

From Reengineering to Process Management

A Longitudinal Study of BPR in a Danish Manufacturing Company

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From Reengineering To Process Management - A Longitudinal Study of BPR in a Danish Manufacturing Company

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Abstract

This paper is a longitudinal study of BPR initiatives at Enzyme Business carried out between January 1994 and March 1998 in Novo Nordisk A/S, one of the largest companies in Denmark and the world's largest producer of industrial enzymes with a market share of more than 50%. The paper provides empirical insight from a number of BPR-projects and related BPR-initiatives, e.g. Business System Reengineering projects. The paper suggests that reengineering focusing on process orientation and customer satisfaction in a functional organisation is a valid alternative to a fully implemented process organisation. Novo Nordisk Enzyme Business employs this approach by integrating functional, industrial, and business process strategies. As no process owner exists in this setting, a role as a so-called Flowmaker is established in order to facilitate and further streamline the activities of each reengineered process. Furthermore, it is concluded that several iterations in the Business System Diamond is required in order to mature the organisation in applying and obtaining success by the concept of Business Process Reengineering.

1. Introduction

Manufacturing companies face a rapidly increasing competitive, globalised, and dynamic market. This leads to new perceptions and blueprints for companies. In the recent years, a generally accepted way of dealing with this problem is through Business Process Reengineering (BPR). We thus see in manufacturing companies in general, and in Novo Nordisk A/S in particular, that numerous BPR activities and general change management efforts are being undertaken in order to cope with an increasingly competitive environment.

It is generally perceived e.g. in cases presented in Hammer & Champy (1993) that transformations of entire large corporations take several years in order to carry out and anchor the redesign throughout the organisation. As organisations are organic entities, the adoption, diffusion

and implementation can take various paths depending on the individual organisation and its context. However, little is known about development of reengineering activities with respect to large transformations. In fact, indepth case studies of BPR projects are rarely found in the literature (Grover *et al.*, 1995; Willmott & Wray-Bliss, 1995; Hamilton & Atchison, 1995; Larsen & Myers, 1997), and particular those of a longitudinal nature (Jones, 1994; Willcocks *et al.*, 1997).

The purpose of this longitudinal study is to analyse the dynamics within the overall reengineering process at Enzyme Business, Novo Nordisk A/S. Hence, the research object of this study is the business unit Enzyme Business. The research questions are how a reengineering project evolves over a timeframe of several years; why an organisation wants to maintain a functional structure, and what mechanisms the organisation implement in order to assure efficiency of the business process.

In order to pursue a structured approach to describing the evolution of the BPR activities, and in order to obtain substantial insight into the projects, a framework for evaluation of the projects is applied.

2. Research Methodology

The research methodology presents the background of the case company, the data collection, and the method for analysis.

2.1. Company Background

Novo Nordisk A/S has about 14.000 employees in approximately 50 countries and provides sales in around 130 countries with a turnover of more than 2 billions USD. Novo Nordisk A/S has approximately 50% of the world market for industrial enzymes. The business unit Enzyme Business (EB) has 2.900 employees, with research centres and production plants in Denmark, USA, Switzerland and Brazil (Novo Nordisk, 1998).

In the first half of the 1990s, Novo Nordisk A/S was engaged in a relatively wide range of business areas

following the merger of Novo Industry and Nordisk Gentofte. In 1994 this led to a strategy change to focus on the core activities, i.e. production and research of industrial enzymes and selected pharmaceutical products. In the following years the whole organisation of Novo Nordisk A/S has been aligned to the new strategy, cf. Figure 1.

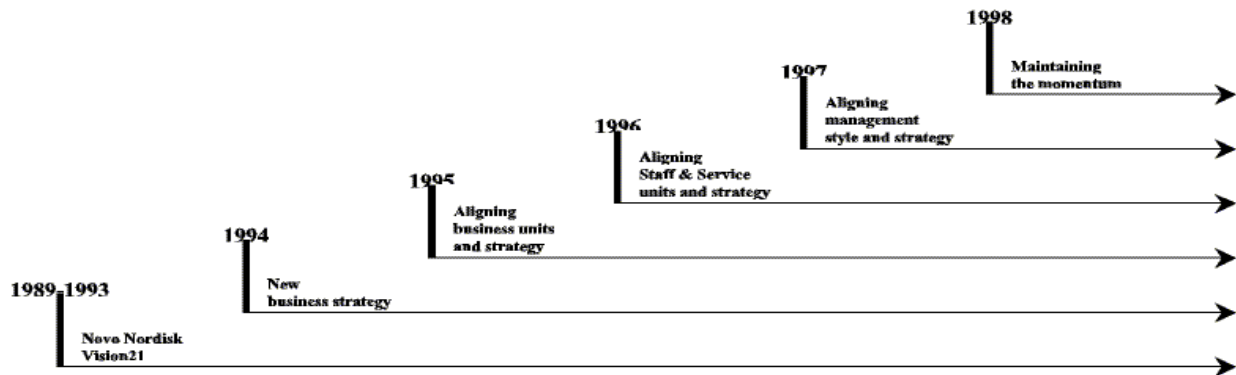


Figure 1: Aligning the activities at Novo Nordisk A/S to New Business Strategy.
Source: Novo Nordisk (1998:6).

2.2. Data Collection

The data for this article were gathered since early 1996. Data was gathered through internal and external documentation and supplementary semi-structured interviews, as well as verification and follow-up interviews and many discussions due to the roles of the authors in relation to EB.

Internal documentation includes: BPR teaching material (which the EB BPR team members were exposed to), project catalogues, steering committee summaries, extensive documentation of analysis and redesign of all initiatives (20 BPR projects, 5 newly defined processes, two evaluations projects, 5 flowmakers, and 2 quality projects), information form the overall co-ordination and discussion forum regarding BPR activities (i.e. "Umbrella", containing the directors, the corporate vice president, the internal BPR group and project leaders from the line of business), project evaluations, summaries of Novo Nordisk A/S international management forum, internal correspondence, various Intranet documentation, and Novo Nordisk Magazine. External documentation

includes: Articles from newspapers and magazines. Interviews and discussions have been targeted at all levels within the organisation of Enzyme Business. The data were analysed according to the framework developed and described in this paper.

2.3. Method for Analysis

In order to assess a specific BPR project and contrast it to theory / other cases, it is necessary to develop a set of assessment parameters. Such a frame framework is developed by Larsen (1998) based on a study based on a study by Larsen & Leinsdorff (1998b), which identify 150+ pitfalls from literature. This study relies on direct as well as indirect referencing. With respect to the indirect referencing the most significant collection of pitfalls is provided by Grover et al. (1995), which account for approximately 25 percent. Otherwise, most articles only provide a very small number of pitfalls. In this study we do not distinguish between pitfalls of a prescriptive or descriptive nature, respectively. While pitfalls of prescriptive nature describe good ideas of good people, descriptive ones describe factual experiences, which incorporate a high degree of behavioural consequence. Hence, a combination of the two seems to be optimal in order to qualify the relevance of the individual evaluation parameters.

The selection of the evaluation parameters is based on a qualitative assessment of their support in literature. A quantitative approach is not considered suitable for this purpose, as the pitfalls are of a different nature and therefore difficult to compare. Furthermore, the pitfalls arise from different contexts.

As a total system including all variants of pitfalls is impossible to apply in practise, the representation of the

evaluation parameters is put into a structure of categories defined by the Larsen (1998). This framework contains 17 evaluation parameters. The fact that not all parameters are mentioned here (motivation for change, incentives, themes, techniques, project management, shared vision, participation and involvement) implies that they have been constant during the period of the study, or that they have had a marginal impact on the evolution of the BPR concept at Enzyme Business. In this article, only those evaluation parameters, which had a significant impact (retrospectively) in the case study are presented in table 1, although all of them were considered with respect to the initial evaluation of the projects of EB.

Finally, it is important to notice that these parameters should not only be considered individually, as experience indicates that a correlation can be found between the parameters.

3. Theoretical Foundation

The theoretical foundation consists of the key BPR literature, which briefly is presented, and the development of the framework that will be applied for evaluation of the longitudinal study.

3.1 Business Process Reengineering

Business Process Reengineering (BPR), also known as Business Process Redesign (Davenport & Short, 1990), Core Process Redesign (Kaplan & Murdock, 1991), Process Innovation (Davenport, 1993), or Business Engineering (Meel *et al.*, 1994), is a concept within the field of change management which to a large extent is undertaken by industry as well as by public services.

Numerous definitions of BPR are found in the literature, e.g. Davenport & Short (1990), Morrow & Hazell (1992), Hammer & Champy (1993), Davenport (1993), Johansson *et al.* (1993), Loewenthal (1994), Burke & Peppard (1995), and Pollalis (1996). In spite of slightly different definitions, they agree that the processes start with the customer and their satisfaction. In other words, what the company needs to do is, as Katzenbach *et al.* (1995:175) put it: "to absorb the customer's point of view".

Literature also presents numerous definitions of Business Processes, cf. e.g. Pall (1987), Davenport & Short (1990), Hammer & Champy (1993), Davenport (1993), Johansson *et al.* (1993), Scheer (1993), and Katzenbach *et al.* (1995). The most cited definition of a business process is probably: "a collection of activities

that takes one or more kinds of input and creates an output that is of value to the customer" (Hammer & Champy, 1993: 35). Similar to this Davenport & Short (1990) regard a business process as "a set of logically related tasks performed to achieve a defined business outcome".

Hviid & Sant (1994:49) define Business Process Reengineering as: a systematic approach with the purpose of obtaining dramatic and permanent improvements in customers' satisfaction related to such factors as time, quality, cost and service by analysing and reconstructing - on a clean sheet principle - the strategically most important cross-functional business processes supported by: innovative use of information technology; new, process-oriented organisational principles; process oriented performance measurements and - after implementation - maintained by continuous improvements.

The core business processes of an organisation according to Tinnilä (1995) and Hammer (1996) are: customer acquisition and service, product development, and order fulfilment. These processes are extending over different functions and embed suppliers as well as customers. Hence, one of the characteristics of a business process is that it begins and ends outside the organisation (Hammer, 1996: 9-12), and has clear interfaces towards other processes.

According to Hammer & Champy (1993) one of the main criteria for reengineering success is to get all the way around the business system diamond (Hammer & Champy, 1993). The business system diamond identifies the relationship between business processes, jobs and structures, management and measurement systems, and values and beliefs, as illustrated in Figure 2.

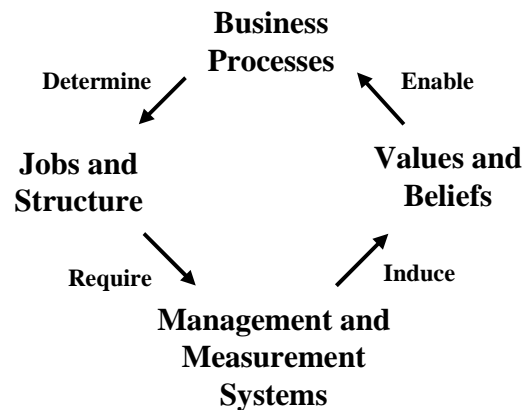


Figure 2: The Business System Diamond.
Source: McManus (1995).

When restructuring the business process, the content of jobs and of organisational structures changes for all employees. Changing jobs and structures require changes in management principles and performance measurement systems. These new management principles and performance measurement systems induce change in values and beliefs, which in turn enable the new business processes. Consequently, reengineering is not complete until all elements of the business system diamond have been changed and aligned (e.g. [Larsen & Leinsdorff, 1998a](#)).

3.2. The BPR Project Evaluation Framework

The framework of BPR project evaluation parameters (i.e. the relevant subset the one developed by Larsen, 1998) is presented below. Definitions of the individual parameters with references are provided.

This framework will be applied in the following section in order to describe the evolution of the BPR activities at Enzyme Business, Novo Nordisk A/S.

Evaluation Parameter	Definition	Prescription (Recommendations)	Description (Experiences)
Organisational Structure	Overall hierarchy of tasks, roles and functions.	Woolfe (1993) and Hendry (1995:56).	Cole <i>et al.</i> (1993), Davenport & Short (1990) , Davenport (1993), and Hall <i>et al.</i> (1993)
Strategic alignment	Business Process (BP) aligned to Strategy	Harrison & Pratt (1993), Bashein <i>et al.</i> (1994), Rühli <i>et al.</i> (1995), Grover <i>et al.</i> (1995) .	Schnitt (1993), Woolfe (1993), Furey & Diorio (1994), King (1994), Tinnilä (1995), Clemons (1995), Lockamy & Smith (1997) , and Sarkis <i>et al.</i> (1997).
Project Breadth	Extend of project, i.e. from sub process to all core BPs (including holism)	Hall <i>et al.</i> (1993) , Grover <i>et al.</i> (1995)	Morris & Brandon (1993), Stephens <i>et al.</i> (1997:14), and Larsen & Leinsdorff (1998a).
Skills	Skills in the BPR projects, including IT skills.	Pryor & Katz (1993), Caldwell (1993), Bashein <i>et al.</i> (1994), and Martinez (1995).	Davenport & Short (1990), Furey (1993), Allen & Nafius (1993), Harrison & Pratt (1993), Morris & Brandon (1993), and Cole <i>et al.</i> (1993).
Measurements	Measures associating jobs and business processes	Gulden & Reck (1992), Schnitt (1993), Woolfe (1993).	Hall <i>et al.</i> (1993), Hammer & Champy (1993:80), Davidson (1993), and Davenport (1993).
Information technology	The degree of which IT is integrated in all business areas.	Bjørn-Andersen (1994) , Rock & Yu (1994), Kim (1994), Classon (1994), Lee (1995), and Willcocks & Smith (1995) .	Davenport & Short (1990) , Venkatraman (1991), Teng <i>et al.</i> (1992) , Davenport (1993), Davidson (1993), Housel (1993), Bjørn-Andersen & Turner (1994), Fielder <i>et al.</i> (1995) , Ascari <i>et al.</i> (1995), Bjørn-Andersen & Chatfield (1996), Aggarwal (1997:331), Guimaraes <i>et al.</i> (1997), Gunasekaran & Nath (1997), and Love & Gunasekaran (1997).
Shared values	Values known throughout the org.	Hall <i>et al.</i> (1993) and Grover <i>et al.</i> (1995) .	Hammer & Champy (1993) and Davenport (1993).
Learning	Type of learning, e.g. assurance of doing the right things as oppose to doing it right	Regarding general evaluations supported by Carr & Johansson (1995), Grover <i>et al.</i> (1995) , Galliers (1997:181), and Tatsiopoulos (1998).	Larsen & Leinsdorff (1998a). Regarding advanced system development: Stein & Vandenbosch (1996).
Change management	CM contains e.g. training and handling of political controversies. Furthermore, the significance of people and lack of appropriate communication in reengineering projects is emphasised.	McElrath-Slade (1994:56), Bashein <i>et al.</i> (1994:10), Willmott (1995), Grover <i>et al.</i> (1995) , Taylor (1995:85), Willmott (1995), and Hammer (1996).	Katzenbach & Smith (1993), Bartlett & Groshal (1995), Meyer & Gardner (1992), Guha <i>et al.</i> (1993), Buday (1993), Grint (1994), Ryan (1994:78), Champy (1995), Clemons <i>et al.</i> (1995), Davenport (1995), Homa (1995:23), Davenport (1995), Hammer & Stanton (1995:32,33), Willcocks & Smith (1995), Grint & Willcocks (1995:103), Strebel (1996), Barua <i>et al.</i> (1996), and Willcocks <i>et al.</i> (1997).
Results	The outcome of the reengineering efforts	Common agreement, e.g. Hall <i>et al.</i> (1993).	Common agreement. In particular, regarding bottom line results: Cypress (1994) and Berrington (1995).

Table 1: Evaluation parameter definitions and evidence from literature.

4. The Case Study At Novo Nordisk A/S

The need for BPR in Enzyme Business (EB), Novo Nordisk A/S, was due mainly to a very competitive market where the main concerns are factors such as "value for money" and "delivery reliability". In consecutive years, from 1992 to 1995 the average price level for enzymes have been declining (Novo Nordisk, 1998).

The case study is divided into three phases, as the adoption, application, and adaptation of BPR changes in these phases. The longitudinal study is summarised in Table 2 based on the contributing evaluation parameters, in order to provide an overview of the four years of BPR activities in the Enzyme Business. Descriptions of the phases are following the table. The keywords stated in table 2 are chosen to represent the actual events and highlight the essential circumstances that characterise the BPR methodology in each phase.

The first phase (Jan. 94 – Dec. 95) is characterised by two overall projects initiated by the corporate vice president, the BPR-Production (BPR-P) and BPR "Planning, Order to Delivery" (BPR-POD) projects.

The BPR-P project generated 6 minor projects, which

were followed by 3 additional minor projects all related to the Production process and related support process, e.g. planning and approval of products.

The BPR-POD project was in this phase primarily focusing on an IT platform survey and analysing root causes for the high number of back-order, customer complaints, and significant non-value-adding work, e.g. having multiple entries of exact same information. In addition to that, the second half of this period was dominated by the completion of a ISO 9002 project, which meant a reallocation of the BPR resources. However the ISO project contributed to developing the process focus in the organisation.

The second phase (Dec. 95 – May 97) was initiated by a definition of a new BPR project portfolio containing 8 projects in the production area. These projects were based on the idea of reengineering a well-defined sub-process, and gave birth to the concept of Business System Reengineering (BSR) projects. A BSR project was defined as a reengineering project, which incorporates best practice as well as breakpoint ideas, within a well-defined system, i.e. a sub-process or an organisational part that serves a common purpose, as project breadth. This is

Evaluation Parameter	Phase 1 (Jan. 94 – Dec. 95)	Phase 2 (Dec. 95 – May 97)	Phase 3 (May 97 – March 1998)
Organisational Structure	Functional structure. Emphasis put on customer satisfaction.	Functional structure. Emphasis put on process focus.	Process facilitation through Flowmakers in a functional structure. Emphasis put on process orientation.
Strategic Alignment	Functional and industry strategies derives project goals	Transition of the strategic process	Simultaneous development of strategies and processes
Project Breadth	Narrow	Systemic	Process
Skills	General external facilitation and internal adoption	Internal adaptation and development	Internal maturity
Measurements	Lead-time Delivery Reliability	Lead-time and Delivery Reliability/ Quality/Promise (DR/Q/P)	Quality and process capability, and DR/Q/P. All broken down to individual employee process tasks.
Information Technology	Function specific proprietary systems	Integrated Sales and Service system	Integrated Sales, Service, and Distribution system. World Wide implementation of SAP/R3.
Shared Values	"R&D excellence" and departmental values	Company wide diffusion of "A well oiled machine"	Empowerment through "Trust, teamwork, clarity, and will to win"
Learning	Tool adoption and experimentation	Application and optimisation	Innovation
Change Management	Line responsibility.	Line responsibility. HR representation.	Line responsibility. HR involvement. Union involvement.
Results	Awareness of need for cross-functional co-operation	Streamlined and visualised business processes. IT and quality strategy defined.	Existing functional structure maintained. Business processes integrated in the ongoing strategic development.

Table 2: Longitudinal observations of the BPR initiatives at Enzyme Business.

in contrast to the traditional process approach.

In this phase the BPR-POD project started implementing a SAP/R3 system. A forum, called Umbrella, was established for the directors, executives, and the EB BPR Group of Enzyme Business. The purpose of this forum was to inform, co-ordinate, and transfer knowledge between projects throughout the business unit. Also it was important to have a forum to discuss the critical matters that emerged during the BPR projects. This forum also introduced a formal coupling to the BPR-P and BPR-POD projects. In this phase the strategic process was altered in order to consider processes explicitly in the strategy definition of the Business Unit.

The third phase (May 97 – March 1998) is continuing until end of year 2000. However, the research of this article was terminated in March 1998. In this phase, top management selected five major “business processes” originating from the reengineering of BPR-POD, BPR-P and supporting areas: “Idea to Sales”, “New Technology in Production”, “Rolling Sales Forecast (RSF) to Delivery”, “Product Line Maintenance”, and “Creating Customer Preference”. A “Flowmaker” (at director level) was appointed to each of the business processes to support and challenge the Process Management. The flowmakers (at director level) ensure and support cross-functional co-operation, alignment of activities and an ongoing challenge of the performance of the business processes through the line of business. In addition to the processes defined, a quality project was launch in order to get the production processes in control. Finally, the area of finished goods is being reengineered in order to complete the reengineering activities at Enzyme Business and focus entirely on process management.

During the four years of reengineering, performance has increased markedly. “Finally, the past years’ focus on productivity and improvement of internal business processes gave good results leading to increased profitability and competitiveness”, cf. President Mads Øvlisen (Novo Nordisk, 1998).

5. Analysis of the Case Study

In the analysis of the longitudinal study emphasis will be put on the development within each individual parameter, the reasons for this development, and the implications of this regarding BPR at EB, Novo Nordisk A/S.

5.1 Organisational Structure

Throughout the study the structure has maintained its existing functional structure containing 5 divisions. While the Marketing and Sales functions have been merged, a new division for “Economy, Planning and Logistics” was established. During the first phase the BPR concept was introduced. Consecutively, indepth analyses of customer perception were conducted. Hence, emphasis was put on customer focus and customer satisfaction. As the BPR concept was adopted, the focus on the business process diffused throughout the organisation. As EB still preferred the functional structure - in other words they did not want or dare to break the walls between departments, they were faced with the issue of securing the efficiency of the business processes in the functional structure. No process owner (as known from the literature (e.g. Hammer, 1996)) was appointed, as this would mean an overruling of the individual functions. Hence, the Flowmaker for each process was appointed to facilitate the flow of process and secure the process orientation of the involved. By facilitating is meant that the role of the flowmaker is to challenge and support the business processes by constantly questioning the actions taken.

5.2 Strategic Alignment

The use of BPR principles became part of the strategy as a mean in attacking the high cost level of the EB. Hence, the goals of the BPR projects were derived from the functional and industry strategies. In the first years there was no long-term strategy for the BPR activities. As BPR led to several recognition's, among other things the need for constantly adapting the business processes to the changing environment, a rethinking period of the strategy was acknowledged. This led to a transition of the strategic process. Now business processes became part of the strategic process of EB, as the functional and industry based set of strategies was extended to a “strategic cube” integrating functional, business process and industry strategies. The implications of this transition were that strategies and processes were simultaneously developed. Integrating several views in the strategic alignment process is also acknowledges by (Rühli et al., 1995).

5.3 Project Breadth

In the first phase, reengineering was initiated by two larger projects dividing the “order fulfilment process” (cf.

Figure 2), the pre-analysis of the BPR-Production project led to a 6 focus areas, which were treated as individual sub-projects with a narrow project breadth. Furthermore, 3 additional projects were launched with at project breadth spanning a single department. A consequence of this was that this scattering of narrow projects did not support an easy co-ordinated task with respect to the BPR-POD project. The hindsight of this was that the root causes of the BPR-Production project was not addressed until the relations between the projects were analysed (in phase 2). Then it was discovered that the root causes in the production process was lack of predictability and not long lead-times.

In the second phase projects with a broader project breadth were launch as the idea of reengineering well-defined sub-processes was developed. This gave birth to the concept of Business System Reengineering (BSR) projects, which was successfully carried out in phase 2. A BSR project was defined as a reengineering project incorporates the BPR principles and tools within a well-defined system, i.e. the project breadth was a sub-process or an organisational part that serves a common purpose. The holistic approach in the BSR projects facilitated the coming of processes. The many reengineered areas in addition to the emerging process awareness led to a natural and gradual transition to process management. These areas were decisively defined in phase 3 as five processes, which were to be managed.

The implications of this evolution in project breadth were that process orientation was obtained in spite of the functional structure of the organisation.

5.4 Skills in the BPR project

The BPR projects were established using existing internal employees with project management and analytical skills. BPR skills were brought into the projects through external consultants, courses, and on the job training. The first year external consultants were closely attached to the BPR-P project. During the second phase the BPR methodology was adapted and developed further (cf. the BSR and flowmaker initiatives), which during the end of phase 2 and in phase 3 led to maturity of the BPR project skills.

The implications of this were that BPR was adjusted to match the culture and wishes of EB (e.g. the continuation of a functional structure).

5.5 Measurements in the Redesigned Organisation

The measurements established in the BPR-POD project were focused on the performance of the Enzyme Business. Three measures were developed. Initially the Delivery Reliability (DR) was defined. This identified whether or not the goods were delivered as requested by customers. Later in phase 1 it was recognised that a more exact measure of customer satisfaction was required. Then the Delivery Quality (DQ) and Delivery Promise (DP) were defined. DQ identified whether or not the goods were delivered in the agreed quality, defined as within the right time, location, and condition with the necessary documentation, and the DP identified whether or not the goods were delivered as promised by Enzyme Business. A significant characteristic is that the customers are regarded individually, cf. agreed terms of delivery, which may imply increased customer retention.

These performance measurements are implemented in the annual appraisal system (APIS)-measurements of the employees, cf. Larsen (1997), in order to link incentives to business process related performance and they are an integral part of the basis for the ISO certification of the Enzyme Business. In addition, several additional Key Performance Indicators (KPI) have been developed to help identify performance deficiencies along the planning and supply chain.

The measurements established in the BPR-P project were focused on lead-time as mentioned earlier and later changed into a quality and production process capability measure. This was due to the realisation (in phase 2) of the fact that a time focus do not have any impact on the product quality, whereas quality on the other hand can give time advantage. This observation is even more crucial for organic deteriorating products as enzymes.

The measurements in the redesigned organisation had taken place independently of the BPR activities, but in a supporting manner and timing. The remuneration system has become increasingly performance oriented, and area goals are broken down to individual goals through APIS. As business process goals are part of the strategic set-up, the individual employees are also measured on how they contribute to the overall performance of the business processes they are part of (form phase 3).

5.6 Information technology

In BPR-POD the IT-solution (SAP/R3) has been a major lever for change. In the beginning of phase 1, the

status of IT systems was an array of function specific proprietary systems. In phase 2, the SAP/R3 implementation integrated the Sales and Service systems. This was later extended to the Distribution system on a world-wide basis.

The impact of focusing on an integrated information system is that the root causes of non-conforming orders are eliminated in the supply end of the company. Though the production has not yet been integrated, several production control systems has been implemented. The impact of this is that the problems regarding product quality have been reduced markedly.

5.7 Shared Values

Novo Nordisk A/S has a long tradition of being one of the strongest research companies in Denmark. Hence, "R&D excellence" is a prime company value also on a departmental level.

From a shared vision of regarding the company as "A well oiled machine", the values of the EB areas and employees became shared in phase 2. This vision was established at director level and diffused company wide.

In the end of phase 2, the Management at Vice President and director level initiated a process in order to nourish and upgrade the values for carrying out projects as well as general company practice. These were "trust, teamwork, clarity and will to win". The implications of generating these values were that the basis for empowering middle management to carry out their process related tasks in phase 3 and beyond were established.

5.8 Change Management

During the first phase of the study, change management issues regarding e.g. abilities for communication, motivation, coaching/training and manoeuvring in a political environment, were taken care of by the relevant line of business in which the BPR project took place. Consecutively, the Human Resource department was part of the BPR Steering Group and involved directly on ad-hoc basis. In the third phase, HR was involved on a regular basis, and in addition to that also the union of the operators was involved. The impact of integrating unions into a BPR project was a reduction in the resistance to change, and better assurance of the employees' point of view.

5.9 Learning and Results

In the first phase of the longitudinal study of BPR at EB, tools were adopted and experimentation were undertaken resulting in a general awareness of the need for cross-functional co-operation. During the second phase, the tools were applied to a wider extent and optimised based on the experiences gained. These efforts resulted in streamlined the business processes. In doing this, the processes were becoming more visible for the employees involved. A supporting factor in these results was the definition of an IT and a quality strategy concerning the entire business unit of Enzyme Business. Towards the third phase, EB engaged the concept of the Flowmaker as an innovative measure to ameliorate and bridge the inefficiencies of current organisational structure matching the preferred functional organisational structure. This construct facilitated the flow of the business processes. Another innovation was to integrate business processes in the ongoing strategic development. The implications of aligning the strategy and the business processes on a continuously basis is that the organisation becomes more agile, which may reduce the risk of strategic drift.

6. The Flowmaker Role

In this section we shall focus our attention on the new concept of the Flowmaker, and comment on the advantages and disadvantage of this concept. The reason for only focusing on the evaluation parameter "structure" is that the Flowmaker concept is new to the established body of reengineering knowledge.

As mentioned earlier, the purpose of the flowmaker is to challenge and support the business process, which (s)he is assigned. However, as a specific mandate is not assigned to flowmakers, the employees attached to the role share the responsibility of the individual business processes. With a number of people responsible for parts of the business process, shared responsibility is a potential pitfall when consensus can not be reached. Hence, the final authority rests with the top management. As the concept of a Flowmaker is presented here as an alternative to the BPR literature recommendations of a process owners, the advantages and disadvantages will be provided in the following.

There seems to be several advantages to the role of the Flowmaker, as the person responsible for the full business process in the otherwise functionally oriented organisation in order to preserve customer focus. Most important are

decreased change effort, reduction in allocated resources, and reduction in associated risks as existing structures are preserved (unless they contradict the process orientation and the customer focus), and as the organisational history including the existing knowledge is recognised explicitly. Another issue in favour is that all employees have to understand their contribution to the business process in relation to the area and industry strategies. The empowerment is a prerequisite for active use of strategy at all organisational levels. Previously, the strategies have been established and communicated by top management, which resulted in inadequate awareness of strategies throughout Enzyme Business.

The disadvantages of the Flowmaker approach are primarily the risk of doing business as usual, and that the responsibility is distant to the actual process. Pitfalls of this approach are that the construction relies on a single flowmaker to challenge the process. Also it relies on the skills of the flowmaker, i.e. the capacity for double loop learning, communication skills, and boldness when confronting top management with compromising observations. Furthermore, the approach relies on the resources of the flowmaker dedicated to this assignment. Another disadvantage to the approach is that the approach requires tight co-ordination of the flowmakers in order to establish a shared methodology, and in order to prioritise resource needs across business processes.

Summing up the observations, the Flowmaker concept seems as a relevant alternative to that of the process owner concept known from the literature, but which is very seldom found in practice.

7. Conclusions

This article provides an analysis of a longitudinal study of Business Process Reengineering effects spanning four years. A framework of BPR project evaluation parameters is applied to view the dynamics of the adoption, application, and development of the concept. An evaluation parameter framework was applied, however only the parameters, which showed significant development, are provided in this presentation of the study.

The reengineering activities leads to the establishment of the flowmaker in order to assure efficiency of the

business processes. The concept of the flowmaker was developed as the functional structure of the organisation was maintained. Hence, the role of the flowmaker was to constantly questioning the actions taken within a particular business process in order to secure the flow in a structure with more than one decision-maker.

The overall conclusion is that Novo Nordisk Enzyme Business has developed BPR in various ways based on their experiences gained in 25 BPR projects in three phases. In this way the study shows the innofusion of the BPR concept, i.e. that the practice has been innovated while it was diffused over time throughout the organisation.

8. Perspectives

As concluded above, the concept of BPR is innofused over the period of 4 years. This could be illustrated in the "Business Evolution Spiral" of Enzyme Business (cf. Figure 3). The Business Evolution Spiral is proposed as an elaboration of the Business System Diamond (cf. Figure 2) in order to emphasise that several iterations in the Business System Diamond is required in order to *mature* the organisation in applying and obtaining success by the concept of BPR. The smooth Spiral does not, however, fully account for the hurdles of carrying out the reengineering project. As the Spiral goes through predefined phases, it needs more empirical grounding in order to verify the proposal of the Business Evolution Spiral.

The Spiral follows the three phases of the longitudinal study, however, it does not end here. The practice of BPR has now been developed and matured in Novo Nordisk A/S with among other things the introduction of the role of the Flowmaker. But development will not stop here, as Figure 3 suggests. Management is determined to "Maintaining the momentum" (cf. Figure 1), and a likely development in focus attention on Knowledge Management and E-Business in relation to the business processes (also called e-engineering) might be the next wave in the Reengineering endeavour at Novo Nordisk Enzyme Business.

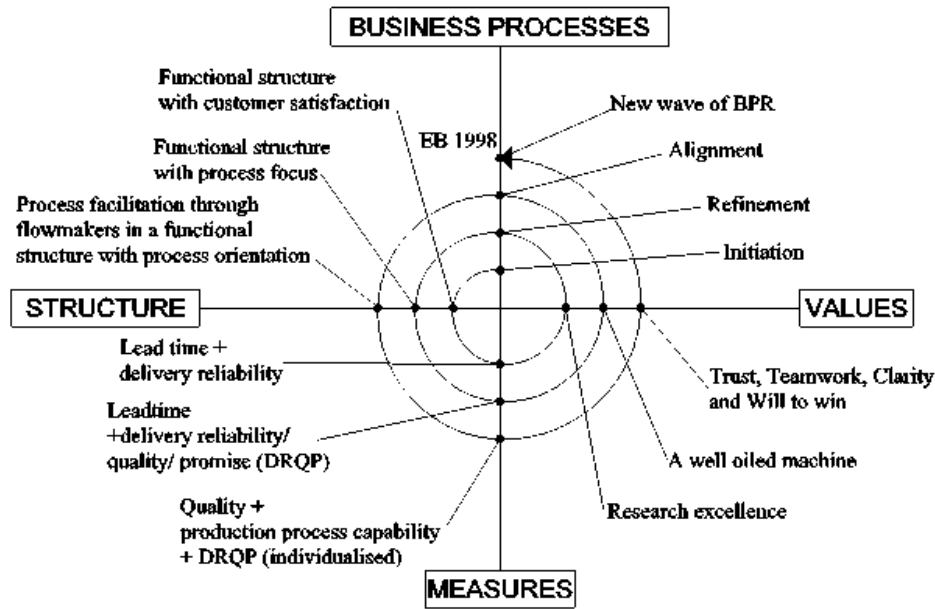


Figure 3: The Business Evolution Spiral of Enzyme Business.

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