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Realising Strategic Management Reengineering Objectives with DEMO

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Abstract

Executives are experts in managing their business systems, much in the same way Formula One drivers are experts in driving their cars. However knowing the behaviour of cars doesn't tell one how they are constructed and could be improved with new technology. The same holds true for Reengineering Business Systems through Information Technology. If management wishes to redefine the organisation, technical skills and knowledge of reengineering information systems are required to realise these objectives. Therefore Reengineering the Organisation will have to integrate a technical and a strategic management approach. In this article the Theory of DEMO is presented as a fundamental new perspective for Reengineering Organisations through IT.

1 Introduction

Market turbulence and technological developments are changing organisations and the way in which business is conducted. Business Redesign is necessary in order to act constructively. In this Information Technology is seen as an enabler to achieve new forms of organisation (Hammer, 1990; Scott Morton, 1991). After losing the interest of management, employees and consequently consultants, technical methodologies such as Information and Business Systems Planning are being replaced by IT-induced strategies. These current approaches to Business Redesign largely draw from economic theories, such as industrial organisation economics for strategic management (Porter, 1980). Models that derive from Porter's Value Chain (Porter, 1985a) have appealed to the interest of management in general and of scientists, especially in the field of Business Redesign (Scott Morton, 1991). Models as these have made a huge contribution as a starting point for Business Redesign, but they lack the ability to support consistent management decision making and communication in the further and more specific aspects of systems design, for one simple reason. Strategic Management is about allocation and growth of organisational resources and not about a powerful change approach that can bring radical improvements by redesign of business, information and data systems.

Therefore a new perspective on organisations as well as on the practice of IT has to be established, which provides an approach and tools that address the envisioning, enablement, or implementation of radical change (Davenport, 1993). However, the popular management literature has created more myth than practical methodology (Davenport, 1994; Dietz, 1994). In this article a revolutionary foundation for Business Redesign through IT and a more coherent approach is presented than currently applied in BPR-methods. This way of thinking is based on the informatical theory of Dynamic Essential Modelling of Organisations (DEMO) by Dietz, which captures the essence of organisations by analysis of transactions from a Language/Action perspective. On the principle that

complex processes can be decomposed into discrete transactions, the ‘primitive’ building blocks are provided for translating Business Redesign into information systems specifications, thus providing a grounded approach for Business Redesign through Information Technology (Keen, 1991).

2 The problem of Strategic Management foundations for Business Reengineering

The history of information systems design is a history of borrowing from other disciplines. This borrowing began when people suggested similarities between business processes and computer software processes. From this perspective, business processes were viewed mechanistically as if they were computer programs. The first systems design methods were an extension of software engineering principles. Other concepts were borrowed from organisational science to address important social factors in implementing IT-projects. More recently, ideas from microeconomics (Porter, 1980; Porter and Millar 1985) have been borrowed in the development of IT-induced strategies and the Business Redesign model (Scott Morton, 1991). Although the use of methods, such as Yourdon’s System Development and Porter’s Value Chain have advanced and contributed to parts of business systems design, the underlying assumptions, reasoning and common paradigm of these sources lead to difficulties in the field of realising Strategic Management Reengineering Objectives.

System analysts or designers, or whatever title is used to describe the role of intermediary between management and software engineers, will have to understand both the strengths and limitations of these non-informatical theories in their profession. Examples of purely informatical methods, are DEMO and the Flores-Winograd workflow model. These methods focus on communication processes to understand the business, rather than starting to examine the current organisational structures or documental flows. We will not elaborate on all sorts of problems that can arise when designing systems on non-informatical foundations, but we will give an impression of the pit-falls when applying technical or strategic management approaches.

2.1 The Technical Approach

Originating from the 1950’s the common paradigm of software engineering is seeing information and data systems as lines of code or as tables and relations, nowadays. Software engineering principles show a bottom up approach with regard to data collection, modelling and design.

When an analyst takes as ‘given’ the validity of current business processes, the starting point of IS design and development is data collection rather than business processes. Data collection methods are mostly based on interview techniques, work observation or analysing current documental flows. Then a business process model is composed of the gathered and selected ‘relevant’ data followed by sophisticated modelling principles. Lastly systems are defined, which can be done by rigidly executing techniques such as Create/Use matrices.

Fig. 1.: Overview of Systems Development

The ultimate goal of this paradigm seems to be the development of information systems. Applying the techniques lead to programmable representations of the organisation. This implementation driven approach focuses on the documental and informational level for increasing the efficiency of the current organisation.

The technical paradigm was valuable within the given time frame of early automation. Programming was complex, time consuming and required expensive and highly trained professionals, which implied that technical implementation had its limitations. It was key not to limit the organisation to this immature state of technology. So one of the rules of thumb became: automation has to fit precisely in existing organisational procedures and documental flows. This rule is contrary to the approach of business redesign.

The software engineering approach was a major step forward in systems development, but borrowing from software engineering without regard to or being aware of its goals and assumptions has it risks for systems design. Methods for Business Systems Planning based on these premises are considered too technical and complex to be fully understood and executed by management and employees. Because of the need for consultancy and the time and effort of the organisation members to specify all processes and data flows on paper, information planning comes at a too high cost.

Although formal methods provide in-depth techniques and consistency checks for information analysis, formal methods seem to have gone out of favour with management, employees and consequently consultants, but the arguments for systems planning and design remain. For this reason some organisations have introduced light versions of information planning methods. These so called light versions give directions regarding the contents of an information plan, but do not suggest the use of method. The light versions allow people freedom in ways to think and work, but they do not provide a foundation (i.e. common reference) for analysis, design and implementation.

2.3 The Strategic Management Approach

Market turbulence and IT developments (Scott Morton, 1991) led to changes in the rules of competition and ways of organising in the 1980's. Many of the constraints imposed by these market forces cannot be anticipated, and thus enormous uncertainties and ambiguities arise concerning the appropriate responses to these forces. These uncertainties, in turn, have seemed to suggest that a firm's performance depends on its good fortune more than on its quality of management. These ideas were contradicted by several research traditions in microeconomics, notably Industrial Organisation (IO) economics, which argues that organisations both shape and respond to market forces, and that a firm's performance ultimately depends on this mix of action and response. This IO conception of competition has shown to be relevant to business redesign through information technology. The IO version has been incorporated into popular theories of strategy, by Porter among others.

In IO economics industries are the unit of analysis. Porter (1981) states that this basic concept of IO, first developed in 1939 by Mason and Bain, offered strategic management a systematic model for assessing competition within an industry. In this model, returns to firms are determined by the structure of the industry. It was Porter's contribution to lift the deterministic limitations of the Mason/Bain paradigm by showing Competitive Strategies that change the structure of a firm's industry and thus gaining superior performance (Porter, 1980). Thus Industrial Organisation economics offers strategic management a systematic model for assessing and structurally changing competition within an industry to gain superior performance (Porter, 1981). Later the Value Chain was presented as a concept to achieve Competitive Advantage (Porter, 1985b).

Fig. 2. Plot of the Value Chain

More recently, the ideas of IO economics (Porter and Millar, 1985a) have been borrowed in the development of IT-induced strategies for gaining competitive advantage, which is a starting point for Business Redesign. Business Redesign advocates a revolutionary change of structure and processes of the organisation in order to act constructively. Information Technology is seen as an enabler to achieve a new organisation (Hammer, 1990; Scott Morton, 1991; Davenport, 1993). Five primary concepts can be identified that make up Redesign :

1. A clean slate approach to organisational design and change.
2. An orientation to cross-functional business processes, or how work is done.
3. The need for, and possibility of, radical change in performance.
4. Information technology as an enabler of change in how work is done.
5. Changes in organisational and human arrangements that accompany change in technology.

It is the combination of concepts that is new in Business Redesign (Davenport, 1994), not the concepts considered individually. Venkatraman defines this IT-enabled business reconfiguration as consisting of five stages, in which the first two stages, automation of isolated activities and building an infrastructure, are the foundation for the other three non-sequential revolutionary stages (Scott Morton, 1991). Stage three, business process redesign, concerns rethinking and integrating the most effective way to conduct business internally. Stage four, business network redesign, includes suppliers, customers, or anyone else who can contribute to the firm's effectiveness. In stages' three and four the organisation remains within the same industry, which has a resemblance to industrial organisation economics. The fifth stage is business scope redefinition, which sets out to exploit new technology in the marketplace and products, much like a Schumpeterian revolution.

In contrast to the technical approach based on software engineering concepts, strategic management is characterised by a more top-down approach. Venkatraman puts it as follows (Scott Morton, 1991) :

A fundamental tool, as IT is best deployed by those with enough vision to see what it can realistically mean to the organisation. In short, general management, and preferably senior general management, should be in direct control. This predicated on a fundamental logic that IT is to be increasingly viewed from a general management (or strategic management) perspective in addition to the traditional perspective of the information systems (IS) function. This reflects a logic that effective exploitation of IT, could involve significant change in organisational strategy, management structure, systems, and processes that can not be accomplished from a functional perspective.

The differences between the strategic management and the traditional technical perspective are evident: The guiding principle in strategic management is on alignment of the Business and IT strategy and not IT for implementation.

2.3 Fundamental difficulties with the Strategic Management approach

The emphasis of strategic management is, of course, on strategic issues, but how are practical questions solved like 'How to distinguish revolutionary opportunities for redesign ?' and 'How to model the way of rethinking the internal and network processes ?' and 'Which techniques are suitable ?'. Davenport (1993) states about analysis precluding to the design and implementation the following:

Inasmuch as understanding current processes is an essential element of all traditional process-oriented approaches, we look to these methods for tools and techniques that might be used to improve existing processes in an innovation initiative. Process diagrams, such as flowcharts, are among the most useful of these tools. Traditional approaches use flowcharting to understand and communicate about processes. The cost build-up chart, another commonly used tool, can be used to reveal process cycle time. In all cases, care must be taken to ensure that the tools and techniques selected fit the overall objectives of the innovation effort.

None of these traditional improvement approaches is likely to yield radical business process innovation. Although they may share characteristics with process innovation, all begin with the existing processes and use techniques intended to yield incremental change; none addresses the envisioning, enablement, or implementation of radical change.

A management interpretation of the practical implications of the Business Redesign approach is given by (Scott Morton, 1991). When examining the Value Process Model of MacDonald, the following statements are interesting :

Value Chain diagrams are frequently used to illustrate the transformations that have taken place in organisations. But many practical problems arise when attempting to develop value chains for an organisation and then using the value chains as the basis for strategic review and business process redesign...The approach suggested by Porter for developing a value chain does represent a starting point. The basic "powerhouse" of the organisation needs to be identified and decomposed, at least to the levels of inbound logistics, operations, outbound logistics, sales and marketing, and service. In practice, some types of industries, particularly government and service industries, do not easily relate to these headings, but with imagination the principles can be applied. The model must reflect an appropriate level of granularity such that the major process elements are all visible. Experience suggests that the level of required detail resolves itself. Having constructed a Value Process Model, probably in the form of a flow-chart, an attempt should be made to compress it into a linear format.

Remarkably the references to theories or methods that support management are limited only to (Porter, 1985b). Porter's Value Chain provides general principles for improving products, customer and supplier relationships, and creating barriers for substitutes and competitors. The Value Chain is adequate to present an overall picture of the organisation and its environment, but this perspective is too general for realising Reengineering Objectives. In practice management supports projects which aim to bring organisational change based on the ideas that seem valid at that time.

2.4 Conclusion

One observes that Strategic Management approaches, like Porter's Value Chain however popular they may be, are lacking practical methodology and suitable techniques for Reengineering. Some difficulties of the strategic management approach for reengineering the firm are :

- Modelling of different types of industries
According to the Value Chain the first model of an organisation needs to be decomposed to the levels of inbound logistics, operations, outbound logistics, sales and marketing, and service. Originally (Porter, 1985b) the value chain focused on production. Later (Porter, 1990) services, such as information processing, were positioned in activities, such as outbound logistics. As (Creemers, 1993) notes 'Services are seen as adding value to goods production. This is not a satisfying situation. How, for instance, can a bank or an insurance company profit from the value chain approach without using terms such as inbound logistics or without adding value to manufacturing processes ?'. Thus grounded reasons for starting with a functional decomposition of inbound logistics, operations, outbound logistics, sales and marketing, and service remain unclear.
- Alignment of Business and IT strategy
To realise Strategic Management Reengineering Objectives, concepts as 'inbound logistics' have to be transformed into the details of information system design. Simple IT principles and notions such as electronic data interchange or bar-coding to improve 'inbound logistics' are all too general to be considered the advocated change in organisational strategy, management structure, systems, and processes, which can not be accomplished from a IS functional perspective. When attempting to realise Engineering Objectives on the basis of a functional (re)design of the Value Chain, one will experience that functional decomposition doesn't lead to specifications for technical redesign; knowing the behaviour of business systems doesn't tell one how it is constructed and could be improved with new technology.
- Decomposition
Decomposition is poorly supported to one level of abstraction, such as Operations or Sales. Methods for how decomposition is achieved and consistency is checked seem to be missing in the Value Chain Theory. In practice this leads to using technical techniques for systems development, which are more suitable for implementation of IT than Reengineering the Organisation through IT.

Clearly the starting point of the Value Chain is strategic, but the management decision making and communication is not supported in the additional and more specific process of realising Strategic Reengineering objectives. The idea of having separate strategic management methods and separate techniques, based on software engineering principles, for realising the strategic management reengineering objectives has evolved to be self-evident. This division of methods for management and reengineering have rooted deeply. Therefore it is important to offer a new perspective which distinguishes and integrates the levels of business and informatics.

3 Dynamic Essential Modelling of Organisations

3.1 Redesign with DEMO

In this section a theory and analysis method are presented which provides the tools to examine business transactions and as well as a revolutionary method for realising business redesign through IT. Keen (1991) points at the conversion for action approach as a new approach to analyse business processes. According to Keen one of the distinctive strengths of this approach is that it provides a customer satisfaction base for targeting IT applications within and across the phases of the work flows. Many work flows require cross-functional activities. This can lead to breakdowns in co-ordination and affect customer satisfaction by creating delays, lost information, or misunderstandings. As an exponent of the language action perspective Keen refers to Flores and Winograd (1986), who built the BDT-method and subsequently the Action Workflow products on the principle that a basic business process is a four-part “action work flow” (proposal, acceptance, performance and satisfaction phase), so that complex processes can be decomposed into workflow loops. These loops provide the ‘primitive’ building blocks for translating Business Redesign into information systems specifications and visa versa. From a management perspective every activity inside the customer/performer loop - and every information or processing system - can damage or enhance customer satisfaction. A comparable approach is proposed in (Dewitz and Lee, 1989).

Reengineering is a powerful change approach that can bring radical improvements in business processes. However, the popular management literature has created more myth than practical methodology regarding reengineering (Davenport, 1994; Dietz, 1994). When examining current literature on Business Redesign, analysis methods and techniques that support Business Redesign are exceptions (Reijswoud and Rijst, 1995). One of them is Dynamic Essential Modelling of Organisations by Dietz et al.. DEMO draws on the philosophical branches of semantics and scientific ontology. An other major source has been the mathematically defined rigid approach to the notions of discrete systems and modelling system dynamics, as described in (Dietz, 1989; Dietz, 1991). The 'conversation-for-action' approach as implemented in the Action Workflow products (Medina-Mora et al., 1992) has been one of the major sources of inspiration for the development of DEMO. The Language/Action perspective argues that the core of an organisation is the network of discrete recurrent conversations. Applying the language/action perspective has generated numerous insights both in academic (Dietz, 1991) and applied setting (Medina-Mora and Denning, 1995).

The idea behind Business Redesign is defined as that more effective usage of IT can be achieved if the IT applications would be designed along with a redesign and reengineering of the business itself. To support the practical realisation of this idea, one needs a model of the organisation which shows the essential characteristics of the business and which abstracts from the way in which they are realised by means of information technology and organisational structures (Dietz, 1994). In much the same way as a documental model is of little use for studying informational issues, an informational model is not very well suited for studying the real business issues from the informatinal point of view. These issues come into sight when we extend our focus to the essential level.

Fig.3.: Redesign of Information Systems

Figure 3 shows that for any organisation there exists one documental model, one informational model and one essential model at any moment. In principle though, one may conceive of a number of documental models, all realising the same informational model and one may conceive of a number of alternative informational models realising the same essential model. The transfer from the essential model to an informational model is what (Re)design is about. In principle there are a number of informational models, all realising the same essential model. Otherwise said, there is a freedom of choice, and consequently a choice problem (Dietz, 1994).

Fig. 4. : Redefinition and Redesign of the Business System

At the documental level an organisation is viewed as a system of actors that produce, store, transport and destroy documents. At the informational level one abstracts from the substance and the syntactic aspect in order to focus on the semantic aspect of information. What one observes now is a system of actors that express and receive messages (semantic meanings) to and from each other.

This is the level where most current technical methods and techniques (e.g. the DFD and the ER-model) aim to be helpful. In DEMO these two levels are extended with a third level, called the essential level. As a consequence of abstracting from informational issues, all actions concerning reproduction and derivation are eliminated. The term "essential" has been used previously in informatics notably in (Yourdon, 1989), but does not differ from a logical model, which aggregates physical data processes. To explain the real value of the essential model, one should compare the actual way of carrying through a financial transaction of a bank some 40 years ago with the way they are carried through with information technology, nowadays. The essential model is the same in both cases, but all less abstract models (e.g. those expressed in DFD's) differ. Another characteristic of DEMO is discrete decomposition. Contrary to modelling methods in the technical approach which often lead to an uncontrolled, complex, subjective and paper consuming explosion of objects and relations, which makes these models almost inaccessible, DEMO provides intuitive and effective models. A comparison between existing speech-act based methods, such as used in Action Workflow products, shows that DEMO offers a distinction in models to differentiate the essential from the informational and documental level. Action Workflow for instance allows the mapping of documental actions as the initiator of informational and even essential transactions.

What one observes when focusing on the pragmatic aspect of a business system in which actors carry on performative conversations : Actagenic conversations, resulting in agreements about future actions and factagenic conversations, resulting in the establishment of facts. Only in performative conversations, original new things are accomplished, we consider these conversations to represent the essence of the organisation. Consequently, we call the actions that are agreed upon in actagenic conversations and the results of which are established in factagenic conversations, essential actions, and the conceptualisation of the system observed the essential model of the organisation (Reijswoud, 1995).

Fig. 5.: The discrete transaction model

Every (essential) action is embedded in a transaction and every established fact is the result of the successful carrying through of a transaction (see figure 5). This constitutes the DEMO transaction paradigm. The transaction is the unit of analysis in organisational behaviour and is divided in three parts. In the actagenic conversation (e.g. negotiation phase) a commitment is stated that one of the parties (e.g. actor 2) will perform an essential action. The result of an actagenic conversation is called an agendum (singular of agenda). After execution of the essential action the third part of the transaction follows; the factagenic conversation. In this phase the actors are reaching an agreement over the outcome of the action. The result of the factagenic conversation is the creation of a fact, which states that the negotiated action has been performed. Actor 1 is called the initiator of the transaction and actor 2 the executor. In each of the time-intervals a breakdown can occur, resulting in an unsuccessful completion or a partial retry of the transaction. An extensive discussion of the transaction model is contained in (Reijswoud, 1995a).

DEMO starts with the set up of the communication model. The Communication model is the specification of the (elementary) actors and of the interaction and interstriction structure. By interaction structure is understood the mutual influency through being initiator or executor of transactions. By interstriction is understood the mutual influencing by means of created facts that play a role in the condition part of the behavioural rules that are executed in carrying through transactions. The Information model is the specification of the state space and the process space in the object world, i.e. all information which is produced and used in the transactions of the organisation. The Behaviour model is the specification of the behaviour rules of the actors (procedures for the execution of an essential action), i.e. the system dynamics. Actors in the model are restricted to the organisation, represented as one elementary actor, and its network. Depending on the required level of abstraction actors are decomposed. The execution of an essential action can depend on the outcomes of other transactions, such that transactions can lead to external purchasing or internal production transactions which have to be performed to complete the transaction.

3.2 Conclusion

In this article we have presented the Theory of DEMO as a fundamental new perspective for Reengineering Organisations through IT, which provides a Strategic as well as Informatical theory to Reengineering, this offers the following advantages :

- Modelling of different types of industries
DEMO has an unique informational perspective on the organisations, which is not limited to one type of industry. Each transaction in DEMO consists of an essential action, such as delivering a product or service, and conversations, which allows information processing.
- Alignment of Business and IT strategy
DEMO provides an ideal starting point for business Reengineering projects, because it distinguishes between essential actions on one side and informational and documental actions on the other side. This model of the essential characteristics leaves the right design freedom to the management and information experts. The transaction model in DEMO is based on knowledge how business systems operate. Thus redesign of transactions leads to specifications for systems redesign to realise Engineering Objectives.
- Decomposition
DEMO abstracts completely from the organisational structure and technological way in which transactions are performed. This decomposition of transactions is intuitive and understandable by managers and employees and results in less paperwork compared to technical methods. The unique distinction between essential and informational actions in DEMO allows a scientific clean slate approach to determine the extent in which new technologies can be applied to obliterate old processes and to reengineer new transactions.

The successes of Business Redesign through Information Technology are well-publicised, but in practice organisations often have to rely on the intuition and experience of the management and IT-staff to realise the Reengineering objectives. DEMO provides a grounded theory, method and techniques which support the Reengineering of the organisation. Several small and large projects have been performed in which DEMO has succesfully been used as methodology for redesign and reengineering (cf. (Reijswoud and Rijst, 1994; Reijswoud and Rijst, 1995a; Reijswoud and Rijst, 1995b; Jansen and Poot, 1995)

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