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Comparing two business modelling approaches in the language action perspective

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Abstract

The increasing market turbulence and the increasing need for the creation of competitive advantages force businesses to rethink the way they perform their business. This rethinking is often performed unstructured or fragmented, and they fail to consider the business as a whole. Therefore there is a need for making a diagnosis as a basis for redesigning the business. In order to perform this diagnosis and redesign in an effective and efficient manner, there is a need for structured business modelling tools. In the current paper two business modelling methods (BAT/SIMM and DEMO) are presented that are founded in the language action perspective. The language action perspective is chosen on the premises that all organisation processes are founded in communicative action. After a theoretical introduction, the two methods are applied to a case study in order to make comparisons both methods on the theoretical and application level. The results from the comparison show that although the methods are based on the same theoretical foundation, their business models highlight different aspects of the business. Based on the comparison the paper proposes a possible integration of the two methods.

1. Introduction

Since the market gets more and more dynamic, the flexibility of organisations is becoming more and more important nowadays (Hammer, 1990; Harrington, 1991; Davenport, 1993; Hammer, Champy 1993; Rummler, Brache, 1995). New products have to be introduced in the shortest possible time and new or altered business processes have to be developed fast (Reijswoud, Heuvel, 1997). Many organisations find decisions about these changes difficult and fear the implications of these changes. In the current paper we propose and evaluate two novel methods for business modelling that provide conceptual models for a structured understanding of business processes and their mutual relationships and that allow well-considered decisions based on this understanding. The comparison is made in order to analyse the focus of the methods and in line of that we will propose a possible integration of the methods (see also Lind, Reijswoud, 1998).

The two business modelling methods that are examined have their roots in the same philosophical foundation, the language action perspective (Dignum, Dietz, 1997; Dignum et al., 1996). The focus on communication as the key concept for the understanding and modelling of organisations requires a theory explaining communication and its functions. The Speech Act Theory (Austin 1962; Searle 1969; Searle 1979; Searle, Vanderveken 1985) has proven to be a strong frame of reference for this purpose (e.g., Flores, Ludlow 1981; Winograd, Flores 1986; Taylor, Cameron 1987; Winograd 1988; Taylor 1993; Reijswoud, 1996). Based on this foundation both methods consider communicative action to be their unit of analysis. By means of analysing business communication as a form of action the business processes and their relationships are identified and represented.

The communicative action-based models of business processes have multiple purposes. In the first place they provide a structured overview of the business and its constituting business processes. This structured overview is often lacking. The models also provide the possibility to diagnose inefficiencies and ineffectiveness in the business' processes. They may, for example, show isolated processes or reveal missing safety procedures.

In the last place the models allow optimisation and alterations of the business processes. For example, on the basis of a diagnostic model we may decide to redesign sequential processes into parallel processes or integrate new processes by using existing sub-processes.

The methods that are discussed in this paper are BAT (Business Action Theory) and DEMO (Dynamic Essential Modelling of Organisations). Both methods consist of a theory for understanding business processes and a modelling facility based on this theory. BAT has been developed by the research group VITS (short for Development of Information Systems and Work contexts), which is established at a some Universities in Sweden, where University of Borås and Linköping University are two of them. BAT attempts to understand the making of business as action and interaction in a generic model. The modelling components for applying BAT are derived from the SIMM methodology (cf. e.g. Golkuhl, Röstlinger, 1993; Goldkuhl, 1992; 1996). DEMO is developed at Delft University of Technology in the Netherlands and attempts to identify, understand and model the construction of the essential (core) business processes. The modelling components are an integral part of DEMO and cover the communication aspects, as well as the information and behavioural aspects.

The paper is structured as follows. In section 2 we elaborate on the notion of methods that is used as a framework for comparison. In section 3 we introduce the two methods separately at a theoretical level. In sections 4 we apply both methods to a case study. The resulting models form the basis for a comparison of BAT/SIMM and DEMO in section 5. In section 5 we also propose a possible integration of the two methods.

2. A method theory – a framework for comparison

A method provides guidelines for work. Its character is prescriptive. A method tells what to do in different situations in order to arrive at certain predefined goals. In information systems development there is usually a need to document different aspects. Many ISD methods therefore include representational guidelines; what often is called modelling techniques or notations. Such methods also involve procedural guidelines; i.e. how to work and what questions to ask. The notation prescribes how answers to these questions should be documented. Often the procedure and notation are tightly coupled to each other. The procedure involves some meta concepts as e.g. process, activity, information, transaction. Such general concepts are used when asking the questions; i.e. they are parts of the prescribed procedure. They are also parts of the semantics of the notation. The concepts are the cement between procedure and notation; the overlapping parts of procedure and notation.

The constellation of *procedure, notation* and *concepts* is called a *method component* (Goldkuhl et al, 1997). A method is often a compound of several method components into, what is called a methodology (Avison, Fitzgerald, 1995). Together the different method components form a structure. This is called a *framework,* which also includes the phase structure of the method. The framework should be regarded as consisting of different possible views on the situation to be analysed.

All methods build on some implicit or explicit *perspective* (Goldkuhl, Cronholm, 1993; Goldkuhl et al, 1997). A perspective includes values, principles, goals and categories (with definitions), which are more fully expressed in the method and its method components. A perspective is the conceptual and value basis of the method.

The important parts of the method theory (Goldkuhl, Cronholm, 1993; Goldkuhl et al, 1997) used in this paper is illustrated in Figure 1.

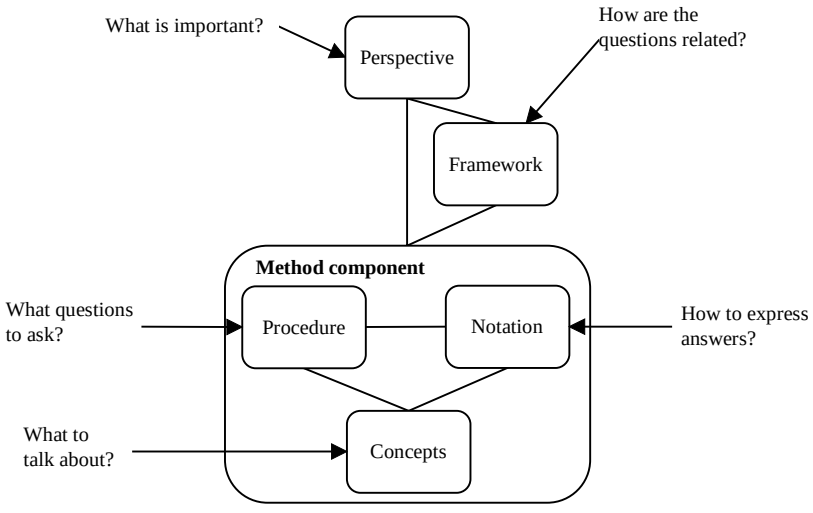

Figure 1: The method notion: Relationships between perspective - framework – method component - co-operation forms (after Goldkuhl et al, 1997)

Methods can be looked upon as objects, where the method's intentional use is studied. The method is then looked upon from an ideal typical perspective. One can also study the methods in use, i.e. how people are using the method. The method is then looked upon from a situational perspective (Goldkuhl, 1995). In this paper we look upon the two methods both ideal typically (in terms of looking upon the underlying perspective) and situationally (in terms of applying the methods to a case study). We are using the method theory presented in this section as a framework for comparison where we are studying the underlying perspectives of the two methods as well as their method components.

3. The two approaches for business modelling

3.1 Business Action Theory and the SIMM-Methodology

The research group VITS makes a distinction between theory and method when performing business modelling. The theory that is used in this paper is the Business Action Theory (BAT), which has its roots, among other things, in the Speech Act Theory. The method components that are used are parts of the SIMM-methodology. BAT has been applied together with the SIMM-methodology in a number of applications (see e.g. Lind, 1996; Lind, Goldkuhl, 1997).

3.1.1 Business Action Theory (BAT)

There is a need to understand the making of business as action and interaction. Making business is not merely agent-less transportation of information and material, it consists of customers and suppliers performing communicative and material actions. These different actions are related to each other in generic patterns.

BAT, presented by Goldkuhl (1996, 1998), is an attempt to describe the generic business action logic. This theory is founded in communicative action theories (e.g. Searle, 1969; Habermas, 1984) and business relationship theories (e.g. Axelsson, Easton, 1992; Normann, Ramirez, 1993; Gummesson, 1996).

This generic business framework describes business processes as consisting of six phases. It starts with business prerequisites of customer and supplier and goes through business communication (with e.g. offers, inquiries, negotiation and contract) to fulfilment (through delivery and payment) and ends with the satisfied usage or discontent and possible claims. The phases are:

1. *Business prerequisites phase*, where prerequisites are established (both within the supplier's and the customer's organisation) for performing business (sales/purchases).
2. *Exposure and contact search phase*, where both parties, customer and supplier, seek contact. The suppliers' ability is offered and exposed to the market. The customer's lacks and needs create demands.
3. *Contact establishment and proposal phase*, where the supplier presents available and possible offers to a specific customer. The customer is showing some needs and purchase interest.
4. *Contractual phase*, where the supplier and customer make commitments that are shown in an order from the customer and an acknowledgement of order from the supplier.
5. *Fulfilment phase*, where the supplier and customer fulfil their commitments. The supplier fulfils the commitment by performing a delivery and the customer fulfils by paying for the received delivery.
6. *Completion phase*, where the customer and supplier achieve satisfaction or dissatisfaction. Either the customer uses the delivered products with satisfaction and the supplier receives the payment, or certain claims are raised.

The phases and their relationships are depicted in Figure 2.

BAT emphasises that there are certain business actions which always have to be performed when doing business, as e.g. the communicative actions offer, order, delivery promise, contract. Such actions always have to be performed in principal, but in simple business situations, some of these actions can be implicit or integrated with other actions. The theory also emphasises that there is a certain principal order between different groups of actions within a business process. The different phases constitute such groups of actions.

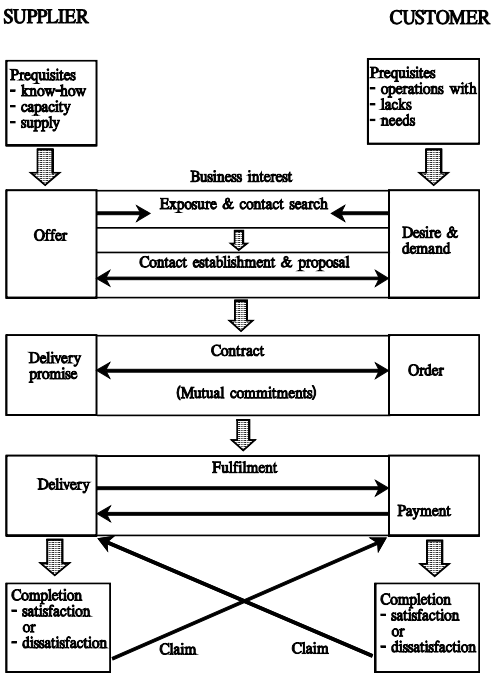

Figure 2: Business Action Theory: The six generic phases of business processes (Goldkuhl, 1998)

The main purpose of BAT is to describe and explain business interaction. But the purpose is also that it can be used as a theoretical lens for 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 congruent change methods (e.g. Goldkuhl, Röstlinger, 1993).

3.1.2 The SIMM-methodology

In this paper we focus on the two method components from the SIMM methodology that are being used for the analysis (reconstruction) of a corporation's business processes. These components are Action Diagrams and Process Diagrams. There are other method components in the SIMM methodology, such as problem analysis, goal analysis and strength analysis, which are important in business process analysis, but they are not described in this paper (cf e.g. Goldkuhl, Röstlinger, 1993).

The purpose of *Action Diagrams* is to capture the detailed activity pattern within a business process. Action Diagrams are graphical models with a well-defined notation (Goldkuhl 1992; 1996). They are intended to be used by systems analysts and IS users together in specifying and modelling information systems and their business contexts. Action Diagrams try to integrate a flow orientation (describing information and material flows) and an action orientation (describing the types of action performed) in one type of description (Goldkuhl, 1996). Therefore Action Diagrams are appropriate for business process modelling. A contextual descriptive approach is mainly used when working with Action Diagrams (Goldkuhl, 1992). Each Action Diagram describes a business context within a business process. Different Action Diagrams are related to each other through descriptive connectors (i.e. links to other Action Diagrams). The limits of each Action Diagram (=business context) are arbitrary; i.e. the analyst has the freedom to choose the appropriate borders of the described context. The basic description elements that are being modelled are action objects (such as information and/or material), actions, activities, performers and flows of information and material.

The *Process Diagrams* enable the analysis of a business process on a survey level. A Process Diagram is a key map of a business process. The content of the Action Diagrams, such as activities, flows and action objects are grouped to more coarse-grained components. These components are called:

- customer-to-customer process
- side process
- sub process

Each business process consists of a customer-to-customer process and possible side processes. The customer-to-customer process consists of the business logic from customer inquiry or order to delivered products to the customer. The activities within a customer-to-customer process are performed for a specific customer, between a supplier and a specific customer. The side processes support the customer-to-customer process and its character is either a condition for or a consequence of the performance of the customer-to-customer process. The activities that a side process consists of are performed for a *potential* customer. The activities that a customer-to-customer process consists of are performed for a *specific* customer (Lind, 1996). The customer-to-customer

process and the side processes consist of one or several sub processes. Each sub process consists, among other things, of several activities, which are contextually related to each other.

The graphical representation for the Action Diagram and the Process Diagram is explained in more detail in section 4.

3.1.3 Different ways of performing business

As identified in Lind (1996) a business usually consists of several business processes (variant processes) and these coexist in a corporation and co-use its infrastructure. This means that an organisation has different ways of reaching business missions, where each business process consists of activities that are performed for a certain business mission. It does not seem that people in corporations often have a clear picture of the business processes the corporation consists of. These have to be reconstructed, which can be performed by applying business modelling techniques like Action Diagrams and Process Diagrams. Guided by a descriptive analysis of the business function (the organisation's mission), a series of Action Diagrams and appurtenant Process Diagram are used to describe the parts of a business process and how these parts are related to each other. A combined bottom-all and bottom-up approach is used to reconstruct the different business processes (Lind, Goldkuhl, 1997). See Figure 3.

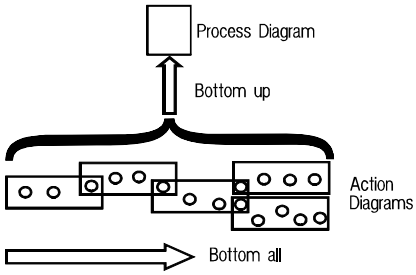

Figure 3: Bottom-all and bottom-up approaches when using Action Diagrams and Process Diagrams

3.2 Dynamic Essential Modelling of Organisations

DEMO (Dynamic Essential Modelling of Organisations) is a cross-disciplinary theory describing and explaining the communicational dynamics of organisations, as well as an analysis method based on this theory. A relevant set of fragments describing DEMO is constituted by (Dietz, 1994a; 1994b; 1996a; 1996b; Dietz, Mulder, 1996; Reijswoud, 1996; Reijswoud, Rijst, 1995; Rijst, Reijswoud, 1995).

In DEMO, the construction of organisations is viewed from three levels: the documental, the informational and the essential level. At the *documental* level, an organisation is viewed as a system of actors that produce, store, transport, and destroy documents. In other words, at the documental level the substance and form by which co-ordination becomes visible is considered. At the *informational* level one abstracts from this substance and form (i.e. documents) and focuses on the actual meaning. The organisation is observed as a system of actors that send and receive information, and perform calculations on this information in order to create derived information. At the *essential* level an organisation is conceptualised as a system of actors that are engaged in the executions of business transactions. At the essential level organisations are considered as networks of business transactions, which are composed of interrelated communicative acts. In other words, at the essential level the organisation is viewed as a social system, at the informational level as rational system, and at the documental level as a formal or material system. Figure 4 displays the levels of abstraction.

When considering an organisation, the documental system proves to be the most voluminous, since the same information may be represented several times in several formats (e.g., multiple forms and screens). The informational system proves to be more voluminous than the business (essential) system. In order to conduct the business, much derived and external information may circulate in the business. To highlight these differences in volume, the triangular form in Figure 4 is chosen.

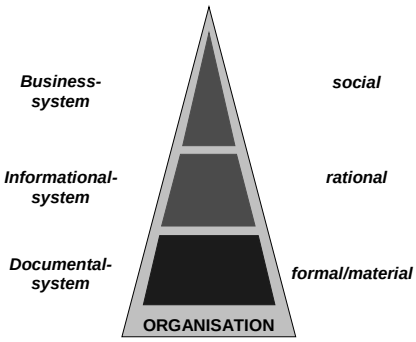

Figure 4: The three levels of abstraction in DEMO

The essential business transaction is a core concept in DEMO. A transaction is a pattern of activity that is performed by two actors: the Initiator and the Executor. It is important to note that actors are roles in an organisation and not persons. A transaction is composed of three phases: the Order phase in which two actors come to an agreement about the execution of some future action; the Execution phase, in which the negotiated action is executed; and the Result phase in which the actors negotiate an agreement about the result as brought about in the execution phase. The successful execution of a transaction in the Subject World (the world of communication) results in a change in the Object World (the world of facts) in which the actors exist. The basic pattern of a transaction is displayed in Figure 5.

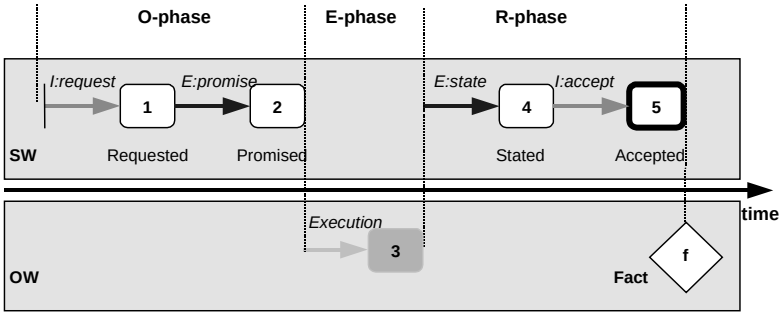

Figure 5: The basic pattern of the DEMO transaction

The basic pattern of a transaction displays on the minimum set of actions that are needed for the successful completion of a business transaction. In order words, it only displays the success-layer of transactional business communication. However, when we observe the transactional communication in businesses, we will observe more complicated patterns. We will observe people asking each other clarification, or discussing the truth or legitimacy of a particular request. We may even observe people in an organisation having meeting in which they discuss the underlying assumptions of their actions in general. In Figure 6 all possible communicative actions in a business transaction are displayed by means of a modified state transition diagram for transaction process modelling (Reijswoud, 1996). The light arrows are communicative acts by the initiator while the dark arrows denote communicative acts by the executor of the business transaction.

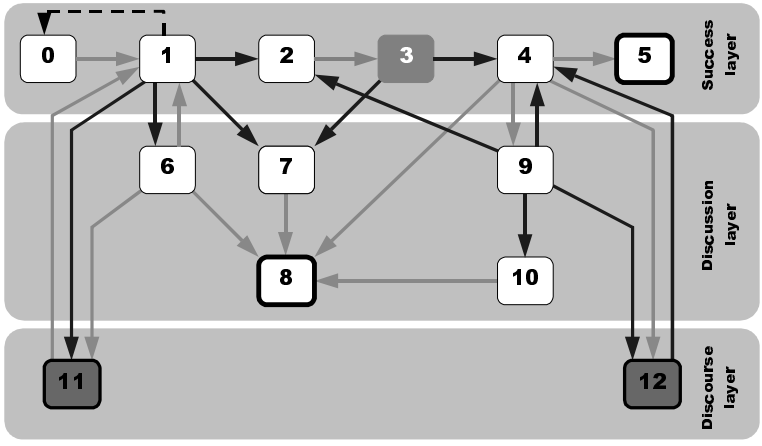

Figure 6: The complete pattern of a DEMO business transaction

In the complete representation of a business transaction the success layer is displayed on top. All the successful transaction processes need to pass through all the states and transitions at this level. When the parties

disagree on a request (transaction state 1) or on the result of the execution of objective action (transaction state 4), they can decide to move to the discussion-layer. Of course, business transactions may also end unsuccessful (transaction state 8). A transaction may be stopped directly from the success-layer, but also as a result of a discussion. The business process may also be temporarily suspended. The transaction then moves to the discourse-layer (transaction states 11 and 12). The communication in the discourse-layer is not further specified.

The execution of a transaction can be described and consequently modelled at all three levels of abstraction. At the essential level the transaction is described as a pattern of communicative acts. At the informational level the execution of a transaction is described as the exchange of information, and at the documental level the materialisation of the transaction in tangible objects (documents, files etc.) is described. The DEMO method hypothesises that the transaction at the essential level allows multiple realisations at the informational level and the documental level. It is important to realise that these realisations are ideally deliberate organisational choices. The principle idea is displayed in Figure 7.

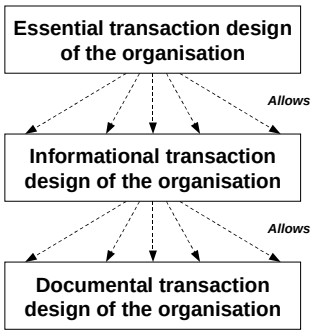

Figure 7: Transaction design and levels of abstraction

The modelling facility of DEMO provides the method components for the graphical representation of the transactional structure of organisations. This transactional structure is modelled in five partial models: the action model, the interaction model, the process model, the facts model and the interstriction model. The models are developed incrementally. The interaction model contains a description of the transaction types and the actors in an organisation. The actors are displayed as initiating or executing actors of a transaction. The graphical notation used for the interaction model is the communication diagram. The process model describes two aspects of the transactional structure. In the first place to display the causal and conditional relationships between the transaction types, and in the second place to display the course of individual transaction processes. The relationships between the transaction types are expressed in the process diagram, and the course of individual transaction processes in the transaction diagram. The fact model is the complete and precise specification of the state space of the object world. The facts diagram is used to represent the fact model. The interstriction model is a specification of the actors and the information that is needed by these actors to execute a transaction type. The interstriction model is also expressed in the communication diagram. Finally, DEMO includes the action model of an organisation. The action model is called the 'mother of the models' because it comprises the most detailed specification of the transaction structure of an organisation. It allows a specification of transactions at the essential, informational and documental level. The action model is expressed in the action diagram.

In the next section we present the analysis of a case study in which DEMO is applied. In this section the different models and the corresponding diagrams are explained in more detail.

4. The Structo case

The case that we present is a company called Structo. The company is situated in Storfors, Sweden and has about 130 employees. Structo is a manufacturing company, which mainly transforms steel into pipes for hydraulic cylinders. The Structo case was originally performed as an action research project where BAT/SIMM was used in order to reconstruct and analyse their business processes. To get an understanding of the working of the company we provide a description of the operative processes. This description is used as a basis to illustrate the practical usage of the business process modelling approaches BAT/SIMM and DEMO. The DEMO-models have been developed on the basis of the description of Structo and generated BAT-models.

4.1 A description of the current way of working

When a customer wants to order products from Structo he contacts Structo (by fax or telephone) in order to specify his needs. At Structo they categorise the customer as a special production customer, a standard stock customer or a whole trading customer. Based on the type of customer the operative process of Structo will differ significantly.

In the case of a special production customer, Structo will, together with the customer, use an inquiry

procedure to look through the customer's demands. The inquiry is a detailed specification of demands, which will later on be used in the production process. The offer, including specification of the customised product, hopefully ends up in an order from the customer.

In the case of the standard stock customer, Structo will give an offer that is based on a price list, but the prices can be negotiated. This offer can result in an order. Alternatively, the customer is already one of the customers of Structo and therefore an order could be made directly without asking for an offer. The acknowledgement of the order obligates Structo to fulfil its commitment to the customer.

For a whole trading customer a request for a product is initiated through a discussion between the customer and Structo. The result from the discussion is a possible customer order, which results in an acknowledgement of order. The order is based on standard products and a standardised price list.

After the customer has placed order with Structo, different procedures are started. These procedures are also based on the type of customer.

In the case of a special production customer, Structo will produce the product based on the specifications in the customer order. The production started in accordance with a planning. For the production of special products, Structo needs material from the raw material stock. The availability of the materials in the raw materials stock that is needed for production of the order is checked and when necessary raw materials are ordered with external suppliers. When the invoice from the supplier arrives, the materials on the invoice are checked against the raw materials that have been delivered before the invoice is paid by the financial department. The stock keepers perform this checking.

For the standard stock customer, Structo will pick the product specified in the customer order from the standard stock. The standard stock is in the company and the stock level is controlled on products coming in from the production and the product going out to the customer. The raw materials for the production are, of course, supplied by the raw material stock. The amount and the nature of standard products that are being produced are based on the market prognoses.

When the ordered products are packed, they are stored in a depot. As soon as the products are stored in the depot, an appropriate means of transport is selected and ordered to deliver the product to the customer. At the time the product is stored in the depot the invoice department prepares and sends the invoice (and possible shipping and quality documents) to the customer.

For the whole trading customer Structo will place a direct order with one of the subcontractors that will directly deliver the product to the customer. After the delivery, the subcontractor will send an invoice to Structo, which, together with customer order, is the basis to prepare and send an invoice to customer.

4.2 Analysing Structo with BAT/SIMM

The BAT/SIMM-analysis of Structo is presented in three different models, which are Action Diagrams, Process Diagrams and the Business Phase Matrix. As explained in section 3.1.3, one starts out with a bottom-all approach in order to reconstruct existing praxis in the business. A contextual approach is mainly used when working with Action Diagrams (Goldkuhl, 1992). When Structo's business processes were reconstructed a total amount of 25 Action Diagrams were generated. In this paper we have chosen to show one Action Diagram in the customer-to-customer process for the standard stock customer (see left part of Figure 8) and the Process Diagram for the same business process (see right part of Figure 8).

The Action Diagram (in Figure 8) describes the content of the business context picking / cutting from standard stock. As can be seen in Figure 8 there is a context related above the grouping (starting with the order) and below the Action Diagram (by descriptive connectors). The picking / cutting from the standard stock is part of the fulfilment phase of the business process, where the contractual phase (which is preceded by actions performed in the contact establishment and proposal phase) also is shown in the Action Diagram. The symbols in the Action Diagram can be described as follows. Two parallel lines with text between the lines represent an activity, where the performer is stated inside the brackets. The tipped square represents an action object, which could consist of either information or material. In order to show the material nature of the action object, a thick line on the right side of the action object is used. An action object with a triangle in the left-bottom corner represents a stock. An action object with two triangles on the right hand side shows encapsulation of information, i.e. information that is not possible for humans to interpret directly (e.g. data in a computerised information system). Circles with text inside are descriptive connectors. Lines are used to connect activities and action objects together, where thin lines represents information flow and thick lines represents material flow. In the Action Diagrams the actions are a combination of the activity and resulting action objects. In order to achieve understanding for the action logic within the business process activities, prerequisites and results from activities are shown, i.e. Action Diagrams do also, except for actions, contain of description elements used to understand the context around the actions.

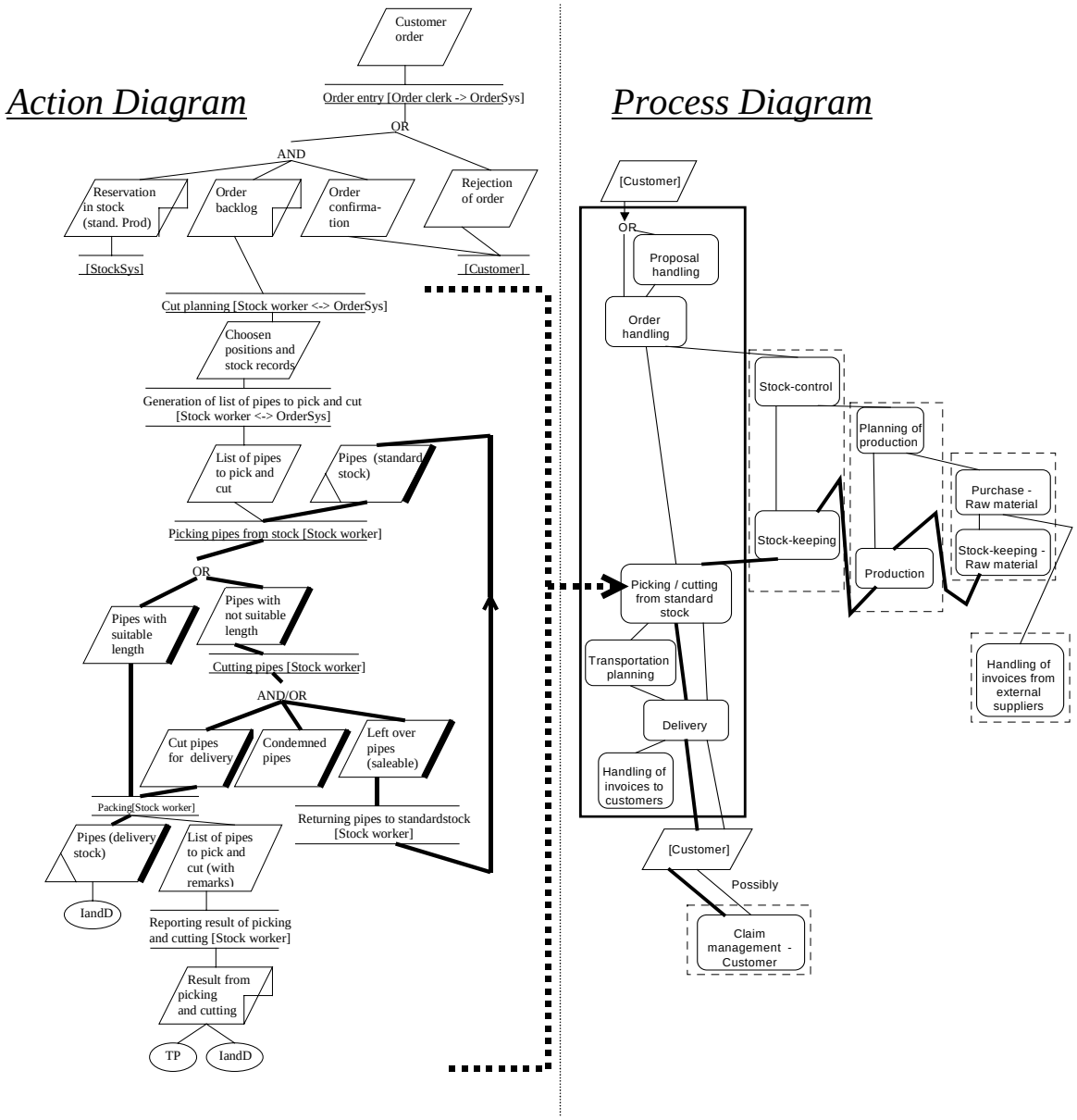

Figure 8: An Action Diagram and the Process Diagram for the standard stock customer

After constructing Action Diagrams, the different components, such as activities, flows and action objects, are grouped into more coarse-grained components (sub-processes in the Process Diagram). When the analyst is producing Action Diagrams, BAT is used as a theoretical lens in order to ask focused questions and to make sure that the business processes are focused. The sub-processes are then related to either the customer-to-customer process or a side process. Process diagrams (see Lind, 1996; Lind, Goldkuhl, 1997) are generated in order to make it possible to regard the business processes on a survey level, where the Action Diagrams are used as a base (a bottom-up approach). The symbols in the Process Diagram are interpreted as follows. Boxes with rounded edges represent sub-processes. The side processes are marked by a dotted square, while the bold square is used to represent the customer-to-customer process. The connecting lines between the sub-processes denote the flow. Bold lines represent material flow, while thin lines describe the information flow. The tipped square indicates an action object. The scope of the customer-to-customer process is the six generic phases of business processes in BAT, where the actions performed by the supplier are emphasised.

Some sub-processes stated in the Process Diagram are the same for other business processes, but they are performed in different contexts, i.c. sub-processes are re-used. The Process Diagram also highlights the business process as a combination of a production process and an interaction between the customer and supplier.

BAT regards the business as consisting of several business processes (variant processes). The criteria used for distinguishing and delimiting different business processes are based on generic communicative action types, such as offer, desire and demand, contract and claim. The two dimensions “customer relation” and “internal handling” classify the variant processes. Table 1 shows the delimitation of the three business processes.

Internal Handling Customer relation	Processing (from raw material to finished products)	Whole trading (direct delivery from subcontractor to customer)
Special production (project based development)	Special production customer	---
Standard stock sales	Standard stock customer	Whole trading customer

Table 1: The delimitation of the business processes (variant processes) at Structo

A Business Phase Matrix (see Lind, Goldkuhl, 1997) is used to show that there are different action types performed differently in the phases for the business processes. Table 2 shows the Business Phase Matrix for the business processes at Structo.

Business process Phase	Standard stock customer	Special production customer	Whole trading customer
1. Business prerequisites phase	Own production of standardised products.	Flexible production equipment, design competence.	Established relationships with subcontractors.
3. Contact establishment and proposal phase	Standard products are offered. Price list exists, but prices can be negotiated.	Products are designed based on customer needs. Prices are negotiated.	Standard products are offered. Price list exists, based on subcontractors prices.
4. Contractual phase	Customer order based on an offer or a price list	Customer order based on offer including product specification.	Customer order based on a price list
5. Fulfilment phase	Production for potential customers. Picking from stock and delivery is done based on the specific customer order	Production based on order from the specific customer. No stock handling, only delivery.	Production and delivery are done by a subcontractor
6.Completion phase	Potential claims are handled by Structo.	Potential claims are handled by Structo.	Potential claims may be forwarded to subcont-ractors.

Table 2: Business Phase Matrix for Structo (Lind, Goldkuhl, 1997)

4.3 Analysing Structo with DEMO

The DEMO analysis of Structo as a network of essential business transactions is presented in four partial models and their diagrams for representation. The first models that are prepared in this section, are the interaction model and interstriction model. Both models are represented in the communication diagram. Then the analysis continues with the process model represented by the process diagram, and finally part of the action model and its action diagram is presented. The DEMO Facts Model is not considered in this paper, because there is not a comparable model component in the BAT/SIMM approach.

The first step in the analysis of Structo's activities is the identification of the transaction types in conjunction with the actors involved in these transaction types. The transactions are identified on the basis of the communicative acts in the complete transaction process model (Figure 6). When one of the acts in the transaction process model is identified, the model is used as a guidance to identify the remaining communicative acts. The transaction table (Table 3) of the case study summarises the business transaction types and the fact types resulting from the successful execution of the transactions as well as the actors involved in their role of initiator or executor of these transaction types.

Transaction type		Initiator	Executor	Fact type
T1	Delivering_order	Customer	Deliver-order	The order <O> is delivered
T2	Delivering_product_ standard_stock	Deliver-order	Stock-standard-material	The product <P> concerning <O> is delivered from the standard stock
T3	Delivering_internal product	Stock-standard-material	Deliver-internal-product	The product <P> is delivered internally
T4	Delivering_raw stock	Produce	Stock-raw-material	The raw material <R> is delivered from the raw material stock
T5	Ordering_raw_material	Plan	External-supplier	The raw material <R> is ordered from external supplier <ES>
T6	Paying_raw material	External-supplier	Pay-raw-material	The raw material <R> is paid
T7	Invoicing_customer_order	Deliver-order	Customer	The order <O> is paid
T8	Offering	Customer	Offer	The offer <OF> is offered

Transaction type		Initiator	Executor	Fact type
T9	Planning	Plan	Plan	The planning <P> of raw material ordering and production is made
T10	Ordering_external product	Deliver-order	Subcontractor	The external product <EP> is ordered from subcontractor <SC>
T11	Paying_external product	Subcontractor	Pay-external-product	The external product <EP> is paid
T12	Shipping_order	Deliver-order	External-shipper	The order <O> is shipped
T13	Producing	Plan	Produce	The product <P> is produced

Table 3: Transaction table of Structo

The 13 different transaction types and their initiating and executing actors are graphically represented in the combined interaction and interstriction diagram called the communication diagram (see Figure 9). The interaction diagram provides a 'timeless' overview of the transaction types, the internal and external actors. The transaction types are displayed by the combined diamond/disk symbol. The actors are represented by means of boxes. The grey boxes are called system kernels, actors of which we do not know their composition. The white boxes are elementary actors. A straight line (an initiation link) between the actor and the transaction type symbol represents the initiating role of an actor. The line with the arrowhead is used to denote the executing role of the actor. It is important to note the line and arrow does not imply an information or material flow. Finally the bold grey line is used to represent the system boundary. The dotted lines between actors and transaction types represent the interstriction, i.e. the information that is used by the actors for the execution of the business transactions. We also observe that two external sources of information (EB1: Price Information and EB2: Quality Standards) are consulted.

On the basis of the interaction diagram, the business process diagrams are created. The business process diagram describes the timely relationships between the identified transaction types or transaction phases. The transaction types are represented by means of disks. A complete transaction type is displayed with a disk with a bold line, while the transaction phases are represented with a normal disk, but with an indicator that indicates whether the phase is an order-phase (O), execution phase (E) or result phase (R). This division refers to Figure 5. Three types of relationships between the transaction types and transaction phases are represented: causal relationships, conditional relationships and optional causal relationships. Causal relationships are represented by means of an arrow, conditional relationships with a dotted arrow and the optional causal relationships with a small line through the causal relationship arrow. The small disk indicates the start of a transaction process.

The last DEMO model that was applied is the action model and its graphical representation, the action diagram. The action model is the most detailed model of DEMO. The action diagram provides a procedural description of each of the transaction phases. This means that there is a separate action diagram for the order phase, execution phase and result phase of each transaction that is identified in the interstriction model. In the action diagram in Figure 9 we present the execution phase of transaction T1: Delivering_order (the transaction phase has been highlighted in the process diagram). We see that the transaction phase start with two parallel choices. When we decide to deliver from stock, transaction T2 is started. After the decision about the delivery from stock, we have to decide again. This time we have to decide whether to ship the order or not. The synchronisation of the procedure is expressed by the downward pointing triangle. After the synchroniser, T7 is started, and the execution of T7 is promised, the actual order is delivered. With the statement that the order is delivered, the execution phase is completed. The further performance is displayed in the action diagram of the result phase of T1: Delivering_order.

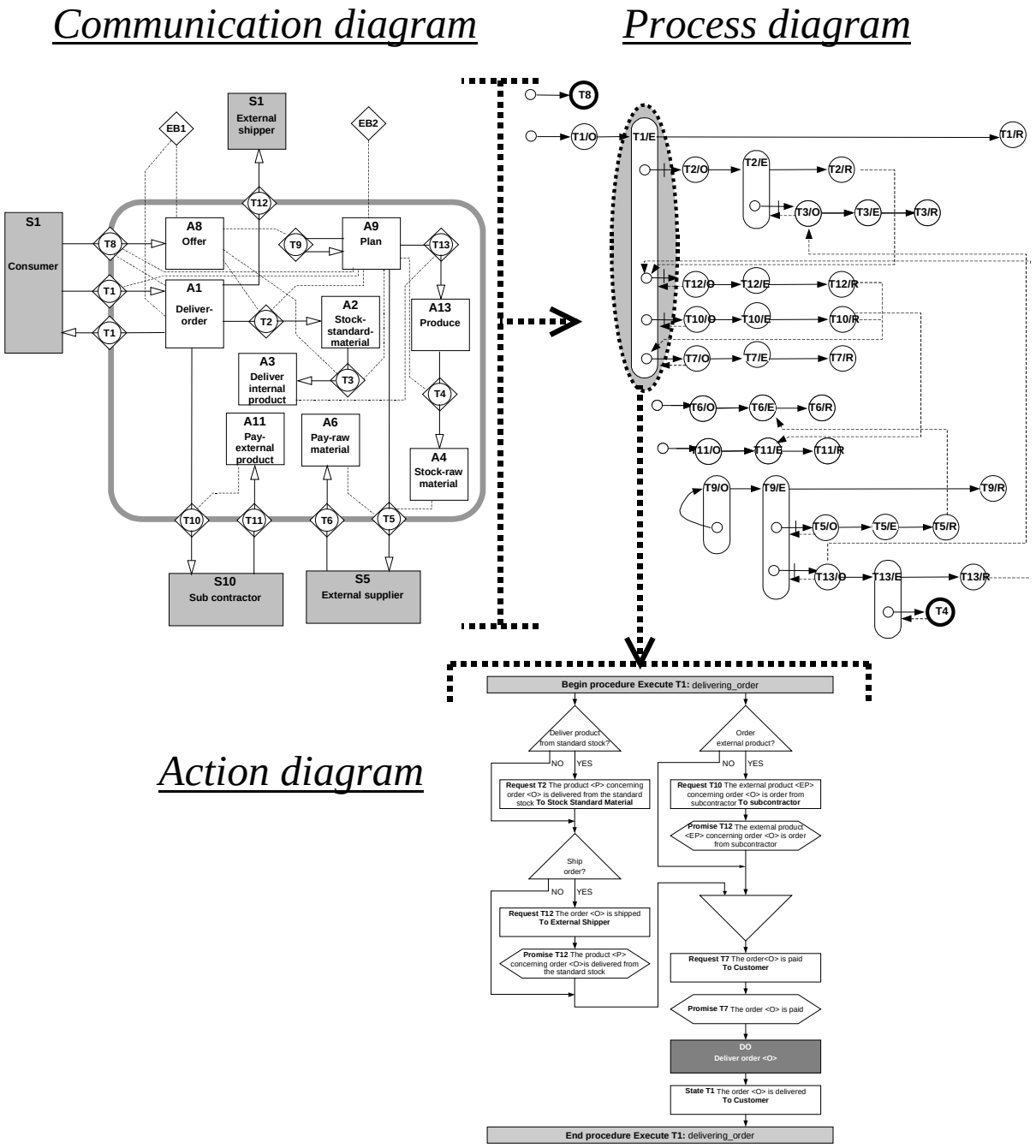

Figure 9: The communication diagram and the process diagram of Structo and one of its action diagrams

5. Comparison and conclusions

In this paper we have presented and applied two methods for modelling business processes in organisations. The two methods have first been introduced at a theoretical level, where the underlying perspectives were emphasised, and then they were applied to a case study. Both the underlying perspective and the practical application form the basis for the comparison in the current section. On the basis of the comparison, some preliminary conclusions are drawn and a proposal for the integration of the two methods is suggested.

5.1 Comparing the underlying perspective

The purpose of this section is to compare the underlying perspective in the two methods. The comparison focuses categories, values as well as goals of the two methods.

The main similarity between the two methods is located in their underlying theoretical basis. Both are firmly founded in the philosophy of language, more specifically in Searle's Speech Acts Theory and Habermas' theory of Communicative Action. This implies that their main focus is on the utterance of speech acts by people

in an organisational context, and the way these acts bring about social co-ordination in business situations.

In both methods speech acts are not considered in isolation, but are considered to form element parts of a larger unit of analysis by which organisations are analysed. In BAT the speech acts have been grouped together in the model of six generic phases of business processes in order to emphasise the relation between a customer and a supplier. In DEMO this larger unit of analysis is the business transaction. The speech acts in the business transaction encapsulate an objective action. Both the BAT generic business framework and the complete transaction process model of DEMO provide a description of the possible steps that may occur in business communication. When the structure of the generic business framework is compared with the transaction process model, we observe that the generic business framework is composed of several business transactions. In other words, we may say that the DEMO business transaction is a composition of speech acts and the BAT generic business framework is a composition of business transactions.

When the described focus of BAT (in conjunction with the SIMM-methodology) and DEMO are compared we observe that BAT is not limited to specific aspects of an organisation, while DEMO focuses solely on the formal business communication (in terms of business transactions). The reason for not limiting the focus in BAT is that BAT tries to reveal as many business process related aspects as possible in order to get a complete (or as complete as possible) understanding of the business. The limited focus of DEMO is chosen to identify only the communication that establishes business processes and brings about the co-ordination between the identified business processes because DEMO considers this to be the core of a business and the key to understand its construction.

The concept of business processes differs between the two methods. In DEMO business processes are determined on the basis of the process model. Externally started transaction chains and self-activated transaction chains are regarded as the business processes of the organisation. In BAT business processes are determined on the basis of variances of the customer-to-customer process. These variances are derived from the current business (products, services etc.) and their customer relation.

A difference is also reflected in the formal underpinning of both methods. DEMO uses formal (syntactic and semantic) definition as a basis that assures the integrity of the models. BAT/SIMM is lacking this formal definition, but founds itself in social theoretical principles.

When we consider the application areas of the two methods we find that BAT is a theory that is used in order to highlight business process aspects when reconstructing, evaluating and redesigning business processes. In this paper we have focused the usage of BAT together with the SIMM-methodology that is aiming to perform business development concerning a range of different aspects. These aspects may include business ideas and goals, organisation culture, products and services, marketing, administrative systems etc. Depending on the application area, the relevant method components are chosen. When BAT is used as a theoretical lens together with the SIMM-methodology one focuses the organisation's business processes. DEMO, on the other hand, is an integrated theory and modelling facility for understanding and modelling the construction of business communication processes. The analysis at the essential level is used as a starting point for information systems design or redesign of the organisation.

5.2 Comparing the procedures and notations

In this section we compare the procedures (way of working as well as the way of modelling) and the notations in the two methods. We are looking upon the method components (see section 2) in each method. The comparison is based on experiences from the application of the two methods in the case study. One should not see this comparison as an overall comparison where we reveal all similarities and differences between the two methods, but a number of highlights are put forward.

The application of BAT/SIMM and DEMO to the case study reveals both similarities and differences. In both methods the relation between the business and its environment are described in terms of communication. In BAT this is conceptualised with the six generic phases model for business interaction between supplier and customer while in DEMO this is conceptualised with business transactions between customers and actors in the business. Both methods actively apply the concepts from the language/action perspective for the understanding of the relation between organisation and its environment as well as for the understanding of the co-ordination of activities in the organisation.

The differences between application of the methods relate to their way of working as well as to the results, i.e. the information included and presented in the models and diagrams. When we consider the way of working we observe that BAT/SIMM starts out in defining which business that is supposed to be analysed (the business function). Then BAT/SIMM continues with the description of the business at the lowest level of detail, the description of the actions and the action objects and the connection between them and represents them in action diagrams. The generic business model is used in order to focus the doing of business. The process diagram is then used to summarise and identify the customer-to-customer process and its side processes (conditions and consequences). The diagrams are developed iteratively in order to find the variances in the business. The DEMO analysis is guided by the its three levels of abstraction (essential, informational and

documental). The organisation is first analysed at the essential level and represented in the interaction model, process model, interstriction model, facts model and action model. When the participants in the analysis agree on the representation, the essential model forms the starting point for the analysis of the informational and documental level of the organisation.

When the resulting diagrams of the two approaches are compared in detail, we also observe similarities and differences. At first glance the DEMO communication diagram and the process diagram show great resemblance with the BAT/SIMM process diagram. In both studies identical business communication processes are identified. A closer look reveals that the DEMO process diagram contains a more formal description of the relationships between the communication processes. In spite of their name, the DEMO action diagram and the BAT/SIMM action diagram show little resemblance. The BAT/SIMM action diagram is a contextual representation of activities, flows, action objects and their relationships in a business process. In DEMO the action diagram is a procedural representation of the communicative actions in a business transaction phase and their relationships with other business transactions. A formal specification of the object world, as performed in the DEMO facts model, is not performed in a business analysis with BAT/SIMM. When modelling for information systems design a detailed activity specification may be performed.

In BAT/SIMM a business is analysed in terms of variant processes. For example different lines of production and customer relations may form the input for separate analyses resulting in multiple process diagrams. In DEMO the business process is analysed as a whole, meaning that there is only one of each of the models constituting the essential model of the organisation.

5.3 Conclusions

In this paper we have applied business modelling with both BAT and DEMO to the same case study. Since the Structo case was first modelled with BAT and then modelled with DEMO we need to be careful with the interpretation of the results of the analysis. An ideal situation would have been if the BAT and DEMO analysis had been applied simultaneously to the case because the analyses would not have influenced each other.

The comparison between BAT and DEMO reveals two methods with identical theoretical foundations resulting in different business models. The first important reason for the differences in the models is located in the fact that DEMO introduces and applies an essential level for modelling businesses. BAT describes business action in the context of business processes, and does not distinguish between layers of abstraction as used in DEMO.

In relation to this difference we observe that the methods apply separate ways in which their models are created. DEMO uses a more top-down oriented approach for determining the business models, while BAT/SIMM uses a combined interaction between the top-down (non-strict), the bottom-all and the bottom-up approach. Therefore the resulting diagrams of BAT show more detail compared to the DEMO models. In BAT this is needed in order to create aggregations of a range of aspects. The DEMO models at the essential level are enriched with detail when the informational and documental levels are analysed.

Since DEMO has a strong formal basis the modelling has proven to result in rigorous models based on rules while the BAT system analyst has more freedom in order to create different models highlighting different aspects depending on the needs of the business.

When applying both methods we have observed that the methods may supplement each other. In the first place that the generic business framework postulated by BAT formed a useful perspective and framework for identifying the communication processes between customer and supplier. It may provide a guideline when identifying the business transactions between customer and supplier in the DEMO approach (see Figure 10). We have also found that the possibility to model variant processes may be helpful to provide a clear overview of the business in order to assure that all variances in the business are treated. When analysing a complex business situation for the purpose of redesign, we found that the SIMM models provided a complete reconstruction of the existing praxis. The DEMO models, however, were found to provide better opportunities to redesign the business processes, where a formal definition of the notion of business processes is used. The DEMO models can then help us to focus the essential transactions performed in the business in the latter part of the analysis and in the redesign. Figure 10, displays a way in which the two approaches may be combined in a process of analysis and redesign.

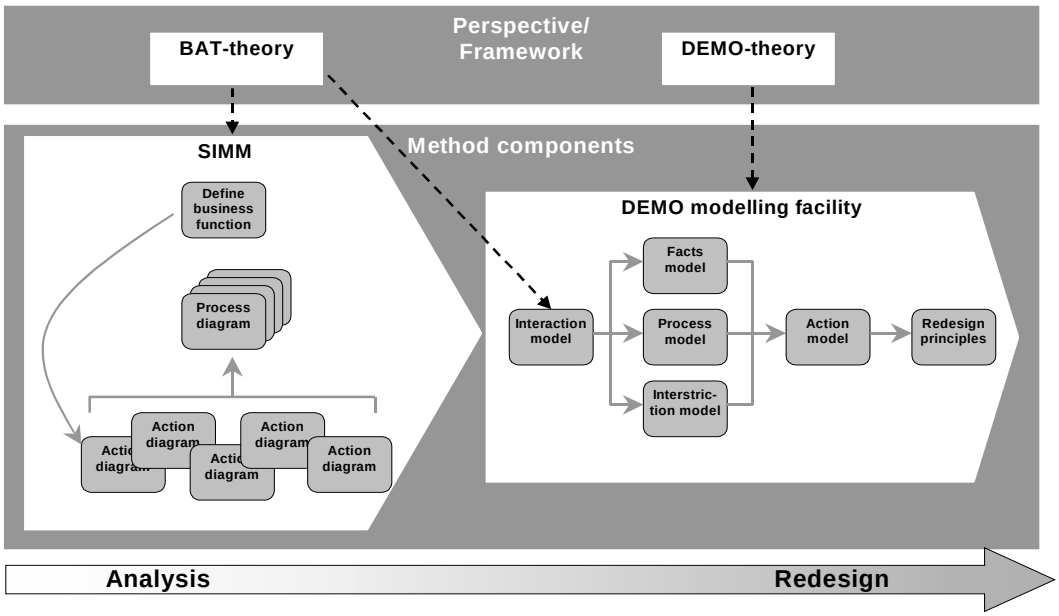

Figure 10: A possible integration of the two approaches in a process of analysis and redesign

5.4 Further research

In the paper we have performed the first step towards the analysis and possible integration of two business modelling methods in the language/action perspective. The first step consisted of a thorough analysis of the two methods at theoretical and practical level. To fully explore the possibilities for the integration of DEMO and BAT/SIMM further research needs to be initiated. This research should concentrate on the different aspects highlighted in the method theory, i.e. perspective (way of thinking), framework (way of working) and method components (way of modelling). One of the steps to perform this further research is to execute a controlled experiment in which both methods are applied to an identical business situation that have not been modelled with either of the methods. Another step to perform this further research would be to perform meta modelling of each method as a basis for comparison.

The results of this further research need to highlight how each method can contribute from each other. An initial impetus can be found in the model for possible integration (Figure 10). Eventually the search for integration may create a sound body knowledge in the language action perspective.

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References

Avison D E, G Fitzgerald (1995) Information Systems Development. Methodologies, Techniques and Tools, McGraw Hill, Berkshire, England

Austin J L (1962) How to Do Things with Words. Clarendon Press, Oxford.

Axelsson B, G Easton (Eds., 1992) Industrial networks. A new view of reality, Routledge, London

Davenport T H (1993) Process Innovation-Reengineering Work through Information Technology. Harvard Business School Press, Boston.

Dietz J L G, H B F Mulder (1996) Realising Strategic Reengineering Objectives with DEMO. In: Proceedings of the International Symposium on Business Process Modelling, Springer-Verlag.

Dietz J L G (1994a) Business Modeling for Business Redesign. Proceedings of the 27th Hawaii International Conference on System Sciences, IEEE Computer Society Press. Los Alamitos, pp. 723-732.

Dietz J L G (1994b) Modelling Business Processes for the Purpose of Redesign. In: B C Glasson, I T Hawryszkiewycs, B A Underwood, R A Weber (Eds.), Proceedings of the IFIP TC8 Open Conference on Business Process Re-Engineering: Information Systems Opportunities and Challenges. Elsevier, Amsterdam, pp. 249-258.

Dietz J L G (1996a) The What and the Why of Modelling Business Processes. In: R M van Es, A Post (Eds.), Dynamic Enterprise Modeling. Kluwer Bedrijfsinformatie, Deventer.

Dietz J L G (1996b) Introductie tot DEMO: Van informatietechnologie naar organisatietechnologie. Samson, Alphen a/d Rijn.

Dignum F, J Dietz (Eds., 1997) Communication Modeling - The Language/Action Perspective, Proceedings of the Second International Workshop on Communication Modeling, Computer Science Reports, Eindhoven University of Technology. http://www.win.tue.nl/win/cs

Dignum F, J Dietz, E Verharen, H Weigand (Eds., 1996) Communication Modeling - The Language/Action Perspective, Proceedings of the First International Workshop on Communication Modeling, Electronic Workshops in Computing Springer. http://www.springer.co.uk/eWiC/Workshops/CM96.html

Flores F, J J Ludlow (1981) Doing and Speaking in the Office. In: G Fick, H Spraque Jr. (Eds.) Decision Support Systems: Issues and Challenges. Pergamon Press, New York, pp. 95-118.

Goldkuhl G (1992) Contextual activity modelling of information systems, in Proceedings of "3rd int. Working Conference on Dynamic Modelling of information systems", Noordwijkerhout.

Goldkuhl G (1995) Metodarkitektur för metodanalys (in swedish), Linköping University

Goldkuhl G (1996) Generic business frameworks and action modelling, In proceedings of conference Language/Action Perspective'96, Springer Verlag

Goldkuhl G (1998) The Six Phases of Business Processes – Communication and The Exchange Of Value, Accepted to the twelfth biennial ITS conference "Beyond Convergence", 21-24/6-1998, Stockholm

Goldkuhl G, S Cronholm (1993) Customizable CASE environments: A framework for design and evaluation, COPE'IT'93/NORDDATA, Köpenhamn

Goldkuhl G, A Röstlinger (1993) Joint elicitation of problems: An important aspect of change analysis, in Avison D et al (Eds., 1993) Human, organizational and social dimensions of information systems development, North-Holland/IFIP w.g. 8.2

Goldkuhl G, M Lind, U Seigerroth (1997) Method Integration as a Learning Process. In: N Jayarathna, T Wood-Harper, B Fitzgerald (Eds.), Proceedings of the 5th BCS Conference on 'Training and Evaluation of Methodology Practitioners and Researchers, 27th – 29th August 1997, Preston

Gummesson E (1996) Toward a theoretical framework of relationship marketing, in Seth JN, Söller A (Eds., 1996): Development, management and governance of relationships, Humboldt Universität, Berlin

Habermas J (1984) The theory of communicative action 1. Reason and the rationalization of society, Beacon Press

Hammer M (1990) Reengineering Work-Don't Automate, Obliterate. Harvard Business Review, July-August

Hammer M, J A Champy (1993) Reengineering the Corporation: A Manifesto For Business Revolution. Nicholas Brealy, London.

Harrington H J (1991) Business Process Improvement: The Breakthrough Strategy for Total Quality, Productivity and Competiviness. McGraw Hill, New York.

Lind M (1996). Business Process Thinking in Practice, in proc of 19th IRIS-Conference, Göteborg University

Lind M, G Goldkuhl (1997) Reconstruction of Different Business Processes – A Theory and Method Driven Analsysis, in proceedings of conference Language/Action Perspective'97, Veldhoven

Lind M, V E van Reijswoud (1998) Modelling Business Communication Differently - A Comparison between Business Action Theory and Dynamic Essential Modelling of Organisations, Working paper, University of Borås

Normann R, R Ramirez (1993) From value chain to value constellation. Designing interactive strategy, Harvard Business Review, July-Aug., p65-77

Reijswoud V E van, W-J van den Heuvel (1997) A Comparison between KISS and DEMO: Two Novel Approaches for Information Systems Analysis in the Netherlands. In: N Jayarathna, T Wood-Harper, B Fitzgerald (Eds.), Proceedings of the 5th BCS Conference on 'Training and Evaluation of Methodology Practitioners and Researchers, 27th – 29th August 1997, Preston

Reijswoud V E van (1996) The Structure of Business Communication: Theory, Model and Application. PhD Thesis, Delft University of Technology, Delft.

Reijswoud V E van, N B J van der Rijst (1995) Modelling Business Communication as a Foundation for Business Process Redesign: A case of production logistics. In: Proceedings of the 28th Hawaii International Conference on Systems Sciences. IEEE Computer Society Press, Los Alamitos CA, pp. 841-850.

Rijst N B J van der, V E van Reijswoud (1995) Comparing Speech Act Based Modeling Approaches for the Purpose of Information Systems Development. In: Proceedings of the Third European Conference on Information Systems, Athens, Greece, June 1-3, 1995, pp. 353-365.

Rummler G A, A P Brache (1995) Improving Performance: How to Manage the White Space on the Organizational Chart. Jossey-Bass, San Francisco.

Searle J R (1969) Speech acts. An essay in the philosophy of language, Cambridge University Press, London

Searle J R (1979) Meaning and Expression. Cambridge University Press, Cambridge.

Searle J R, D Vanderveken (1985) Foundations of Illocutionary Logic. Cambridge University Press, Cambridge.

Taylor J R (1993) Rethinking the Theory of Organizational Communication: How to Read an Organization. Ablex, Norwood.

Taylor T J, D Cameron (1987) Analysing Conversation: Rules and Units in the Structure of Talk. Pergamon Press, Oxford.

Vendler Z (1967) Linguistics in Philosophy. Cornell University Press, Ithaca NY.

Winograd T, F Flores (1986) Understanding Computers and Cognition: A New Foundation for Design. Ablex, Norwood NJ.

Winograd T (1988) A Language/Action Perspective on the Design of Cooperative Work. In: I. Greif (Ed.), Computer Supported Cooperative Work: A Book of Readings. Morgan Kaufmann, San Mateo.