

Information Systems and Process Orientation

– Evaluation and Change Using Business Action Theory

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Abstract

The first purpose of this paper is to outline suitable features of, and strategies for developing and purchasing information systems (IS) in organisations striving for increased process orientation, based on the results from two in-depth case studies and related theory. The results are based on an evaluation of IS and business processes using Business Action Theory (BAT). The second purpose of the paper is to present experiences using BAT as an approach for evaluation of IS and business processes in an organisational context. In analysing data BAT helps to focus on the character and the relations between different critical business actions in a process dimension. The need for information on IS at different departments and a higher integration level was also highlighted when using BAT in studying critical business actions.

Keywords: *Information Systems, evaluation, information systems development, organisational change, business processes, case studies, business action theory*

1. Introduction

In order to increase competitive advantage of organisations a common approach today is to become more process oriented. We can identify process orientation in change concepts such as Total Quality Management (TQM) and Business Process Reengineering or Redesign (BPR) (e.g. Imai, 1986; Davenport, 1993; Hammer, 1990; Hammer and Champy, 1993). Information technology or information systems (IS) is often proposed as a corner stone and enabler for organisational change in these concepts, particularly in the BPR approaches. The role of technology is to cut costs, support teamwork, shorten cycle-times, improve efficiency, support improvement, and/or innovation (Iden, 1994). BPR approaches also seem to imply a so-called clean slate approach to change, even concerning IS — however, the system legacy in organisations is an economic reality (due to large monetary and competence investments), that can not be ignored. IS developed for a more hierarchical, departmental focused, organisation can be a part of the system legacy, and may be an obstacle for increased process orientation. A diametrically opposed view of IS (compared with the BPR concepts formal-rational perspective) is based on the web models developed by Kling and Scacchi (1982). Web models view IS as complex social objects constrained by their context, infrastructure and history.

1.1 The Need for Evaluation of Information Systems and Business Processes

In order to change existing IS in the appropriate direction (to support and enable organisational change), or to replace them, there is a need for an evaluation of IS and business processes in organisations. There are many evaluation techniques or approaches, but no commonly accepted approach to perform evaluation. Symons and Walsham (1988) identify four groups of evaluation approaches with different content and focus: cost/benefit analysis, value analysis, decisions analysis, and management value added. These four approaches have been rejected since they are too narrow and insufficiently cope with social issues. The authors argue that there is a need for evaluation of both IS and organisation, and not independently (based on e.g. Kling (1987) and Hirschheim (1985)). They also argue for an interpretative approach to evaluation, based on four supplementary conceptual frameworks. These four are formal-rational, structural, interactionist, and political perspective. All these perspectives seem, however, to have an intra-organisational focus without an explicit view of the customer, and how to interact with and satisfy the customer.

We follow Symons and Walsham (*ibid.*) for an evaluation of both IS and organisation, together with an interpretative approach. However we reject that a conceptual framework only should have an intra-organisational focus. Instead such a framework should also include the business interaction with customers. For these reasons we choose to use Business Action Theory (BAT) (Goldkuhl, 1996; 1998) as a conceptual framework in evaluation of IS and business processes.

1.2 Research Questions and Purpose

The IS are almost taken for granted be a supportive force in several approaches to change — but does the IS have the features that are needed to meet the challenge of the

“new”, process oriented organisation? Do IS developed for a hierarchical organisation support a process oriented one? Is the IS managed in the appropriate way to support the expected organisational change? Is Business Action Theory a useful approach to perform evaluation and change of IS and business processes?

The first purpose of this paper is to outline suitable features of and strategies for developing and purchasing IS in organisations striving for increased process orientation, based on results from two in-depth case studies. The results are based on evaluation of IS and business processes using BAT.

The second purpose of the paper is to present experiences using BAT as an approach for evaluation of IS and business processes in an organisational context.

The next section of this paper describes BAT. Section three then contains research and evaluation strategy and the results from applying BAT in two case studies: the paper-mill and the manufacturing company. Conclusions are then presented, including important results from case studies and experiences from using BAT.

2. Business Action Theory

In many BPR-approaches there is an emphasis on viewing business processes as transformations of input to output. Hammer and Champy (1993, p. 35) define the notion of business process in the following way: “A collection of activities that takes one or more input and creates an output that is of value to the customer”. Davenport (1993, p. 5) gives a partially similar, but more exhaustive definition: “In definitional terms, a process is simply a structured measured set of activities designed to produce a specified output for a particular customer or market.” [...] “A process is thus a specific ordering of work activities across time and place, with a beginning and an end, and clearly identified inputs and outputs: a structure for action.”

Reading these two definitions, one can see the basic idea that a process is conceived as a set of ordered activities that takes some input and transforms it to some output for a customer. We call this view a transformation perspective on business processes. This view has been challenged by Keen (1997). He argues for a co-ordination view to replace the transformation view. Co-ordination of people is considered as the essence of performing processes. We totally agree with Keen that co-ordination aspects are left out in many BPR approaches (cf. the above definitions) and that such aspects should be put into foreground when studying processes. However, we do not think that a transformation view should be totally abandoned: it should be kept, but put within a co-ordination view.

There are existing approaches to the design of business processes taking a co-ordination perspective. The most famous approach of this kind is probably Action Workflow (e.g. Denning and Medina-Mora, 1995). In Action Workflow there is a focus on the interaction between the two (generic) roles: performer and customer. Four different phases are described on how the two parties accomplish a “business transaction”. After a preparatory phase the two parties come to an agreement on what is to be performed. After that the performance (by the performer) occur and the process is ended by an acceptance made by the customer.

In the spirit of viewing business processes as co-ordination and transformation BAT has been formulated (Goldkuhl, 1996; 1998). According to BAT a business process is divided into six generic phases:

1. Business prerequisites phase
2. Exposure and contact search phase
3. Contact establishment and negotiation phase
4. Contractual phase
5. Fulfilment phase
6. Completion phase

The Business Action Theory describes a business process in terms of the interaction between two generic business roles: A customer and a supplier. The different phases and the interaction between the two roles are described graphically in figure 1.

The first phase includes the establishment of prerequisites, on both sides, for business interaction. The supplier must have ability (a know-how and a capacity) to perform business. The customer has operations where there exist some lacks and needs. In the second phase there is a contact search of each side, which includes exposure of business interest. When making contact, the two parties can start negotiating (phase 3). This communication can be described as proposal stating. Bids and counter bids are made. The desire and demand of the customer are expressed.

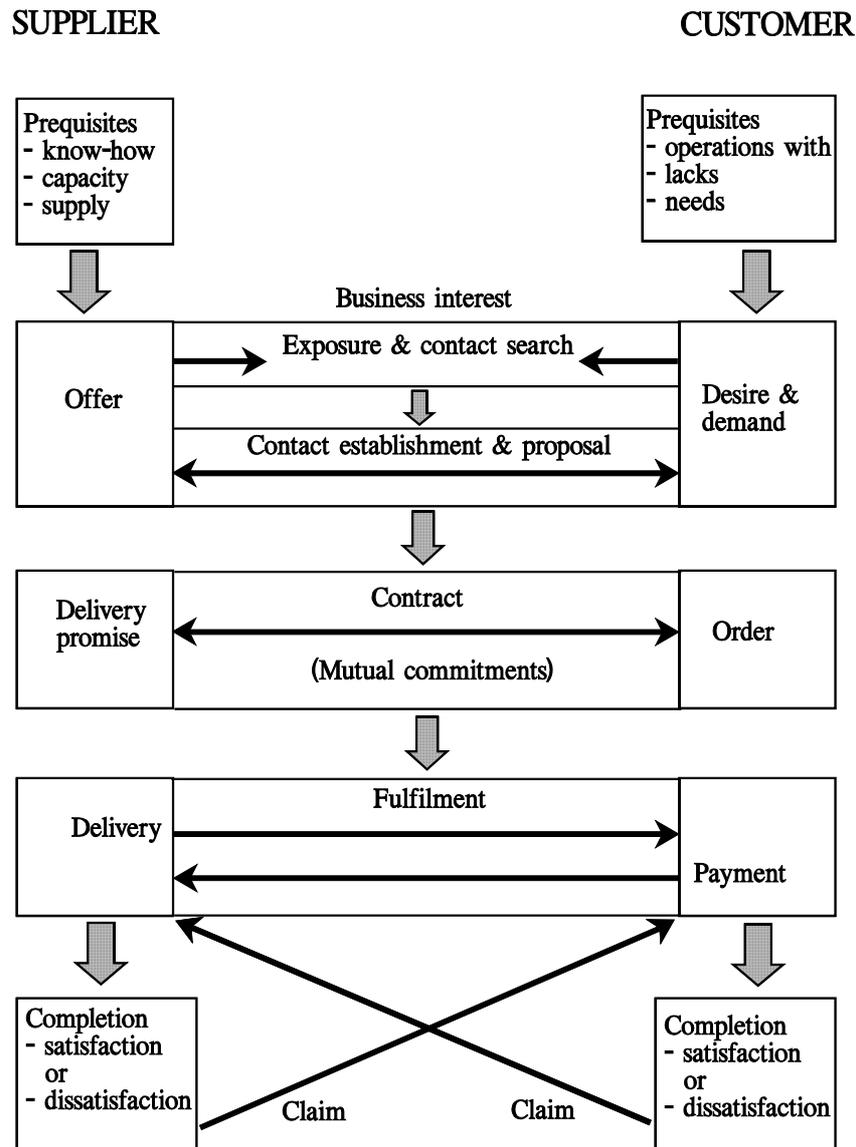


Figure 1 Business Action Theory: A phase model

The supplier can make offers (of standard or customised character). The negotiation can be terminated (which ends up the business processes) or transferred into a contractual phase. This is the fourth phase.

Customer and supplier come to an agreement concerning the business transaction. The contract involves mutual commitments. These different commitments must be fulfilled; otherwise the contract is broken. This fulfilment is made in the fifth phase: The supplier delivers and the customer pays. If not satisfied with the delivery, the customer can make a claim. The supplier is asked to make some modification in the delivery. Correspondingly, the supplier can make payment claims towards the customer if

needed. This is the sixth, and last phase which involves assessments of the fulfilment leading to satisfaction or dissatisfaction.

BAT has thus a focus on generic business actions, both communicative and material actions. It involves the interactive co-ordination between customer and supplier. The fulfilment phase of the supplier usually consists of a transformation of input (raw material) to output (finished products). The BAT model is a symmetric model giving full account to both customer and supplier, which is seldom done in the marketing literature (confer critique in Axelsson and Easton, 1992; Goldkuhl, 1998). Many marketing theories seem to take the perspective of the supplier viewing at the customer (e.g. Kotler, 1994).

The theoretical sources behind BAT are of two kinds: Language action theories (e.g. Searle, 1969; Habermas, 1984) and business relationship theories (e.g. Axelsson and Easton, 1992; Gummesson, 1996). The language action background is used to identify and characterise different communicative actions. Business relationship theories are needed to give the proper business context, including interaction of the two roles.

The main purpose of BAT is to describe and explain business interaction. But this is not the only purpose. BAT can also be used as a theoretical lens in organisational change when developing business processes. The theory can be used as an interpretative framework when reconstructing, evaluating and redesigning different business processes. In such change situations it should be supplemented by suitable development methods (Goldkuhl, 1996; Lind and Goldkuhl, 1997). BAT should thus not be seen as a development method. The Action Workflow approach mentioned above is on the contrary an integration of theory and method into one unified whole. There are other important differences also, although BAT and Action Workflow partially share the same theoretical basis in language action theories. A comparative review of BAT and Action Workflow is made in Goldkuhl (1996) and Verharen (1997).

3. Case Studies: Evaluation of Information Systems and Business Processes

This chapter contains the research and evaluation strategy of two case studies using BAT for understanding information systems and business processes. Information systems features and strategies for development and purchasing are also presented as a result from using BAT.

3.1 Research and Evaluation Strategy

In the two cases studies an overall qualitative research approach is applied (e.g. Yin, 1994). Two in-depth case studies has been performed with the use of interviews, studies of documentation and "face-to-face" studies of IS as methods for data collection (cf. Denzin and Lincoln (1994)). Interviews are conducted with people from different departments and from several hierarchical levels in the companies. The choice of informants has been made in order to get a "rich picture" of the IS and organisation and catch different perspectives of the phenomena (perceived quality of IS and business processes). IS/IT-managers, business development projects managers, system developers, and daily information system users in e.g. sales- and marketing, production plan-

ning, and production are represented in the group of informants. This approach is chosen in order to triangulate data (Denzin, 1978), to capture social meanings held by the actors within the organisation concerning IS and business processes, and also to discover new meanings.

The two anonymous cases, the paper-mill and the manufacturing company, are both striving for an increased process orientation in combination with changes/investments in IS. Some aims of the two Swedish companies are to increase quality, to become more customer oriented, to implement continuous improvements in the daily work, and make a more cost efficient use of IS. The two companies have, of course, both similarities (directions of organisational change, goals etc.) and differences (in size, production processes, products, markets and IS legacy).

The paper-mill is a rather small producer of paper and has a market strategy to be a flexible supplier of goods. Their competitive edge is to make fast adaptations of their production equipment in order to satisfy customer needs. The adaptations in the production equipment must, according to the company, be supported by a mental and competence capacity change in the staff to be successful. The IS in the paper-mill is often developed in-house, but some standard-packages for payment of salary exist as well.

The manufacturing company is, under Swedish circumstances, a large company. The company has, for many years, been an actor on a stable market, but, for a couple of years, has been trying to expand its market. In its efforts the company meets competition, and wishes therefore to become more business oriented. The company was, when the case study was performed, implementing a large standard-package mainly for financial use. Other IS at the company are often developed in-house, during several years, and by support from several different subcontractors. The systems are often based on different platforms, disparate operative systems etc. that makes communication between them difficult.

The use of BAT in our research can be characterised as a guide for and “checklist” for both questioning and analysing empirical material. The approach has, however, not been excluding open questioning in the study. Such open questioning is necessary in order to generate not “pre-defined” concepts and categories, from the empirical field. The open questioning and “open use” is made in order to (1) have the possibility to discover phenomena that are not covered by the guide and checklist, and (2) in order to identify potential improvements for BAT.

This approach can be compared with the open and axial coding of the Grounded Theory approach (e.g. Strauss and Corbin, 1990). In the data collection phase we apply an open questioning. BAT is used as a checklist in this phase. The initial analysis of data is performed as an open coding. The next step in data analysis is to perform axial coding. The axial coding in this case is guided by BAT as an action oriented frame of reference for questioning and interpretation.

3.2 Understanding Information Systems and Business Processes Using BAT

The evaluation of IS in the two companies was made using BAT (figure 1). The different phases in BAT consist of several critical business actions. A selection of identified

critical business actions performed by the suppliers in the case studies are presented below, and related to different phases of the BAT framework.

3.2.1 Exposure of Production Capacity

One critical business action that has been studied is the suppliers' possibility to identify and expose their production capacity. This critical business action is related to the contact and establishment, and negotiation phase in BAT. In the paper-mill a market assistant handles many questions from both established and potential customers concerning when the company has scheduled the production of a certain product, the time of delivery for a certain product etc. In this phase we have identified that the answers to the customers are sometimes unclear and/or delayed in time. The IS-support in performing these kind of critical business actions is weak. This has several negative effects, e.g. on the quality concerning the suppliers' external communication with the customer. The only information that is possible to access is based on historical production figures that of course are relevant, but not in this particular situation. The IS in the paper-mill's sales- and marketing unit is not integrated with the systems for production planning and production. Of course this information can be, and is, gathered by using the "manual" IS, but this is often time consuming and inefficient in this situation, "face-to-face" with the customer.

3.2.2 Presenting an Offer

When the manufacturing company puts together an offer to customers, there are several departments and actors involved, due to the high complexity in their product. The offer is a part of the exposure made by the supplier, and related to the contact and establishment and negotiation phase. The work is done by a so-called offer-team, with members from different departments. Putting together an offer is a time and resource consuming activity, even though the company has implemented a PC-network to support these tasks. The time from the customers tender for an offer to the company's answer to it can however be shortened. One problem with the PC-network is that the network is isolated from the rest of the organisation's IS-resources. One effect of isolation, that was highlighted when using BAT, is that information can not be efficiently moved from the team members' ordinary workstation to the offer-team network, in order to support a short cycle-time from question to answer.

3.2.3 Converting Order Commitments to Production and Product Specifications

In converting an order commitment (e.g. to produce a certain product to a certain customer) to a product specification as a basis for production planning and production, distortion can occur. The distortion is explained by the fact that the sales- and marketing department's information system and the information system for production planning is incompatible. The paper-mill has however tried to solve this problem with an in-house built "bridge" between the two systems. This conversion of order and product data is however not reliable, distortions occur that makes it hard for users to trust the information.

Sometimes when conversion failures are not identified, the original commitment to the customer (order) is changed and not identical with the production and product speci-

fication. A faulty production specification can lead to a low delivery quality. This critical business action is related to the link/interface between contractual phase and the fulfilment phase in BAT.

3.2.4 Producing Goods (Based on Order Commitments Out of Date)

Another problem related to the order information is based on the fact that the paper-mill has an unstable IS-structure, which makes data transmission from distributed IS located at different order- and sales offices and the central order database not transparent. When the situation occurs that a customer change the order specification, the paper mill promises to change the order specification in the information system, and believes that they have made a new commitment, but the data transmission fails. The failure is then not automatically recognised by the system user, and the old commitment (not updated order information) could still be a base for production. A faulty production specification (based on the old commitment) can, again, lead to a low delivery quality. This critical business action is related to the link/interface between the contractual phase and the fulfilment phase in BAT.

3.2.5 Delivery Promises/commitments

When the paper-mill promises a specific customer to deliver a certain amount of goods, at a certain time, they use “week X” as the time of delivery. This is done in spite of the fact that the customers usually wish to have a particular “day Y” as time of delivery. In this case no particular IS is involved. This problem is related to the uncertainty of the paper-mill’s future capacity to deliver goods at a certain time (a commitment to deliver at a particular day). This uncertainty is related to the fact that the paper-mill does not follow up their delivery quality (delivery of the agreed product, on agreed time). Delivery promises are given in the BAT contractual phase and should be followed-up in the completion phase.

3.2.6 Giving Information Concerning Ordered Products’ Status

When a contract is established with a specific customer, the paper-mill’s customers usually ask questions concerning where the ordered goods are in the production line, when it is going to be delivered, and so on. Again the market assistant in the paper-mill is assigned to answer this kind of questions. However it is not easy to get access to information of specific products and their status in the productions process. This information is stored in the production units database, and not possible to access through the IS in the sales- and marketing unit. The ways to get access to this kind of information is, also in this phase, time consuming and dependent on certain peoples (the production planners) presence. These kind of critical business actions are a part of the fulfilment phase in BAT.

3.2.7 Invoice Customers

Invoice customers are another important business action that are part of the fulfilment phase. The paper-mill’s customers can at the same time have several different terms of payment due to different products. The information system and database for customer information, however, does not support this “one-to-many” relationship between cus-

tomers and terms of payment. This restriction has the effects that (1) the system users have to construct fictitious customers, based on the “real” customers in order to allow one customer to have different terms of payment, and (2) the problem of possible information inconsistency when a customer changes addresses. Several updates of a customer’s address have to be performed in order to avoid invoices (and even offers) being sent to wrong addresses.

3.2.8 To Improve Operations and Meet Customer’s Changing Demands

The suppliers’ knowledge of their customers’ satisfaction or dissatisfaction is important in the completion phase in order to improve operations and meet customer’s changing demands. The paper-mill and the manufacturing company do not, in a systematic way, follow-up or measure customer satisfaction or dissatisfaction. The only information concerning customers level of satisfaction is, ideally, “ad-hoc” collected by sales representatives. In order to make the best use of this kind of information it should be spread around the company, which is not done. However the paper-mill has a well-developed way of communicating with some of its customers when performing so called study tours. The objectives in performing these kind of activities is for the production workers to better understand why customers demand that certain quality measures are more important than others.

3.3 Information Systems Features and Strategy Related Results

The results presented below are based on case study research and can be viewed as a result from using BAT as a guide in analysing data together with an inductive research approach (the open questioning described in section 3.1).

3.3.1 Suitable Features of Information Systems in a Process Oriented Organisation

The results from the case studies show, among other things, that the IS should be able to support exchange of information along processes, with other IS (e.g. IS traditionally related to other departments or functions) in order to support communication between actors in different departments in the organisation. The problems with IS that is not sufficiently integrated, are a well-known fact in the case studies, as well as in the literature (e.g. Keen, 1991, 1997; Tapscott and Caston, 1993). These aspects seem to be stressed when applying a process perspective on organisations including the focus on creating customer value, instead of focusing on single functions or departments activities only. BAT has been an instrument in our studies for identifying these process-related weaknesses with a point of departure from the performance of critical business actions.

We have also found that it is important that the IS has a potential to change (flexibility) based on what is technically possible and economically satisfactory. It is also important that the IS has an overall good correspondence with the business, irrespective of whether changes are initiated from technical progress or changes/improvements in business needs motivated by e.g. changes in work procedures or routines.

3.3.2 Suitable Strategies for Information Systems in a Process Oriented Organisation

In our study we also included questions concerning suitable IS/IT-development and purchasing strategies in a process oriented organisation. We have found that it is important to uncover different ideals (starting-points and objectives) before and during a parallel development of IS and organisation. In the manufacturing company this was clear when two different project groups worked with, on the one hand the organisational change (development of future process maps including work-flows etc), and on the other hand the development/adaptation of an standard package. These two groups did not communicate with each other about existing and important decisions on designing future workflow and processes. Of course different perspectives and ideals can generate change, but a far too unclear apprehension of conflicts concerning different ideals appears to obstruct resource-efficient development. On the basis of the earlier discussion we claim that it is important to stimulate a change of perspectives in development of IS between technical possibilities of IS and businesses needs.

We also identified that it is important to be aware of the fact that planned strategies for development and purchase of IS are not necessarily identical with the realised ones. There are frequent differences between interpretations of planned strategies and often a set of developing strategies (according to Mintzbergs (1991) terminology) in the empirical material. The two organisations existing IS/IT-strategy (the realised strategy) is more of a consequence of different, so called "technical", decisions on the operative levels of the organisations. The sum of these often divergent decisions then constitutes the realised IS/IT-strategy. In order to reduce this, it is important to make decisions about IS/IT-development from a point of view that is beyond the domain of single departments or organisational functions (regarding the six generic phases of a business process according to BAT can help avoiding single functional view). By doing this the risk for decisions that generates isolated "islands of information systems" (see Melin and Ritschel, 1998; Tapscott and Caston, 1993) can be reduced.

4. Conclusions

In analysing data, BAT helps to focus on the character of, and relations/interfaces between different critical business actions in a horizontal (process) dimension, instead of a more traditional departmental or functional dimension. Using generic business actions and phases from BAT facilitates interpretation, comparison and evaluation of different cases.

The need for information from different departments' IS and a higher integration level was highlighted when using BAT in studying different critical business actions. The IS should be able to support actors critical business actions, e.g. to inform the customer about the suppliers manufacturing capacity, possible commitments, commitments made, time for fulfilment of an order, above. The IS support should contain information that is needed to perform these actions. No matter where the information is originally stored in the information systems of the organisations IS portfolio. The IS could also be designed to automatically perform some critical business actions. In the studied companies, the existing IS-support performing the critical business actions was weak in sev-

eral situations. The IS in the paper-mill's sales- and marketing was not integrated with the systems for production planning and production.

A question that one could ask oneself is if it would have been possible to detect these features without using the BAT framework in evaluation? Using other evaluation approaches, e.g. the intra-organisational approaches mentioned in section one above could possibly result in knowledge of this kind. But it is accidental if this would be the case. The use of BAT provide direct attention towards features of IS in relation to business processes, business actions, and inter-organisational interaction.

BAT can be used, not only for evaluation, but also as a conceptual instrument in re-designing business processes and IS. BAT can also be used for redesign of specific critical business actions, and whole processes, consisting of several actions performed in concert. This is important in order to reach an organisation with more clear business actions and well worked-out business logic, both internally and in contact with suppliers and customers. In the case of the paper-mill the results from our BAT evaluation served as a basis for development of new IS.

In order for IS to support a process oriented organisation we have also identified (section 3.3) that it is important to give a broad-minded view of different types, and interpretation of IS-strategies and their status in the organisation. A change of perspectives in development of IS, between technical possibilities of IS and business needs is also important.

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