional

boundaries in the delivery of an output (Bevilacqua & Thornhill, 1992; Davenport & Short, 1990; Thomas, 1994). The looseness of this type of definition has led to significant variations in establishing the number of processes in a business. For example, Thomas (1994) cites the case of one large bank which estimated that it had three core processes while another reckoned it had seventeen.

In the past, information technology has been applied to help improve business operations. However, the technology has generally been applied as part of process rationalisation, that is, the primary motivation behind the use of technology is to automate or expedite existing manual processes, and the processes themselves have been largely left intact. The futility of this approach has been bluntly summarised by Drucker (1986) in his declaration: "there is nothing more useless than to do efficiently that which shouldn't be done at all". The application of information technology has resulted in incremental gains, but this is still a long way short of the dramatic 10-fold improvement that has been identified as necessary. Also, the incremental benefits from continuous improvement programmes may be levelling out, and are perhaps finite anyway. Continuous improvement programmes are most effective when companies start from a higher level of efficiency and effectiveness (such as is the case with many Japanese ones). Goss *et al*. (1993) have argued that incremental improvement programmes are not sufficient for most companies today—they do not need to change 'what is'; rather they need to create 'what is not'.

A Methodology for BPR

Much of the literature on BPR has taken an evangelical stance on the issue, assuming that BPR is automatically good for an organisation. As a consequence, there has been little reportage of actual BPR failures. Estimates of failure rates vary. For example, Caron *et al*. (1994) report a 50 per cent failure rate, while Murphy (1994) reports a failure rate of 70 per cent. However, it is quite probably the case that many failures may go unreported since the organisation will understandably not want to publicise the fact, or, indeed, may not even survive to tell the tale. Therefore, it is likely that the true failure rate may be even higher. Certainly, many companies only begin to consider BPR when they are faced with a survival-threatening crisis and radical surgery is required. For example, Rank Xerox were forced to reengineer their business processes when their market share plummeted from 90 percent to 9 percent following the entry of Japanese competitors into their marketplace (Hammer & Champy, 1993).

A key issue in business process reengineering is the 'how' question. Any significant undertaking, which BPR certainly is, requires that some method be

followed. Andrews and Stalick (1992) have argued for a systemic approach to BPR, suggesting that "reengineering...should be based upon numbers and facts, not guts and politics". BPR projects cannot be planned meticulously and organised into precise steps which can be prescribed as universally applicable in all situations (Caron *et al*., 1994; Hammer, 1990). Nevertheless, since BPR requires a fundamental reappraisal of business operations, a methodology which can act as an anchoring framework to co-ordinate the complex web of BPR activities is essential. A clear and committed approach to BPR is necessary, but a possible danger identified in the literature is that those involved in the BPR project will confuse motion with progress and charge about in random directions hoping that any recommended changes can be successfully implemented as a matter of course (Evans, 1993). Caron *et al*. (1994) state that implementing BPR recommendations may require a fundamental change in organisational culture and mind-set and this cannot be left to chance but must be carefully managed. They also argue that visibility into the BPR exercise is vital and must intensify as the project proceeds. Thus, the adoption of some methodological support is appropriate.

In developing the methodology for BPR used in this study, the authors made use of their practical experience with systems development methodologies and combined this with some specific BPR methodological guidelines in the literature. The relevance of systems analysis is confirmed by Earl (1994) who sees it as an essential skill in BPR. As already stated, many BPR researchers have stated that BPR projects cannot be planned meticulously in small precise steps. However, Evans (1993) adopts a bridge metaphor to suggest a broad framework for BPR projects (see Fig. 1).

As can be seen from Fig. 1, Evans proposes four general stages as follows:

- Stage 1: *To Be*
  This stage is concerned with defining the vision of where the organisation wants to be and what it requires of its business processes as a consequence.
- Stage 2: *As Is*
  This stage is concerned with defining the current business processes.
- Stage 3: *The Plan*
  This stage involves making a plan to accomplish the move from the 'as is' stage to the 'to be' stage.
- Stage 4: *The Crossing*
  This stage is concerned with implementing the plan.

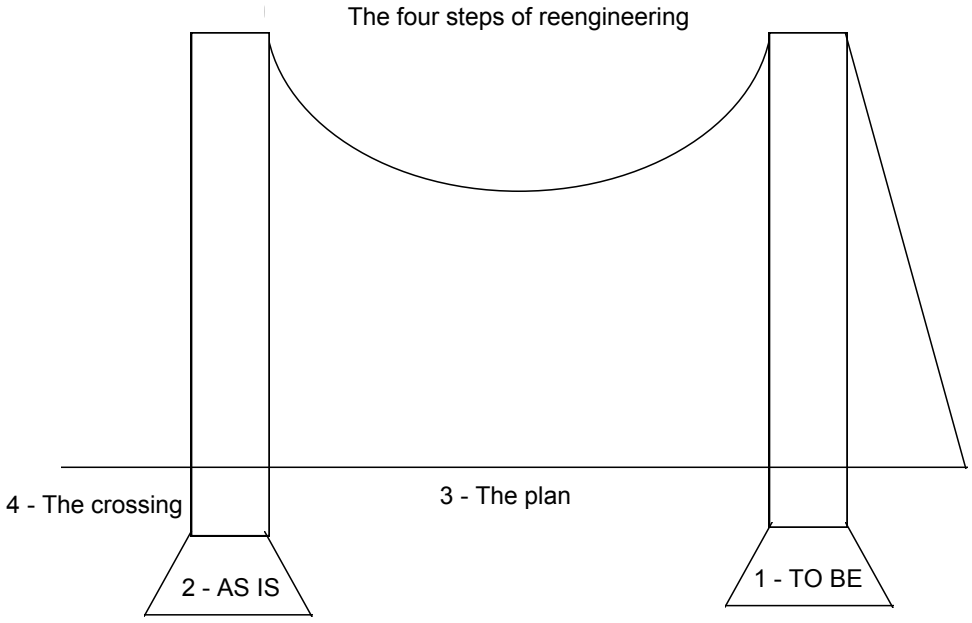

Fig: 1. Four Steps of BPR (From Evans, 1993)

This general high-level approach has its advantages. However, we argue that it has a number of weaknesses. Firstly, trying to build a vision of the future process before understanding the current process is problematic. The issue of concern is whether concentration on the current process will constrain efforts to be imaginative and to reengineer the process with a completely open mind, due to the legacy of past practice. However, the counter argument runs to the effect that one has to understand a process before can consider redesigning it. In fact, Evans himself provides an example which illustrates the vital importance of understanding the context of the current process: He relates the hypothetical example of an accountant who on analysing aircraft fuel consumption discovers that 2 percent of the fuel is used during the first 30 seconds of the flight (the take-off run). Based on this isolated fact, the accountant might recommend that all aircraft should take off on half-throttle thus saving millions of dollars on fuel bills. However, the folly of such a proposal is immediately obvious when one considers the context. Discontinuous thinking and imagination are very important when it comes to developing a vision of the new processes, and it is important to escape the shackles of past practice. This requires a fresh and open mind, but it must be grounded in a thorough understanding of the operation of the current process.

Therefore, the authors rejected the sequence in which developing a vision of the reengineered process precedes the understanding of the current process.

Secondly, the authors view Evans' framework as being too general to be useful in specific projects. The term 'process' in business process reengineering indicates the need to focus on differentiating between the logical activity of *what* the process does or should do, and the physical manifestation of *how* the process is accomplished. This logical/physical separation is at the heart of the structured approach to systems analysis and design (De Marco, 1978), and although the original four step (current physical--current logical--new logical--new physical) transition has been criticised as too cumbersome to be practical, researchers have since modified the approach to counter this criticism (McMenamin & Palmer, 1984). The authors adapted the structured approach to devise their BPR methodology. The methodology is expressed as a series of phases (see Fig. 2), each of which addresses a basic question, and is summarised below:

- *Select process to be reengineered*
  This addresses the basic question "Where are we going to start?"
- *Establish process team*
  Addresses the question "Who is going to do it?"
- *Understand the current process*
  Addresses the question "Where do our stakeholders see us now?" Also in this phase, the current physical to current logical mapping of the process models are established.
- *Develop a vision of the improved process*
  Addresses the question "Where do our stakeholders want us to be?"
  In this phase, the new logical model of the process is defined.
- *Identify the actions needed to move to the new process*
  Addresses the question "What do we need to achieve?"
  Here, the new physical process model is established.
- *Negotiate/execute a plan to accomplish these actions*
  Addresses the question "How will we achieve it?"

It is worth noting that the methodology is expressed from a first-person point of view, reflecting the fact that culture and mind-set change are required and this can only come from within the company itself rather than from any direct actions which external consultants can take. However, the phases of *understand the current process* and *develop a vision of the reengineered process* adopt an external viewpoint, reflecting the fact that a detached stakeholder-oriented, outside-in viewpoint is necessary. The term 'stakeholder' is used here in the same sense as Mason and Mitroff

(1981) who define stakeholders as "all those claimants inside and outside the organisation who have a vested interest in the problem and its solution".

Even though the above phases are presented as linear steps, a central tenet of the strategy is that it is based on an iterative approach. At any stage, it is permissible (and may indeed be desirable) to revert to a previous stage for further refinement (see Fig. 2). In fact, in practice, it was often the case that work at later phases required a reconsideration of earlier stages. Also, the links between the *understand current process* phase and the *develop a vision of reengineered process* phase are shown as dotted lines to indicate that this is not an automatic progression. Indeed, as has been discussed, some writers put the *develop a vision of reengineered process* phase before the *understand current process* phase.

A key issue in the development of any methodology is the need to test it empirically so that it can be validated and modified as appropriate. In the case of BPR, this poses a problem since a typical reengineering project can last between one and two years. BPR thus requires considerable effort on the part those engaged in the project. Also, it has been argued that BPR efforts cannot be uniformly applied across different cultures but need to be tailored to the specific contingencies of the situation (Murphy, 1994; Caron *et al*., 1994). For these reasons it was decided to take an action research approach (cf. e.g. Wood-Harper *et al*., 1985) where the authors applied the methodology in an organisation, as described below.

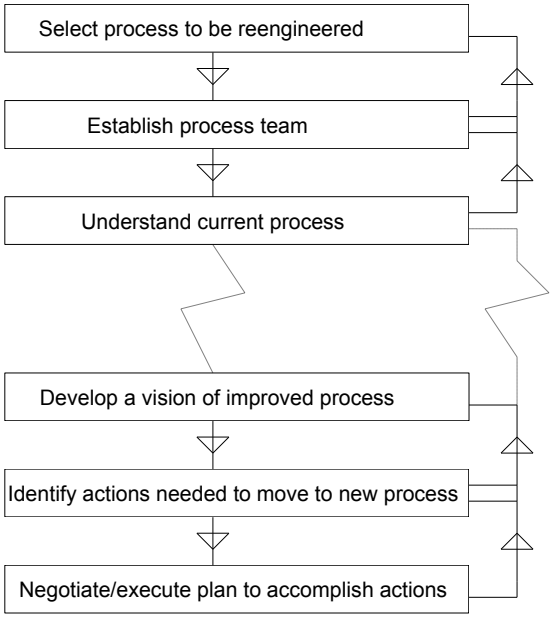

Fig. 2. A Methodology for Business Process Reengineering

A Case Study of BPR

The methodology was tested in a BPR exercise that was undertaken by the authors in an Microelectronic Devices Incorporated (MDI), a multinational company that specialises in the design and manufacture of electronic components for the personal computer market. (The company name has been changed for reasons of confidentiality). The company has four manufacturing sites: two in the Far-East, one in the US, and its European manufacturing headquarters is located in Ireland. The BPR project was initiated in mid-1993, and, while only tentative classifications of reengineering projects have appeared in the literature thus far, the project could be categorised as a "first-wave" reengineering exercise according to the Caron *et al*. (1994) terminology. Alternatively, using Earl's (1994) four-strand typology of BPR projects, the project would be categorised as spanning core processes and support processes. (see Fig. 3).

Core Processes:

These are the processes central to business functioning. They are typically primary value-chain activities and relate directly to external customers. The generic example is the order fulfillment process in which several organisations have shortened lead-times, reduced material and information flows, administrative steps and staff head-count. Notable examples in the literature are those of Xeros, Texas Instruments, Mutual Benefit Life.

Support Processes:

These are the back-office processes which underpin the core processes. They are typically secondary value-chain activities and relate more to internal customers. The classic example in the literature is that of Ford's redesign of the accounts payable process.

Business Network Processes:

These are the processes which extend beyond the boundaries of the organisation into other organisations such as suppliers and customers. The basic principle here is to create symbiotic partnerships, thus redefining the business scope. Examples would include the American Hospital Supplies ASAP evolution, and the virtual compnay concept between Apple, IBM and Motorola.

Management Processes:

These are the processes through which firms plan, organise and control resources. This involves redesigning the organisation and its roles along business process lines. Eaxmples include National and Provincial Building Society, Frito-Lay, Texas Instruments, and CIGNA Corporation.

Fig. 3: Typology of BPR Projects (adapted from Earl, 1994)

Reasons for Reengineering

In 1992, demand for the company's products grew very significantly—in excess of 100 percent. Sales projection figures in mid-1992 were found to have significantly underestimated product demand for late 1992 and early 1993. As a result, the company had to recruit a large number of temporary staff, who had to be trained in a very short space of time. The company also had to reschedule its delivery dates with some of its customers. By mid-1993, problems had been addressed and the situation had stabilised. However, the general manager, mindful of the crisis which had been undergone, resolved "never to go through an experience like that again". He believed the failure to predict the upsurge in demand had been due to basic problems in the existing company processes for dealing with customers. Having recently become aware of the business process reengineering concept, he felt that senior management at the company should investigate whether BPR could help analyse and address the problems that had arisen. The authors were asked to help management in undertaking the BPR project. The philosophy adopted was one of 'think big, start small' and the name chosen for the project was *Smart Moves*.

Select process to be reengineered

BPR requires a global view and an integrated approach to business rather than the traditional reliance on narrow departmental specialisations. Arising from a number of interviews with key members of management at MDI, a number of processes emerged as candidates for reengineering. At this stage, a decision was taken that individual process reengineering was more appropriate than overall business reengineering. This is a more-focused approach and requires broad acceptance of the current overall business strategy, with the reengineered process linked to the fundamental business strategy. The specific process chosen for reengineering was *Customer Handling/Support.* This process had been identified as a critical process by a number of managers in MDI, not altogether surprising given the extent to which customer service has become the dominant force in the supplier-customer relationship in all market sectors. Indeed, Treacy and Wiersema (1993) identify 'customer intimacy' as one of the key strategic value disciplines that organisations should focus on. Thus, the customer handling/support process was one which had the potential to bring some real competitive edge to the business.

The scope of the process to be reengineered must be defined clearly and unambiguously. Therefore, the specific deliverable from this phase was a 200-word (half-page) preliminary description of the process to be reengineered. This helped to

bound the area, and even though it was modified later, it helped in the next phase when team members were being selected.

Establish process team

Process reengineering requires improved leverage of people and technology operating within the appropriate structure. The importance of people cannot be overemphasised and the selection of the *process team* has been identified as critical (Caron *et al*., 1994). Process change is about challenging even the most basic business assumptions, and may thus require significant cultural change. The process team must be empowered and this has to come from the highest management level possible. The necessity of executive support has been empirically determined in the Caron *et al*. (1994) study. Thus, an *executive sponsor* was sought at MDI. This person's role was to initiate the project publicly, ensure that doors were opened, and necessary resources made available. The general manager at MDI fulfilled the role of executive sponsor. However, because of the intensive nature of the process reengineering task, it was considered unlikely that the executive sponsor could be sufficiently involved on an ongoing basis, and so a *process leader*—the IS manager—was appointed by the general manager. This person's role was to ensure that the project did not flounder and, for the duration of the project, the process leader reported directly to the executive sponsor. Additional team members were then chosen—one of the criteria for selection being that good candidates would probably be those who felt they were too busy to partake in such a team.

The size of the team posed a problem initially. Members were chosen from all the specialist areas relevant to the process, but the large team of experts resulted in meetings dragging on interminably as minor points of dispute were raised. Also, it was readily apparent that no one individual had a complete understanding of the overall business process. Compounding this, each team member represented their portion of the process with different graphical notations and narrative standards, thus making amalgamation difficult. These difficulties were resolved by reducing the size of the team to contain just a small number of core people who were able to elicit any necessary information from other relevant personnel in the organisation. Also, a *scribe* was appointed to collate all information into a single repository using a standard graphical notation with each process component underpinned by complete narrative information.

Understand the current process

This phase involved the team acquiring a clear definition and knowledge of the current process which several writers have identified as an essential stage in BPR (Bevilacqua and Thornhill, 1992; Davenport and Short, 1990). In the case of MDI, there was strong evidence that the various constituents did not fully appreciate the overall business process, so this phase preceded the redesign of the process. The phase required detailed analysis of the current process. The nature of the analysis was both top-down and bottom-up. It involved the examination of relevant documentation, interviews with relevant personnel internally, and also externally, since customer concerns are vital in the product-market strategy.

Benchmarking of the existing process took place at this stage and other metric data on the existing process was gathered to assist later evaluation of the reengineered process. The analysis from this phase produced a graphical model of the current business process (see Appendix I). The complexity of this model surprised the team, with one member commenting that having been used to viewing business functions in vertical terms, the scale of the horizontal process dimension was striking. The model helped to reveal several problem areas which had not been previously articulated. For example, the timing of the computerised production scheduling and planning tasks followed a rigid timescale which was somewhat arbitrary and did not offer sufficient flexibility to the customer. This was very obvious from the model, and so a decision was taken to delay the computer run to the latest possible time to allow fine-tuning of customer orders.

Develop a vision of the reengineered process

The articulation of the current process in a graphical model helped to surface assumptions that needed to be challenged. To further stimulate desirable changes, the existing domain knowledge was supplemented by a strategic benchmark of similar processes in relevant industries and from world leaders in the process. This type of benchmarking is typical of reengineering exercises (Earl, 1994).

The team also identified a general need to flatten managerial and functional hierarchies and to align the process away from a bureaucratic structure to a more customer-focused one. For example, corrective action reports, which gave customers feedback on the status of returned goods, were not being given adequate priority, with little inter-departmental co-operation. One person was being employed full-time to collate these reports from the relevant departments. However, this person was experiencing major difficulties as individuals in the various departments did not devote adequate priority to this task. Thus, there was a clear need to promote the

awareness of the importance of this task in the organisational culture. To facilitate the process, a Lotus Notes database was established which allowed individuals in relevant departments an easy and structured medium for accessing and updating these reports.

Identify the actions needed to move to the new process

The actions needed to move to the new process must be detailed and prioritised. A number of basic flaws had been identified in core operations related to the process being studied at MDI, and these had to be rectified. For example, some problems emerged in relation to the working practices in the quality control section. Firstly, the quality control department did not operate in a shiftwork system. However, receipt of incoming materials followed a continuous flow in other departments that operated a shift, and materials which were undergoing quality control inspections were consequently being buried under new material received during evening shifts and from early morning deliveries.

In addition, the investigation of the quality control process revealed a basic flaw in how the company dealt with goods being returned under warranty. Typically, when a customer returned goods as faulty, it was assumed to be genuine and the customer's description of the fault was taken to be *bona fide*. However, it emerged that the product lifespan for some products was shorter than the warranty period. Thus, customers were using their return of goods under warranty option to reduce stock levels by simply shipping back surplus stock on the pretext that it was faulty. In some cases, products still in their shrink-wrapping were returned as faulty!

A major problem was also identified in relation to stock levels. Too much stock was being held out of "natural optimism" according to the general manager, and so an "unbuying" policy was put in place to create some impedance in the procurement process. There was a need to change the prevailing culture in the company so that not having something in stock was seen as a "lesser sin" than having huge excesses. Reducing stock in a coherent fashion was a major problem in that accurate stock levels were not available. A very simple solution to this problem presented itself, however. The company were already putting bar-codes on all products to satisfy customer requirements, and these bar-codes could be used to automatically update stock levels. his required a change to the stock control system in use in the company. The ‘clean-up’ of the stock area had a major impact. The general manager estimated that the stock value has been reduced by $5m., giving rise to annual savings of $500,000.

Also, at this stage it was considered important to set audacious goals or "stretch targets" to use Davenport and Short's (1990) terminology. This is necessary to

avoid a half-hearted approach being taken, whereby BPR can lapse back into an incremental improvement program without any radical substance. Visible metrics were established wherever possible, so as to verify that the reengineered process is meeting expectations. If the efficacy and value of the reengineered process cannot be reliably assessed, then it is difficult to tell if BPR has been successful.

Negotiate/execute a plan to accomplish these actions

The plan must be negotiated, and again the executive sponsor plays a critical role here in ensuring that any cultural change will not be impeded. This is a vital but delicate stage and it is imperative that negative effects on employee morale be avoided. Relevant support mechanisms and management processes must be aligned. A formal presentation of the plan should be conducted to help win over those vital to ensuring its success. This step can be anticipated to be difficult. The organisation must present a 'business as usual' front, while at the same time accomplishing a smooth transition to new processes which must then be institutionalised. Frequent monitoring is essential to ensure that the project does not fail at this stage, as this is where many BPR projects go on the rocks as radical change may not be fully undertaken.

In the case of MDI, this phase was iterated with the previous one. As actions were identified, meetings were held with the general manager, and he gave full and public support to the actions mandated.

Lessons Learned

A number of lessons have been learned from the research at MDI. Firstly, BPR, while perhaps inevitable, is not an easy or automatic activity. If true reengineering is to take place it is certainly not about half-measures taken by the half-hearted. The early phases of the methodology: *select process to be reengineered; establish process team; understand current process* were found to work well. The selection of the appropriate process—one capable of adding value and which can be clearly and concisely defined—was found to be a key issue, and like systems development, mistakes not detected at this stage could prove costly to rectify later in the exercise. The team must be established and empowered, and to this end, an executive champion/sponsor must be found. Achieving a thorough understanding of the current process and representing this clearly and unambiguously in a graphical format can be tedious. However, the rigour of such a methodological approach can result in significant benefits.

The latter phases of the methodology from the *develop a vision of the reengineered process* phase to the *negotiate/execute plan* phase are fraught with difficulty. While a radical change may be identified by the team as necessary, it is very difficult for management to commit themselves to a high-risk project, especially one which fundamentally alters the status quo. In the case of multi-national companies radical changes in business operations often cannot be mandated locally, but require head office approval. Also, the literature indicates that BPR projects have almost always involved "downsizing" (cf. Caron *et al*., 1994; Hammer, 1990). This dramatic reduction in head-count—"skimming management's midriff" to use Drucker's (1986) phrase—may not be palatable in many organisations or cultures (Murphy, 1994). For example, in the European context, lateral transfer is more widely used than dismissal as a means of dealing with personnel problems, but such a policy is anathema to BPR. In the BPR project presented here, the general manager explicitly stated that he was not interested in reducing head count, nor did he consider it a priority that expenditures be cut. Rather, his objective was to achieve more value from current resources. Thus, the radical changes that might have been required by business process reengineering were not going to be automatically supported by the general manager.

The question arises as to whether, given these constraints, it is worth initiating BPR projects in the first place. However, the answer must be in the affirmative. Firstly, a thorough understanding of the current process, which is a key deliverable from the methodology used in this study, can help identify certain basic problems, some of which can be rectified without radical change. Also, it may be possible to identify stages in the process where a richer approach could add value for the customer without too much extra effort—the delaying of the production scheduling process as described above, for example. Finally, the BPR exercise can give rise to serendipitous benefits, such as the quality control one mentioned earlier.

Ptolemy long ago declared that there was no royal road to geometry, and the same could be equally said of business process reengineering. However, as can be seen from the evidence presented above, the journey may be just as important as the destination, as there are potentially significant benefits to be gained from undertaking the exercise along the way. Furthermore, the rewards of a successful BPR project are great, including the very survival and prospering of the organisation.

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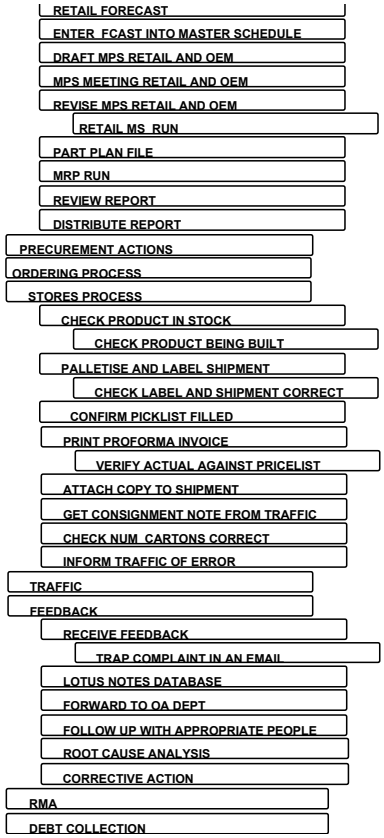
Appendix I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DRAFT MPS RETAIL AND OEM
MPS MEETING RETAIL AND OEM
REVISE MPS RETAIL AND OEM
RETAIL MS RUN
PART PLAN FILE
MRP RUN
REVIEW REPORT
DISTRIBUTE REPORT
PRECUREMENT ACTIONS
ORDERING PROCESS
STORES PROCESS
CHECK PRODUCT IN STOCK
CHECK PRODUCT BEING BUILT
PALLETISE AND LABEL SHIPMENT
CHECK LABEL AND SHIPMENT CORRECT
CONFIRM PICKLIST FILLED
PRINT PROFORMA INVOICE
VERIFY ACTUAL AGAINST PRICELIST
ATTACH COPY TO SHIPMENT
GET CONSIGNMENT NOTE FROM TRAFFIC
CHECK NUM CARTONS CORRECT
INFORM TRAFFIC OF ERROR
TRAFFIC
FEEDBACK
RECEIVE FEEDBACK
TRAP COMPLAINT IN AN EMAIL
LOTUS NOTES DATABASE
FORWARD TO QA DEPT
FOLLOW UP WITH APPROPRIATE PEOPLE
ROOT CAUSE ANALYSIS
CORRECTIVE ACTION
RMA
DEBT COLLECTION