

**Institutionen för data och affärsvetenskap  
vid  
Högskolan i Borås**

**No 14**  
ISSN 1402-3318

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**Modelling Business  
Communication Differently**

**A Comparison between Business Action Theory  
and Dynamic Essential Modelling of Organisations**

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**February 1998**

**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 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 communication. After a theoretical introduction the two methods are applied to two case studies in order to make comparisons both 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.

*The working paper is a preliminary result of co-operation between  
the research group VITS and Delft University of Technology*

# **Modelling Business Communication Differently**

## **A Comparison between Business Action Theory and Dynamic Essential Modelling of Organisations**

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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 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 communication. After a theoretical introduction the two methods are applied to two case studies in order to make comparisons both 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.



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## 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 1994; Rummler, Brasch, 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, 1996). 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 business modelling that provide conceptual models a structured understanding of the business processes and their mutual relationships and that allow well-considered decisions based on this understanding.

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). Based on this foundation both methods consider communication to be the unit of analysis. By means of analysing business communication as form of action the business processes and their relationships are identified and represented.

The communication-based models of business processes have multiple purposes. In the first place the 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 and DEMO. Both methods consist of a theory for understanding business processes and a modelling facility based on this theory. BAT (Business Action 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 and model 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 philosophical underpinning that characterise both methods. In section 3 we introduce the two methods separately at a theoretical level. In sections 4 and 5 we introduce two case studies. Each of the studies is modelled with both approaches. The resulting modelling of these case studies form the basis for the comparison of both approaches in section 5.



## 2. Speech act based modelling approaches

The focus on communication as the key concept for the understanding and modelling of organisations requires a theory explaining language 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).

The main characteristic of the Speech Act Theory is that it considers the use of language to be a form of rule-governed behaviour. Uttering a sentence is the performance of an act, a so-called speech act.

The most important type of speech act in an organisational context is the illocutionary act. Falling through the Speech Act Theory's prism, the concept of saying something spreads out a spectrum of illocutionary acts and illocutionary forces. These forces specify how an utterance in question is intended to be taken - that is, what natural effect (cognitive, motive, social or legal) it is intended to have, and, accordingly, in what dimensions (truth, feasibility, propriety, and so on) it is supposed to be assessed. For instance, an utterance has the "force" of a statement, a warning, a promise, an order, and so forth (Vendler, 1967). The general structure of the illocutionary act is  $F(p)$ : a proposition  $p$  with an illocutionary force  $F$ .

On the basis of their force, illocutionary acts have been grouped into five families:

- *Assertives* commit the speaker to something's being the case (e.g., stating);
- *Directives* try to get the hearer to do something expressed in the proposition  $p$  (e.g., questioning and commanding);
- *Commissives* commit the speaker to some future course of action (e.g., promising);
- *Declaratives* bring about a (new) state of affairs by merely declaring it (e.g., declaring);
- *Expressives* express the speaker's attitudes/feelings about a state of affairs (e.g., apologising).

The Speech Act Theory has been the foundation for a number of theories and modelling approaches in the area of information systems. These approaches consider the utterance of speech acts to be the backbone of business processes and consequently their modelling effort focuses on speech acts. The initial impetus to a speech-based conceptualisation of organisation has been the work by Flores and Ludlow (1981). The authors propose to perceive organisations as networks of inter-related commitments created by directives, commissives, assertives and declaratives (expressives were not included in their analysis).



### 3. The two concepts

#### 3.1 Business Action Theory and the SIMM-Methodology

When performing business modelling there is a need for both theory and method (Lind, Goldkuhl, 1997). A method consists, among other things, of questions to ask when performing work of investigation. A supplementary theory is an aid to gain deeper understanding of the area that is studied. More questions are added to the method by using supplementary theory. There is although a need for methods, when performing business modelling, in order to achieve a structured documentation. See Lind, Goldkuhl (1997) for a deeper discussion about method and theory driven business modelling, with special focus on reconstruction of business processes.

Therefore 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 language action perspective. The method components that are being used are parts of the SIMM-methodology. BAT has been used together with the SIMM-methodology in a number of applications (see for example 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 mere agent-less transportation of information and material. It consists of customers and suppliers performing actions of communicative and material character. Such different actions are related to each other in generic patterns.

BAT, presented by Goldkuhl (1996, 1997), is one such attempt to describe the generic business action logic. This theory is founded on communicative action theories (as e.g. Searle, 1969; Habermas, 1984) and business relationship theories (as 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 up 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 customers' 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.

These different phases were described in Goldkuhl (1996) and have been further developed in Goldkuhl (1997). The phases are depicted in Figure 1.

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.

The purpose of BAT is of course to describe and explain business interaction. But the purpose is also that it can 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 congruent change methods.

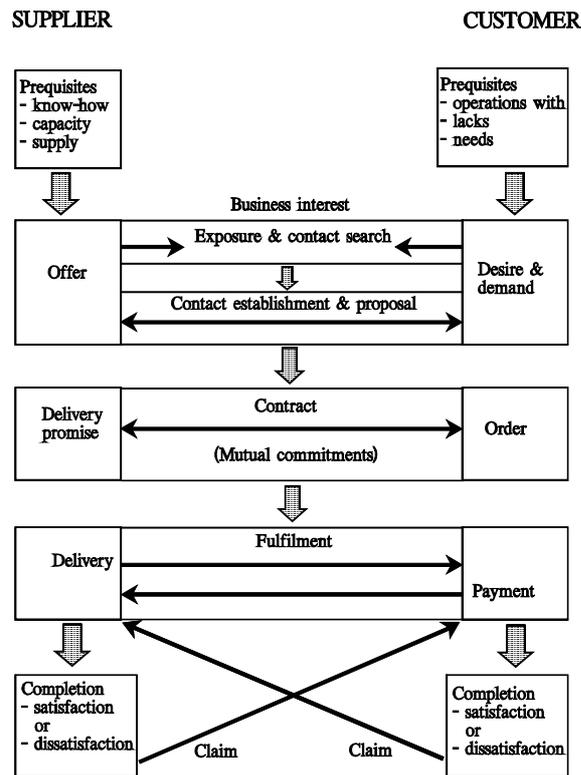


Figure 1: Business Action Theory: The six generic phases of business processes (from Goldkuhl, 1997)

### 3.1.2 The SIMM-methodology

As explained before a distinction is made between theory and method. The L/A oriented business process theory should actively be used in reconstruction, evaluation and redesign of business process. This theory should thus be an explicit supplement to process analysis methods. In this paper we focus the two method components from the SIMM methodology that are being used for reconstruction of a corporation's different business processes. These 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 using Action Diagrams is to capture the detailed activity pattern within a business process. Action Diagrams are graphical models (Goldkuhl 1992, 1996). They have a well-defined notation. 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's 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 are used to make it possible to regard the business process on a survey level. A Process diagram is a key map of a business process. The contents in the Action Diagrams, such as activities, flow and action objects are grouped to more coarse-grained components. These components are called:

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

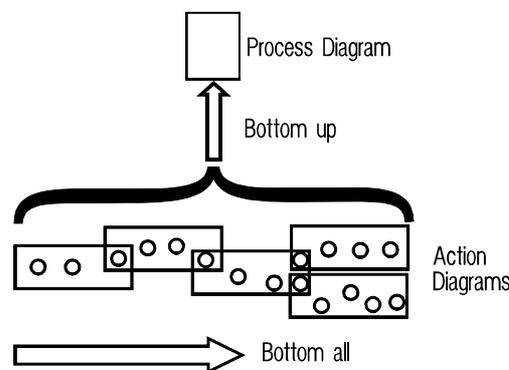
Each business process consists of a customer-to-customer process and possible side processes. The customer-to-customer process consists of the business logic from customer inquiry or order to delivered products to the customer. The activities within a customer-to-customer process are performed for a 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 different models and the corresponding diagrams are illustrated in this section in more detail.

### 3.1.3 Different ways of performing business

As identified in Lind (1996) a corporation usually consists of several business processes (variant processes) and these coexist in a corporation and co-use the infrastructure of the corporation. This means that an organisation has different ways of performing 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 which business processes the corporation consists of. These have to be reconstructed, which can be done by business modelling using Action Diagrams and Process Diagrams. A series of Action Diagrams and appurtenant Process Diagram describes the parts of a business process and how these parts are related to each other. In order to develop a corporation its business processes need to be reconstructed as a basis for redesign. A combined bottom-all and bottom-up approach is used to reconstruct the different business processes (Lind, Goldkuhl, 1997). See Figure 2.



**Figure 2: Bottom-all and bottom-up approaches when using Action Diagrams and Process Diagrams (Lind & Goldkuhl, 1997)**

## 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).

In DEMO, the functioning 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 2 displays the levels of abstraction.

When considering an organisation the documental system proves to be the most voluminous, the same information may be represented several times in several forms (E.g., 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 3 is chosen.

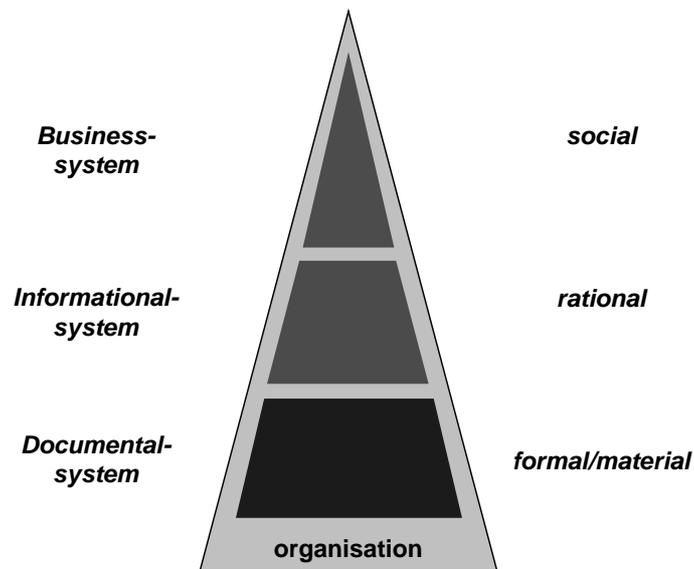


Figure 3: The levels of abstraction in DEMO

The essential 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 Orders 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 4.

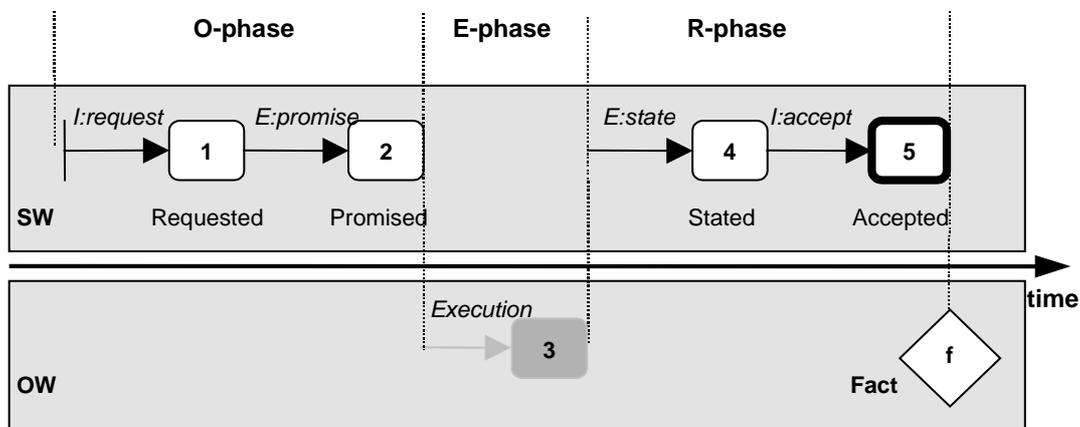
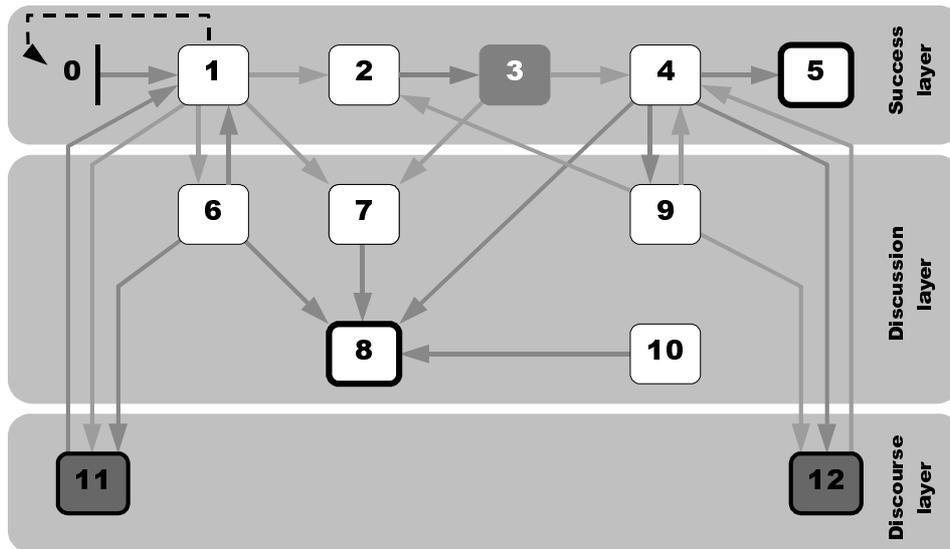


Figure 4: The basic pattern of the DEMO transaction

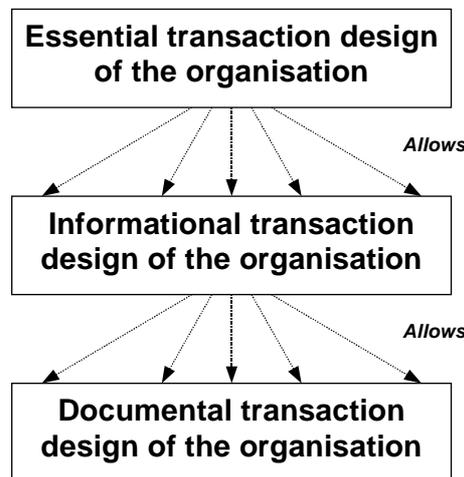
The basic pattern of a transaction displays on the minimum set of actions that are needed for the successful completion of a business transaction. In other words, it only displays the success-layer of transactional business communication. However, when we observe the transactional communication in businesses, 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 5 all possible communicative actions in a business transaction are displayed by means of a modified state transition diagram (Reijswoud, 1996). The dark arrows are communicative acts by the initiator while the light arrows denote communicative acts by the executor of the business transaction.



**Figure 5: 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 transaction 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 performative communication. At the informational level the execution of a transaction is described as the exchange of information (information flows), and at the documental level the materialisation of the transaction in tangible objects (documents, files etc.) is described. The DEMO approach 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 6.



**Figure 6: Transaction design and levels of abstraction**

The modelling facility of DEMO provides an understanding and 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 fact 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 transaction initiating or transaction executing actors. The graphical notation used for the interaction model is the communication diagram. The process model describes 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. The different models and the corresponding diagrams are illustrated in this section in more detail.

## 4. Case 1: 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 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. In the next paragraphs this description is used as a basis to illustrate the practical usage of the business process modelling approaches BAT and DEMO. The DEMO-models have not been used in the case study. They 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 of one of the following types:

- special production customer
- standard stock customer
- 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 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 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.

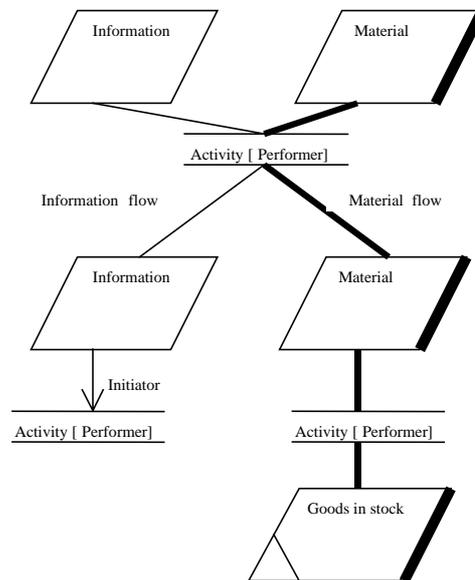
For the whole trading customer Structo will place a direct order with one of the subcontractors that will directly deliver the product to the customer. After the delivery, the subcontractor will send an invoice to Structo, which, together with customer order, is the basis to prepare and send an invoice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

### 4.2 Analysing Structo with BAT

The BAT-analysis of Structo is presented in three different models, which are Action Diagrams, Process Diagrams and the business phase matrix.

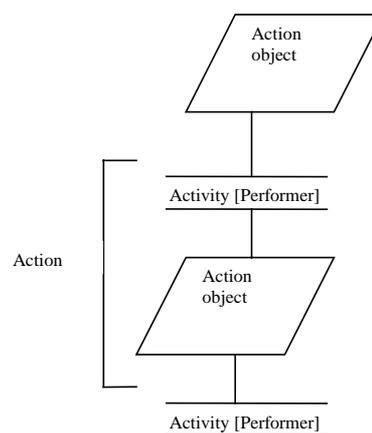
As mentioned before one starts out with a bottom-all approach in order to reconstruct existing praxis. A

contextual 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's through descriptive connectors (i.e. links to other Action Diagrams). The limits of each Action Diagram are arbitrary; i.e. the analyst has the freedom to choose the appropriate borders of the described context. The basic description elements are found in Figure 7.



**Figure 7: Basic description elements in Action Diagrams (Goldkuhl, 1996)**

When the analyst is producing Action Diagrams BAT is used as a theoretical lens in order to ask focused questions. Action Diagrams can be used for many purposes and the design of the diagrams is done situation adaptable. In this paper business processes are focused, where Action Diagrams are used to reconstruct business praxis. BAT is emphasising different communicative actions when doing business. In the Action Diagrams the actions is a combination of the activity and resulting action objects (see Figure 8). In order to achieve understanding for the business context activities, prerequisites and results from activities are shown, i.e. Action Diagrams does also contain description elements used to understand the context around the actions.



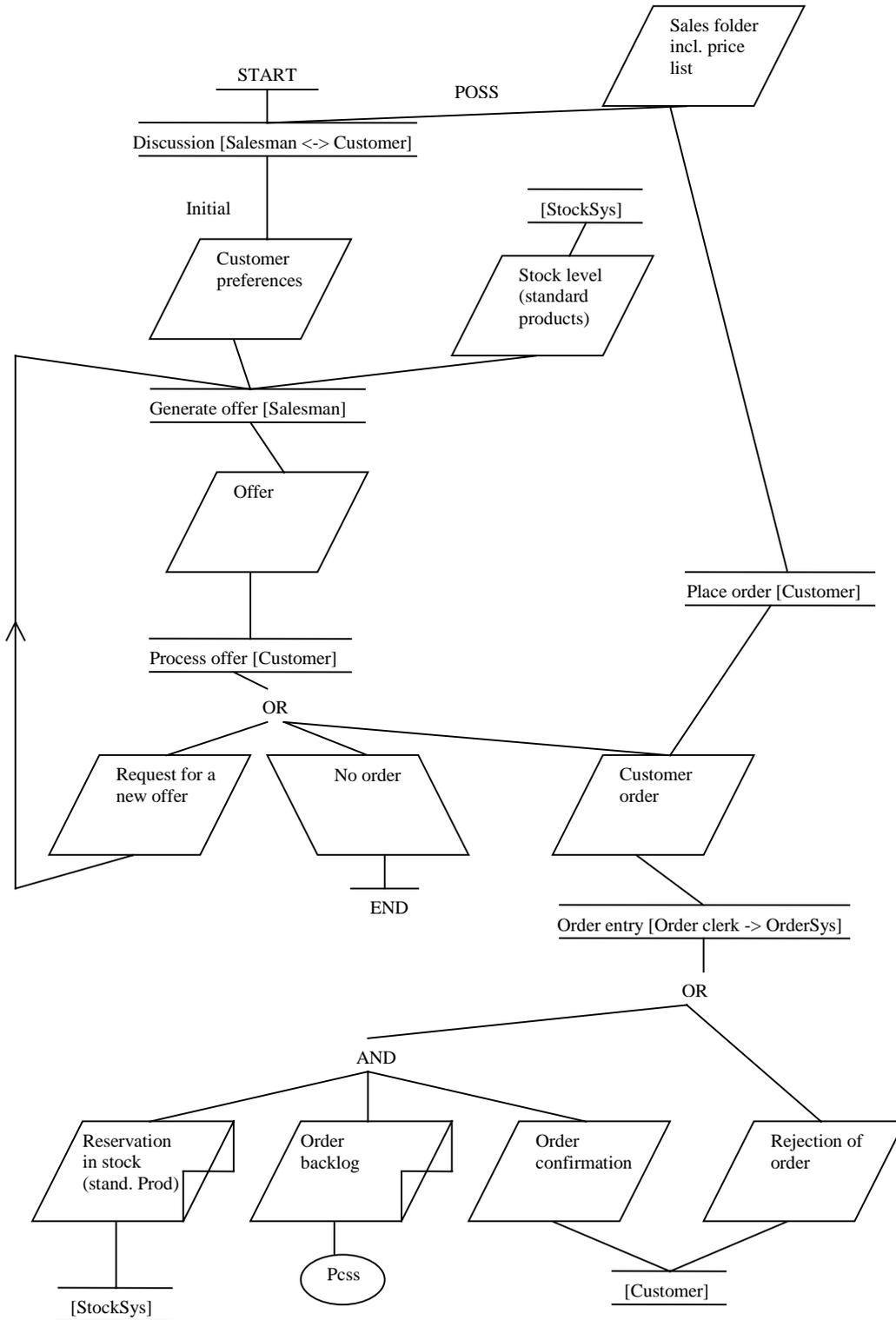
**Figure 8: An action is a combination of the activity and resulting action object**

When Structo's business processes were reconstructed a total amount of 25 Action Diagrams were used. In this paper we have chosen to show the Action Diagrams for the customer-to-customer process for the standard stock customer. These are shown in figure 9, 10, 11 and 12. As can be seen in the figures descriptive connectors link the Action Diagrams to each other. The table below shows the descriptive connectors for each figure.

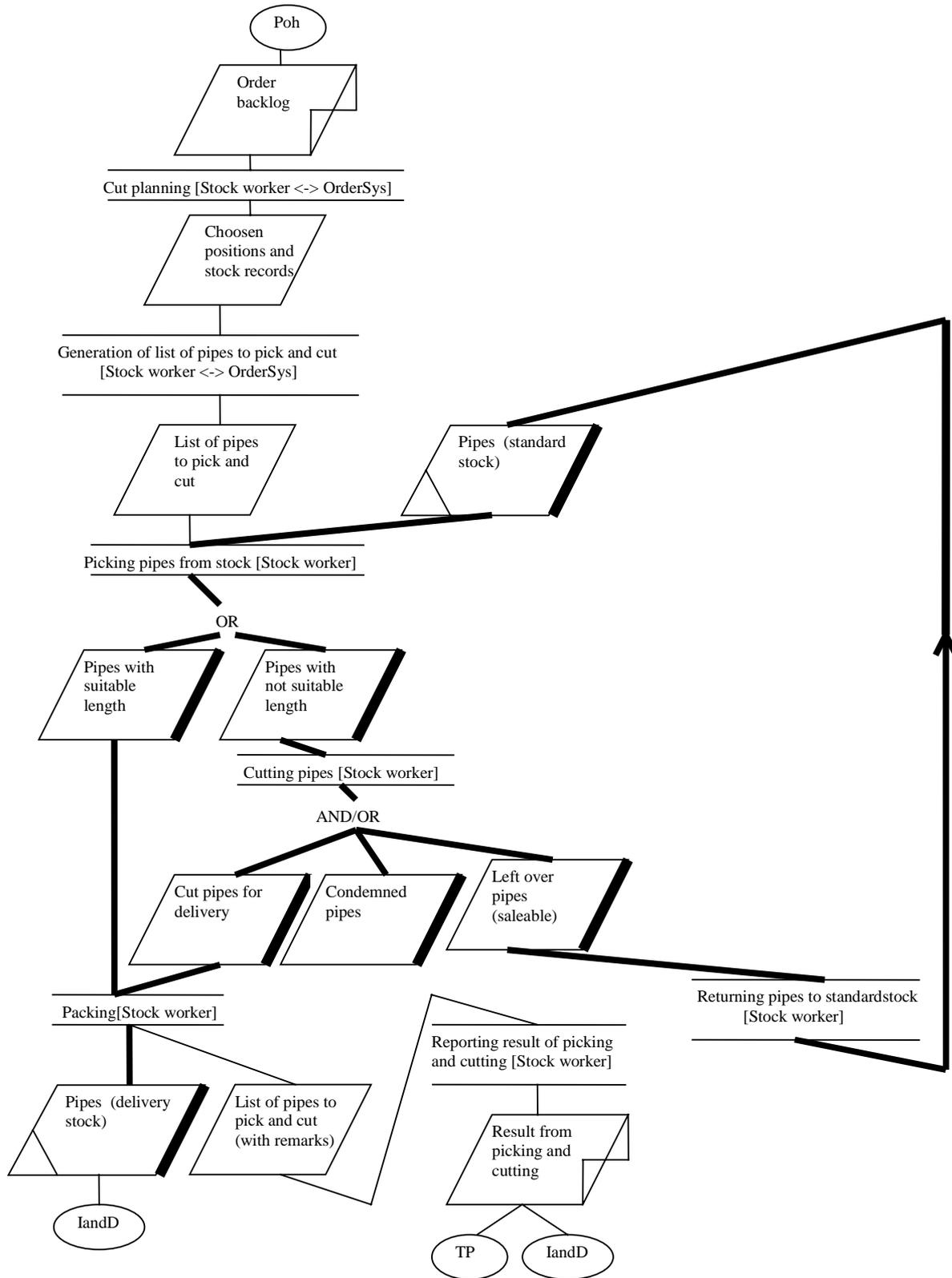
<i>Descriptive connector</i>	<i>Business context</i>	<i>Figure</i>
Poh	Proposal and order handling	9
Pcss	Picking/cutting from standard stock	10
TP	Transportation planning	11

landD	Invoicing and delivery	12
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**Table 1: Descriptive connectors for the Action Diagrams**



**Figure 9: Action Diagram concerning Standard stock customer: Proposal and order handling (Poh)**



**Figure 10: Action Diagram concerning Standard stock customer: Picking / cutting from standard stock (pcss)**

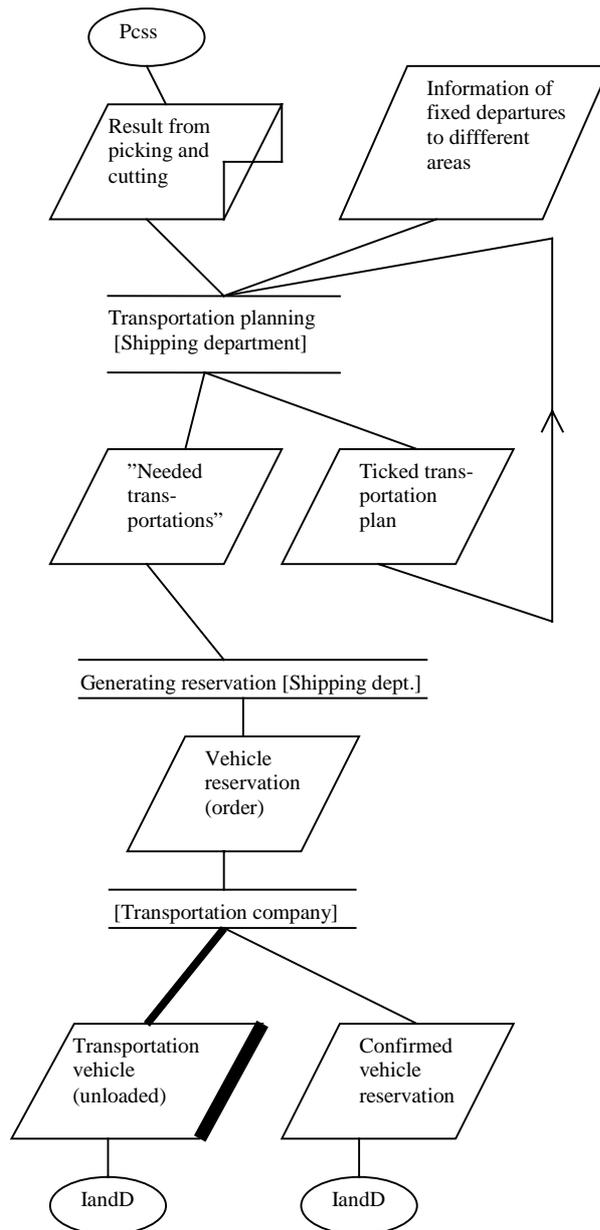
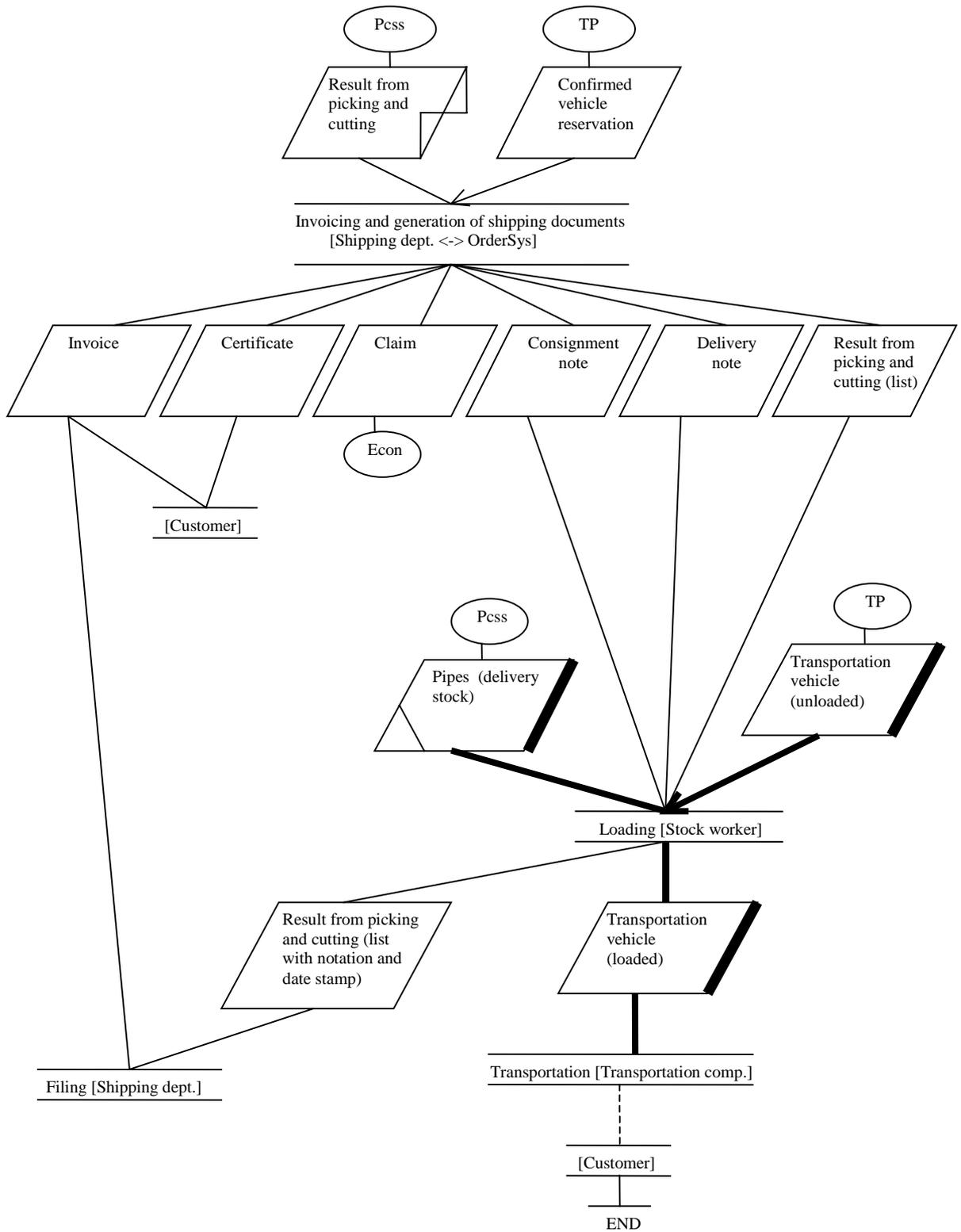


Figure 11: Action Diagram concerning Standard stock customer: Transportation planning (TP)



**Figure 12: Action Diagram concerning Standard stock customer: Invoicing and delivery (IandD)**

Action Diagrams have been generated for all business contexts concerning the different business processes. These business processes are regarded as variant processes, which are classified by the two dimensions “customer relation” and “internal handling”. Table 2 shows the delimitation of the three business processes.

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

**Table 2: The delimitation of the business processes (variant processes) at Structo**

Process diagrams are generated in order to make it possible to regard the business processes on a survey level. The bases for generating the process diagrams are the Action Diagrams. The different elements in the Action Diagrams are grouped to more coarse-grained components. These components are sub-processes, side-processes, flows (information and material) and a customer-to-customer process. 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. For more syntactical and semantic details on the graphical notation of the process diagram see (Lind, 1996; Lind, Goldkuhl, 1997). Figures 13, 14 and 15 show the process diagrams for the different business processes.

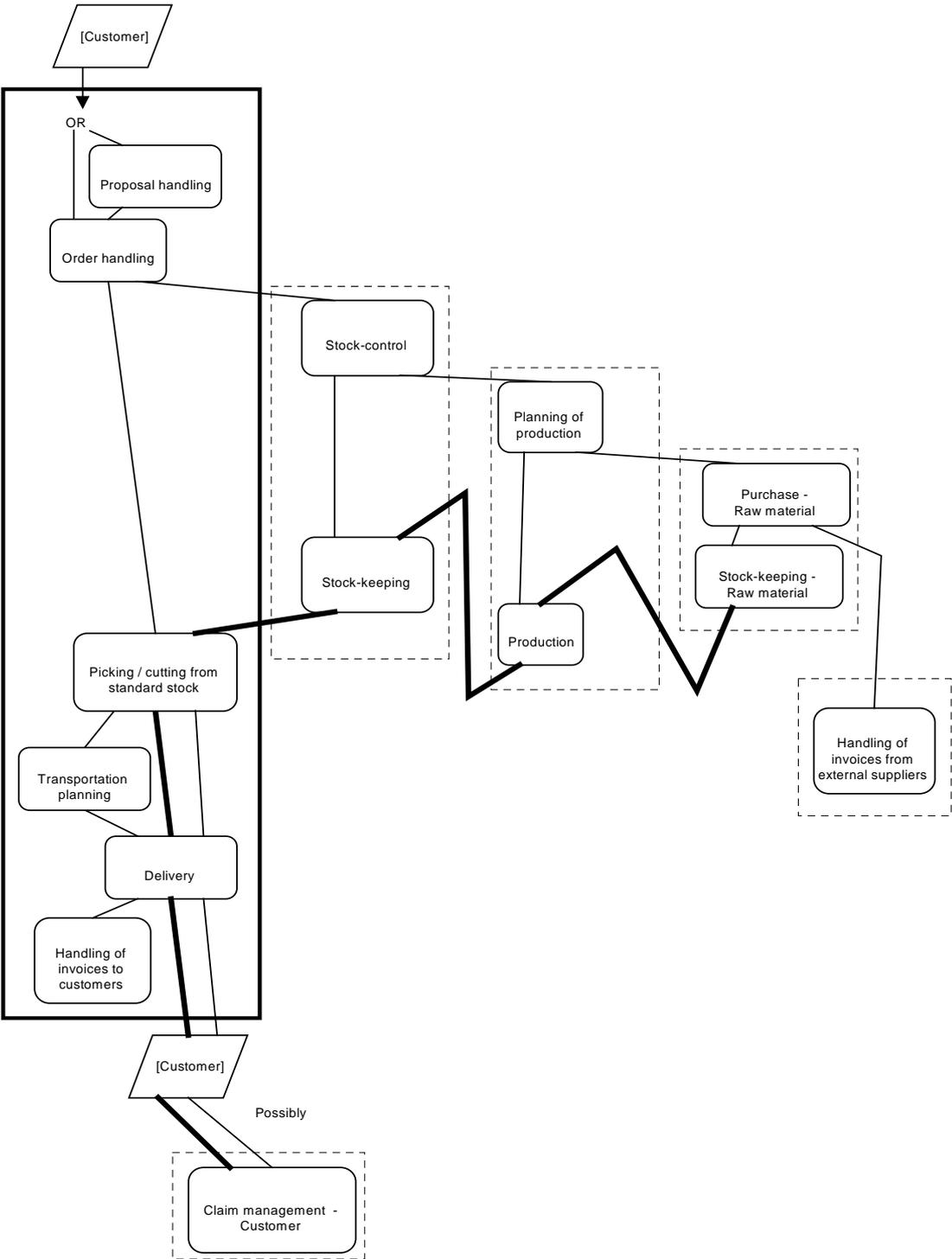


Figure 13: Process Diagram concerning the business process Standard stock customer

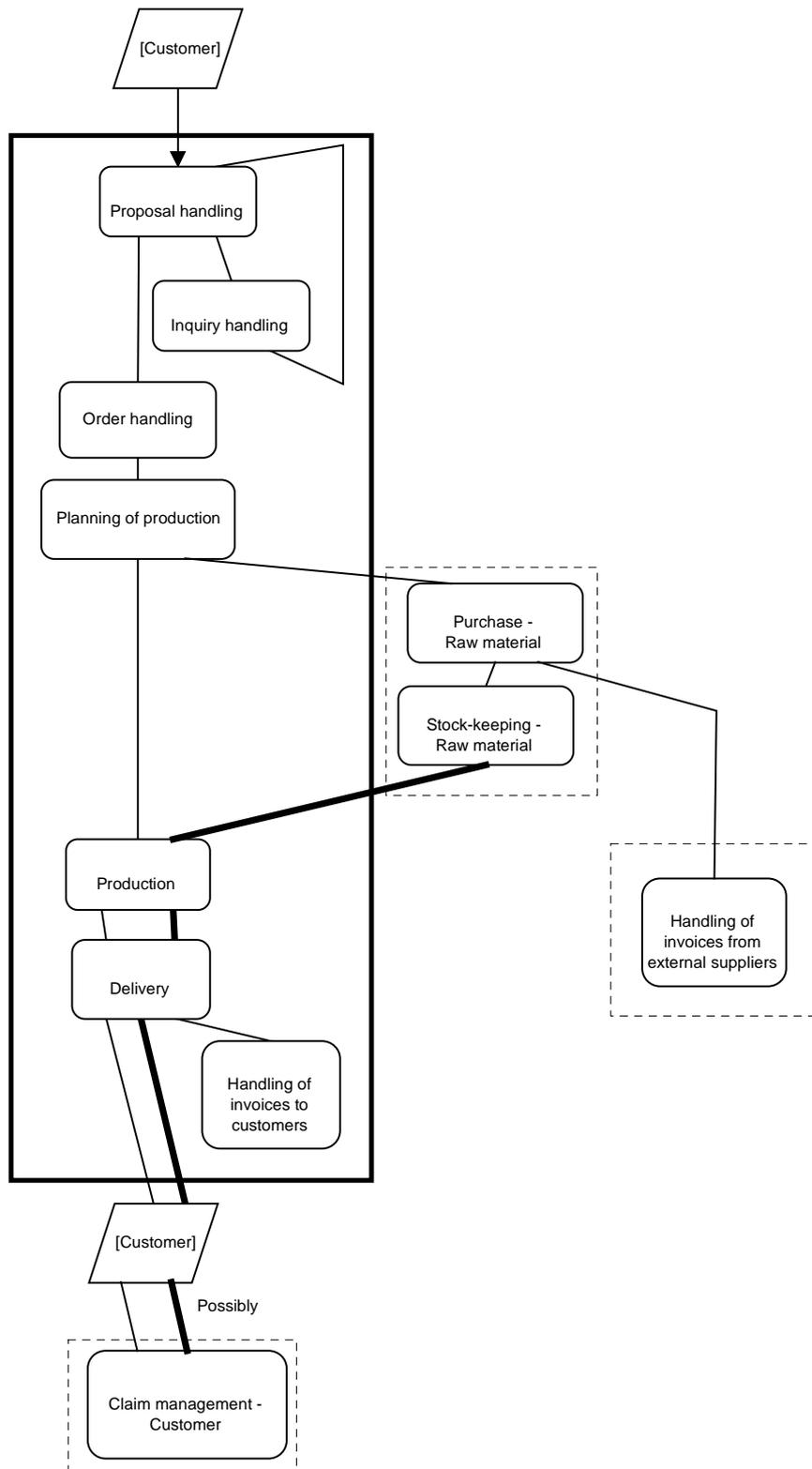
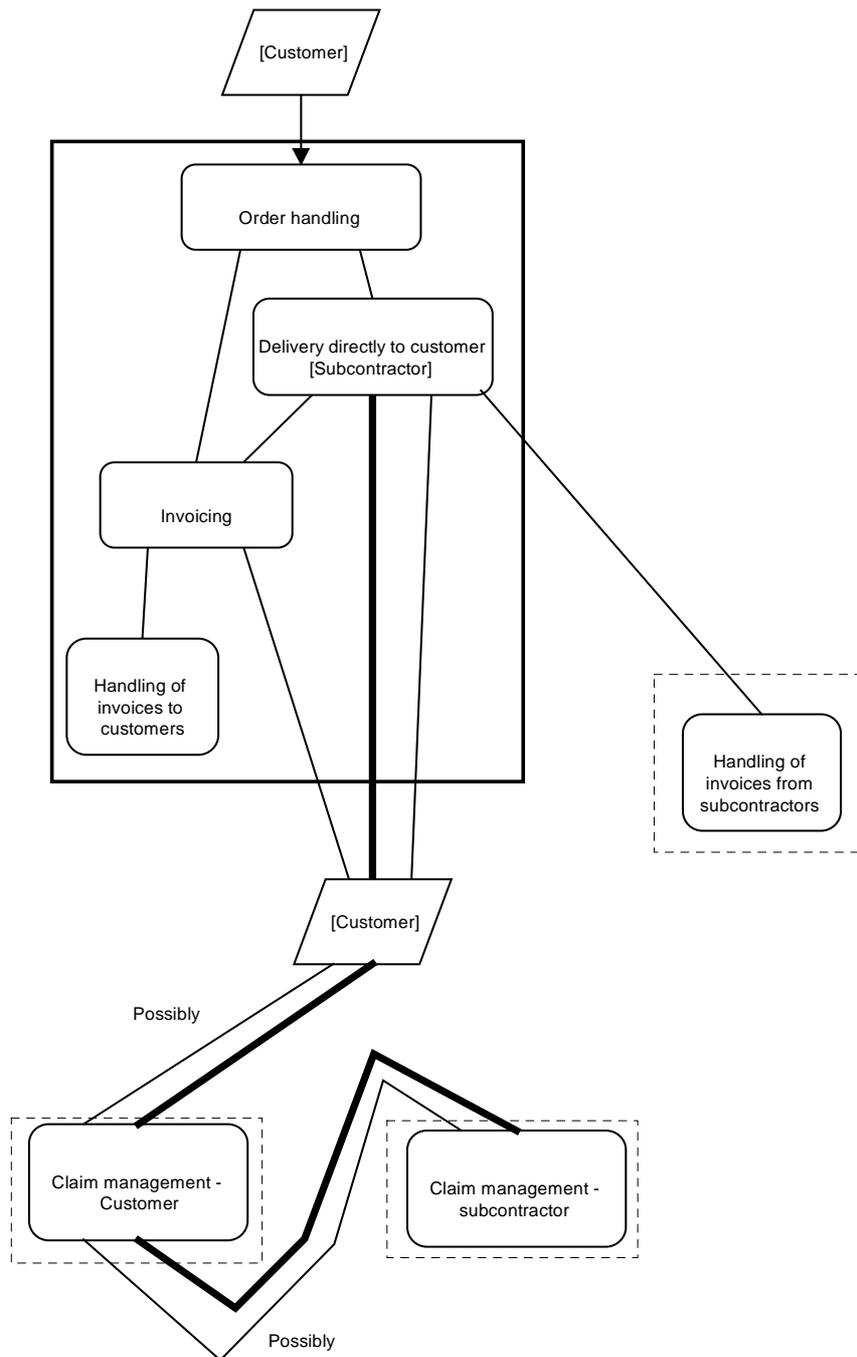


Figure 14: Process Diagram concerning the business process Special production customer



**Figure 15: Process Diagram concerning the business process Whole trading customer**

The process diagrams show that some sub-processes are the same for different business processes, but they are performed in different contexts. Sub-processes are re-used. The process diagrams also highlight the business process as being a combination of transforming raw material to finished product and the actual business actions.

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. 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 3 shows the business phase matrix for the business processes at Structo.

Business process Phase	Standard stock customer	Special production customer	Whole trading customer
<b>1. Business prerequisites phase</b>	Own production of standardised products.	Flexible production equipment, design competence.	Established relationships with subcontractors.
<b>3. Contact establishment and proposal phase</b>	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.
<b>4. Contractual phase</b>	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
<b>5. Fulfilment phase</b>	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
<b>6. Completion phase</b>	Potential claims are handled by Structo.	Potential claims are handled by Structo.	Potential claims may be forwarded to subcontractors.

**Table 3: Business phase matrix for Structo (Lind, Goldkuhl, 1997)**

### 4.3 Analysing Structo with DEMO

The DEMO analysis of Structo as process network of essential business transactions is presented in four partial models and their diagrams for representation. The first model that is presented in this section, is the Interaction Model, which represented by the interaction diagram, then it continues with the Business Process Model represented by the process diagram, and finally part of the Action Model and its action diagram is presented. In this paper the DEMO Facts Model is not considered, because there is not a comparable model component in the BAT 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 the transaction. The transaction-fact type table (table 4) of the case study summarises the business transaction types and the fact types resulting from the successful execution of the transactions. Table 5 presents the transaction-actor table. In this table business transactions and the actors involved in their role of initiator or executor of these transaction type are presented.

Transaction type	Fact type
T1 Delivering_order	The order <O> is delivered
T2 Delivering_product_standard_stock	The product <P> concerning <O> is delivered from the standard stock
T3 Delivering_internal_product	The product <P> is delivered internally
T4 Delivering_raw_stock	The raw material <R> is delivered from the raw material stock
T5 Ordering_raw_material	The raw material <R> is ordered from external supplier <ES>
T6 Paying_raw_material	The raw material <R> is paid
T7 Invoicing_customer_order	The order <O> is paid
T8 Offering	The offer <OF> is offered
T9 Planning	The planning <P> concerning raw material ordering and production is made
T10 Ordering_external_product	The external product <EP> is ordered from subcontractor <SC>
T11 Paying_external_product	The external product <EP> is paid
T12 Shipping_order	The order <O> is shipped
T13 Producing	The product <P> is produced

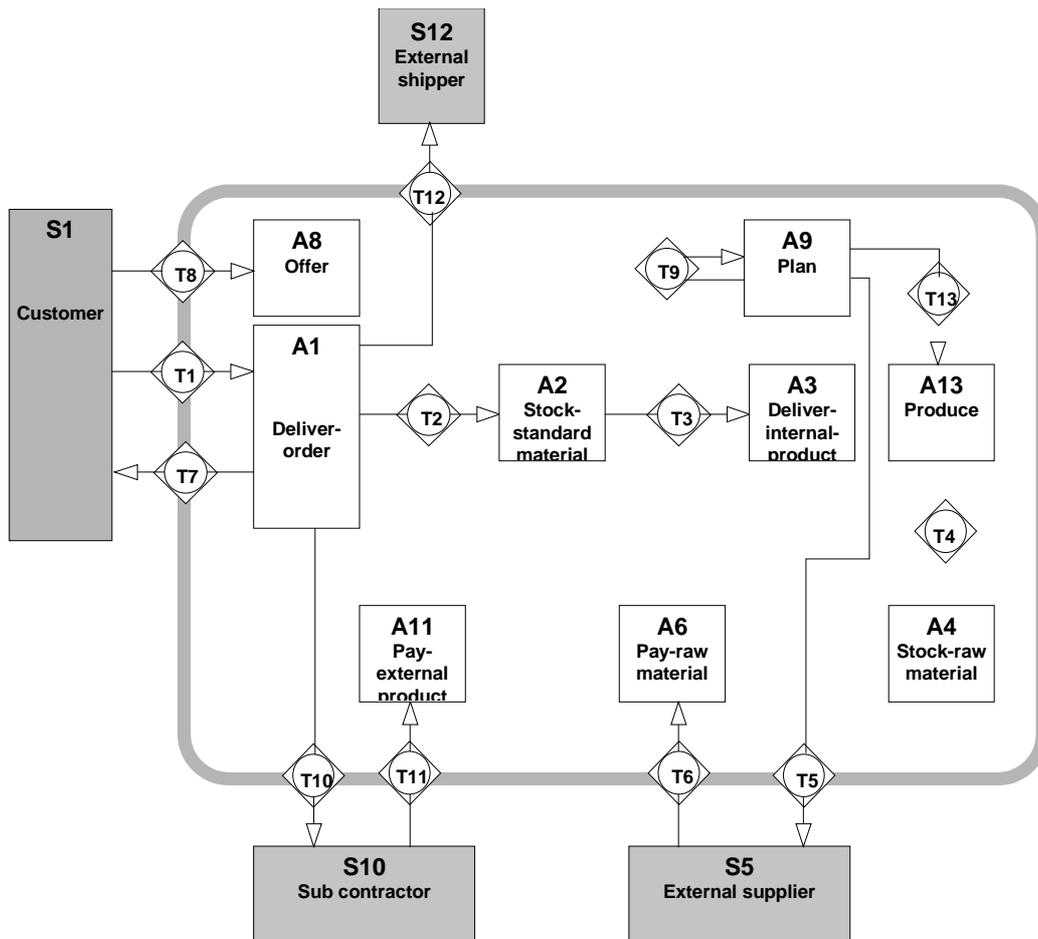
**Table 4: The transaction-fact type table of Structo**

Transaction type	Initiator	Executor
T1 Delivering_order	Customer	Deliver-order

Transaction type		Initiator	Executor
T2	Delivering_product_standard_stock	Deliver-order	Stock-standard-material
T3	Delivering_internal_product	Stock-standard-material	Deliver-internal-product
T4	Delivering_raw_stock	Produce	Stock-raw-material
T5	Ordering_raw_material	Plan	External-supplier
T6	Paying_raw_material	External-supplier	Pay-raw-material
T7	Invoicing_customer_order	Deliver-order	Customer
T8	Offering	Customer	Offer
T9	Planning	Plan	Plan
T10	Ordering_external_product	Deliver-order	Subcontractor
T11	Paying_external_product	Subcontractor	Pay-external-product
T12	Shipping_order	Deliver-order	External-shipper
T13	Producing	Plan	Produce

**Table 5: The transaction-actor table of Structo**

The 13 different transaction types and their initiating and executing actors are graphically represented in the interaction diagram (see Figure 16). 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.



**Figure 16: The interaction diagram of Structo**

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 4. 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.

For the analysis of the process of Structo we have decided to analyse first the process structure for each of the customer types (figures 17, 18 and 19). In Figure 20 we have combined the three business process models into one complete model.

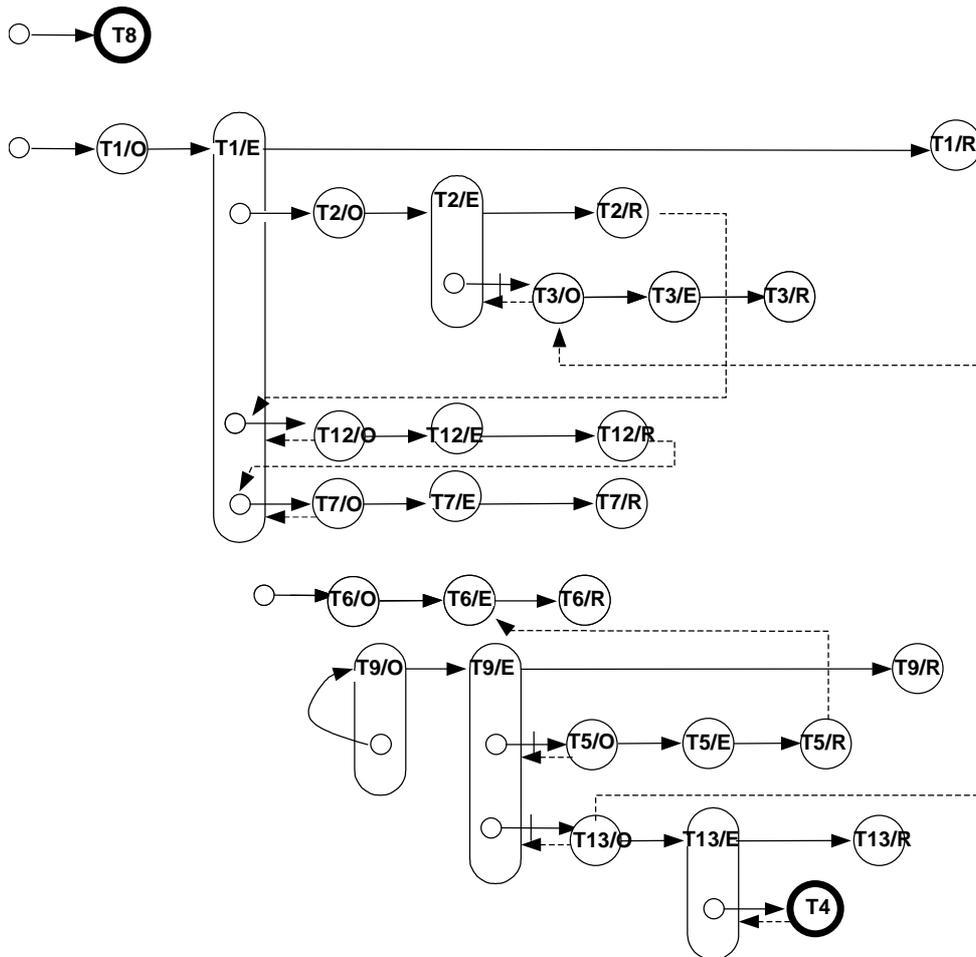


Figure 17: Process Diagram of the Standard Stock Customer at Structo's

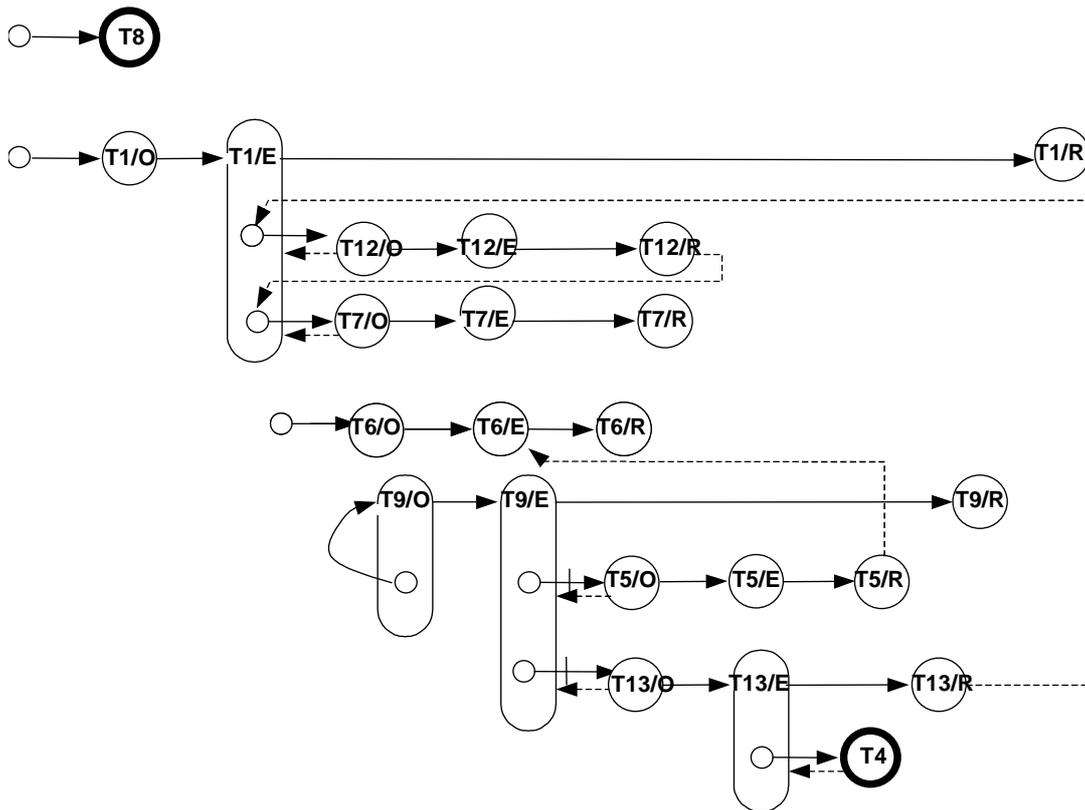


Figure 18: Process Diagram of the Special Production Customer at Structo's

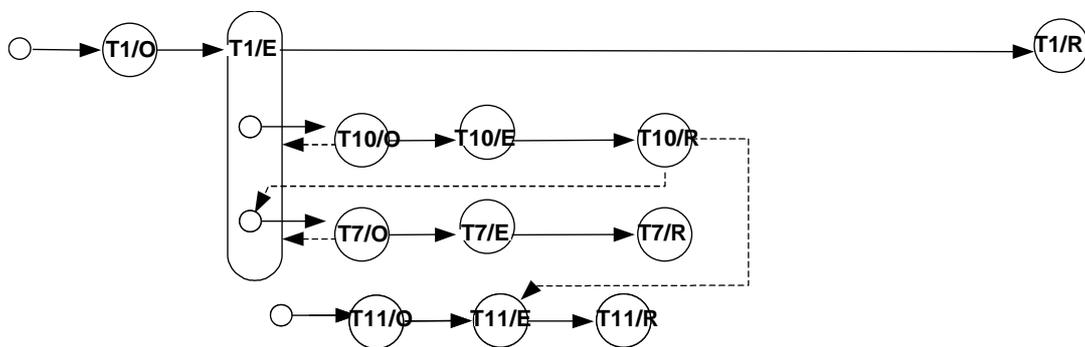
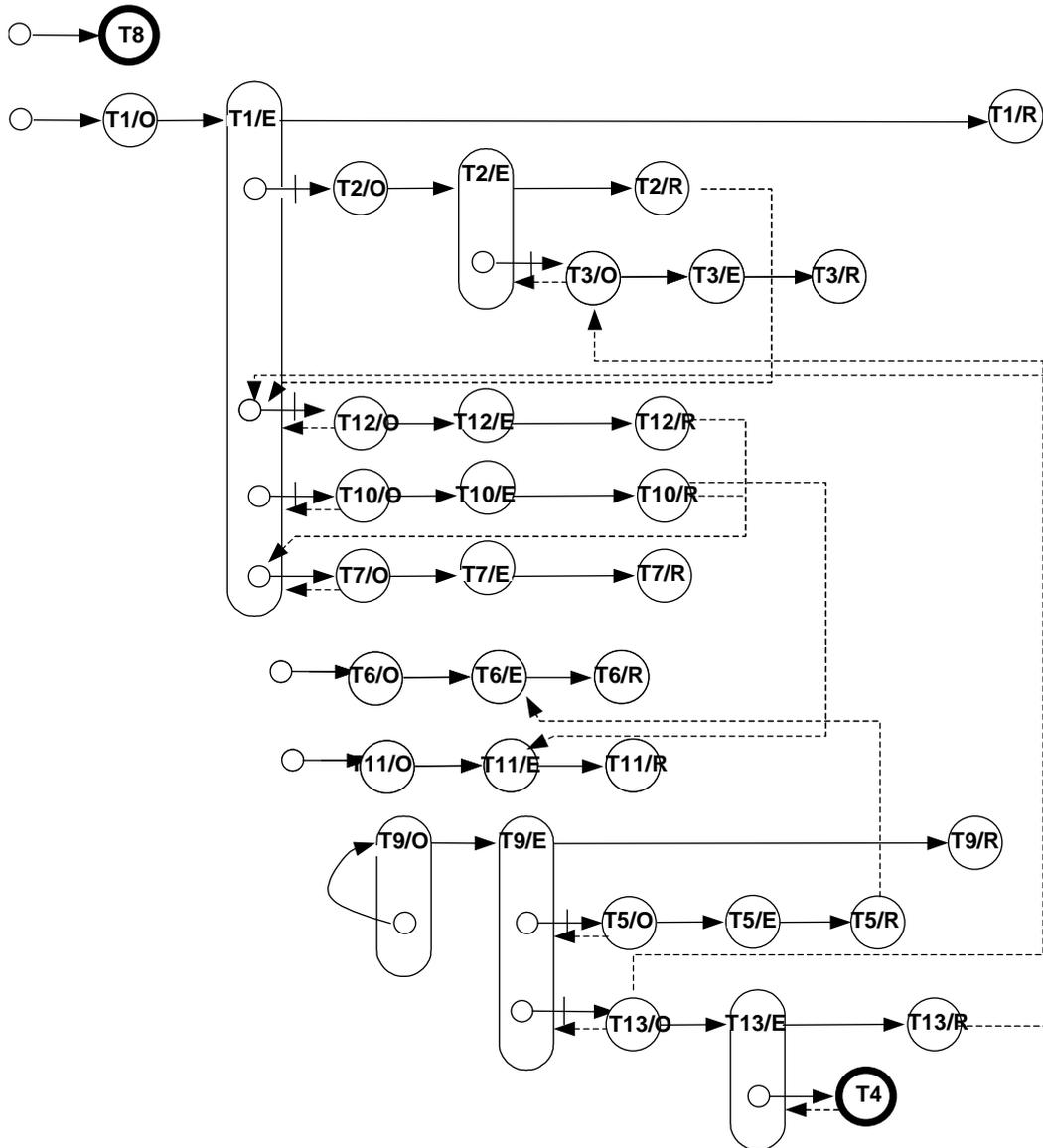


Figure 19: Process Diagram of the Whole Trading Customer at Structo's

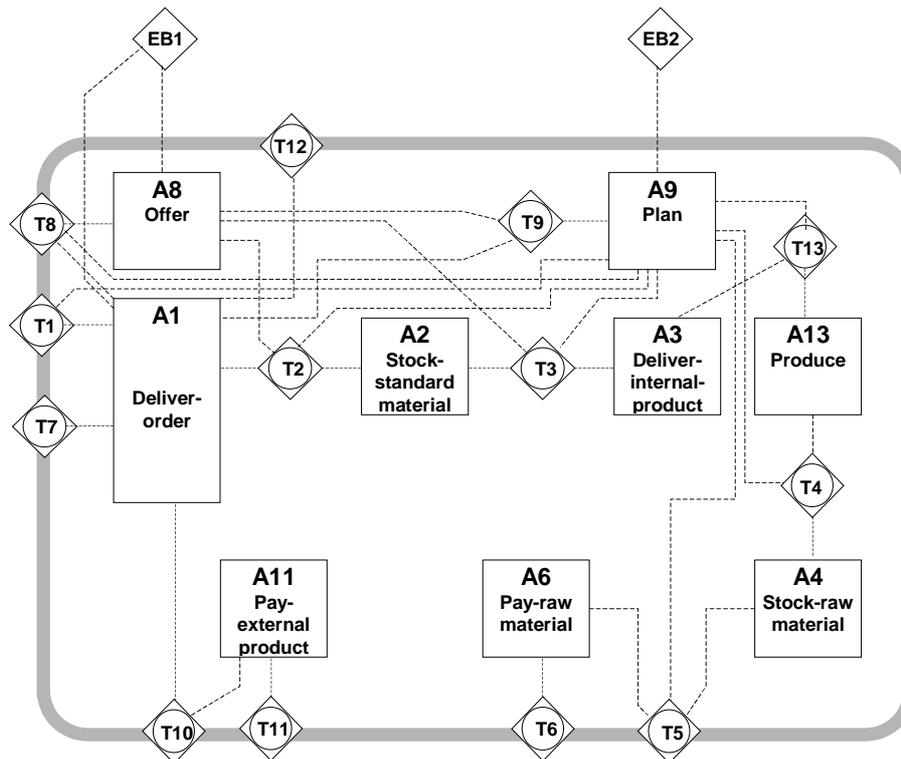


**Figure 20: The complete process diagram of Structo**

In the interstriction diagram we represent the information actors need to complete their initiating and executing role (interstriction). The interstriction diagram is based on the same symbols as the interaction diagram, with some minor changes. Since the initiating and executing role of the actors is not at stake in the interstriction diagram the initiator and executor links are deleted. When deleting these links, an informative link 'is revealed'. When engaged in a transaction process, the involved actors are permitted to inspect the content of the communication bank (disk), the fact bank (diamond), or combined in the transaction bank (disk+diamond). This inspection is represented by means of a dotted line between an actor and a communication or fact bank. In some occasions, the actor may also need information from transaction banks. Actor A1 provides a good example of the inspection of various banks. These are denoted with the same informative links. To indicate that an actor uses information from sources outside the system boundary, external banks are added. External banks are represented with the diamond symbol and are indicated with 'EB'. Below in Table 6 we have described the content of the two external information banks.

Information bank	Content
EF1	Price information
EF2	Quality Standards

**Table 6: External Fact Type table**



**Figure 21: The interstriction diagram of Structo**

For the Structo case we have not applied the fact model and its corresponding fact diagram because this information could not be derived on the basis of the analysis of the case with BAT as presented in the previous paragraph. In the analysis of the SGC case in the next paragraph, the fact diagram has been added.

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 Figure 22 we present the DEMO action diagram of the execution phase of transaction T1: Delivering\_order. 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.

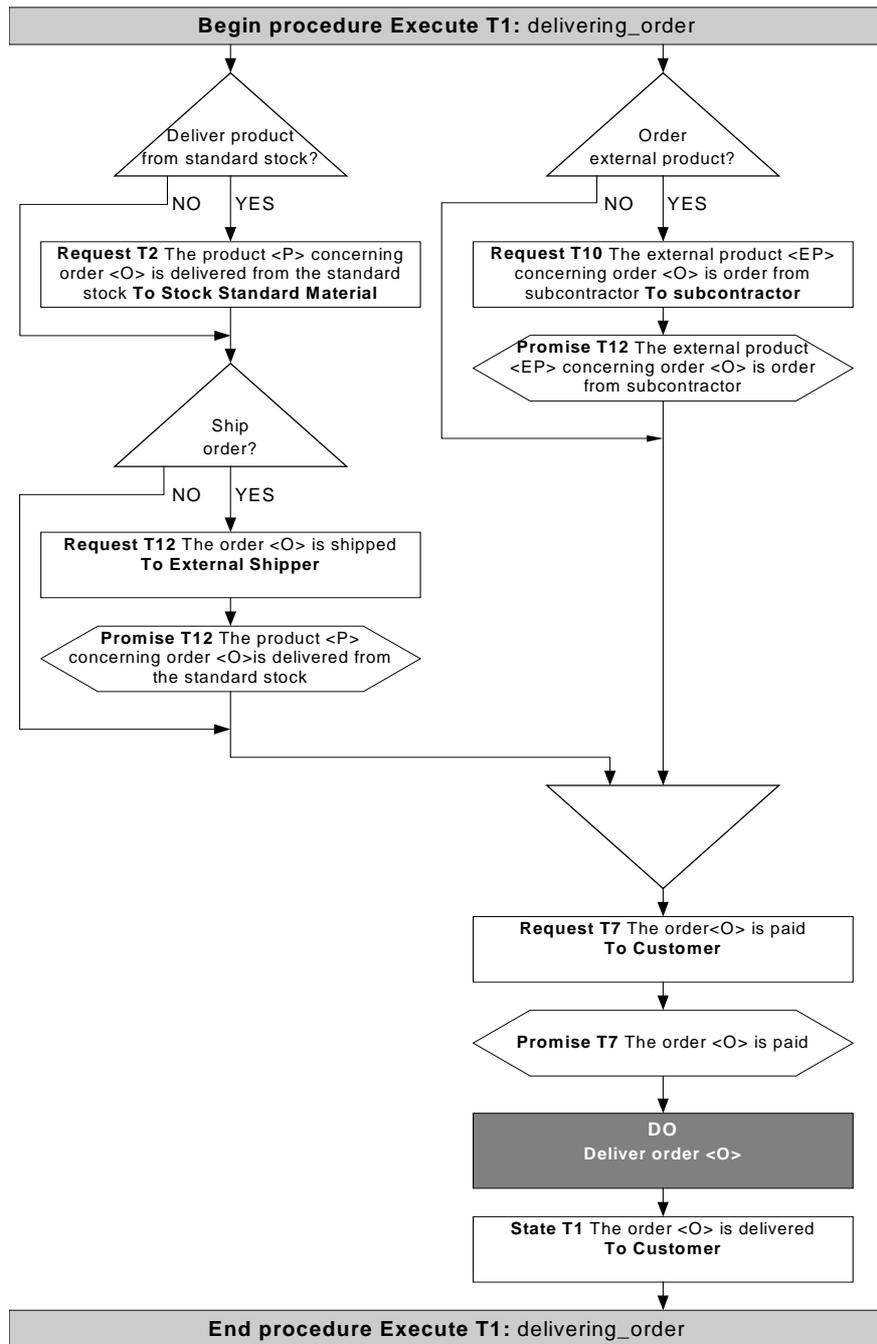


Figure 22: Action diagram of the execution phase of Transaction T1 in Structo



## 5. Case 2: The SGC case

The second case that we present is at the Conciliation Board for Consumers (in Dutch abbreviated to SGC), which is a non-profit organisation with the aim to negotiate quick, less costly and easy solutions for disagreement between customers and suppliers. For suppliers the participation in a Conciliation Board for Consumers is an important part of the quality management. An optimal mediation of the board in consumer-supplier disputes requires an optimal availability of internal and external information.

The SGC case was originally performed as an action-research project where DEMO was used in order to analyse the current way of working. The DEMO approach was used to describe the current situation of SGC. To get an understanding of the working of the company we provide a description of the operative processes. In the next paragraphs this description is used as a basis to illustrate the practical usage of the business process modelling approaches BAT and DEMO. The BAT-models have not been used in the case study. They have been developed on the basis of the description of SGC and generated DEMO -models.

### 5.1 A description of the current way of working

A request for mediation of the Conciliation Board for Consumers needs to be started with a letter in which the nature (concerning housing, computers, travels etc.) and the magnitude of the complaint is explained. There are about 12000 letters received every year. On the arrival of a letter, a file is opened. The committee the complaint relates to, a unique identification number of the complaint, the name of the complainer and the date that the complaint was submitted, identifies the file. In the course of the procedure the file is used to archive additional information. On the basis of the first letter a first selection is made as to whether the complaint is taken into consideration.

When the complaint is taken into consideration (which holds for about 70% of the complaints), the complainer is requested to fill out a questionnaire, to pay complaint fee (based on the amount of the invoice of the complaint), and to deposit the remaining amount of the invoice. At the same time the supplier is requested for a bank guarantee. When the questionnaire is returned and the complainer transfers the money and the supplier provides the bank guarantee, the procedure continues. When the complainer fails to meet (one of) these conditions within one month, the request to meditate in the conflict is turned down. In some circumstances exceptions on this rule are made, but the complainer has to submit a request for dispensation with reasons within this one-month period.

Next to exclusion on the basis of failing to meet the requirements of the standard procedure of submitting complaints there are some other reasons for turning down a request for mediation by SGC. A complaint is turned down when the paper the complaint relates to is used professionally, involves physical injury, or the supplier has suspension of payment or has already gone bankrupt, or when the supplier is not a member of a branch organisation.

When the request for mediation by SGC is granted, the supplier is informed by mail and the execution of the procedure is filed in the, so-called, complaint book. This complaint book was set up for the purpose of progress monitoring. At the same time the supplier is supplied with the documents of the file and is requested for his defence or may propose an agreement. In addition to the complaint of the customer and the defence of the supplier, the board can initiate an expert examination.

All the documents of the customer, supplier and possibly the experts form the input for a meeting of a special committee of the board for which all the parties involved are invited. In this meeting the committee reaches a decision. About one month after the meeting the parties involved are informed by mail about the judgement of the committee.

After the judgement of the committee, the financial matters between the customer and the supplier are settled. This winding up comprises the complaint fee, the deposit of the remaining amount of the invoice, and the expenses of the members of the committee and the experts. If the supplier fails to comply with his terms of payment, the consumer can appeal to a regulation that assures payment. At the same time the branch organisation of the supplier is informed.

Then, the file is closed.

### 5.2 Analysing SGC with DEMO

The first step in the DEMO analysis of the Conciliation Board for Consumers is the description of the activities at the essential level. This means that the business is described as a network of inter-related business transactions. These transactions are formulated at type level and are displayed in a transaction table. In the transaction table the resulting object world facts of the successful execution of the transactions are also included. The resulting facts are represented in a high level manner, more details of these facts are revealed in the facts

model. (NB. Time variables like the date the complaint is submitted or the date that the committee passes judgement have been left out for reasons of clarity).

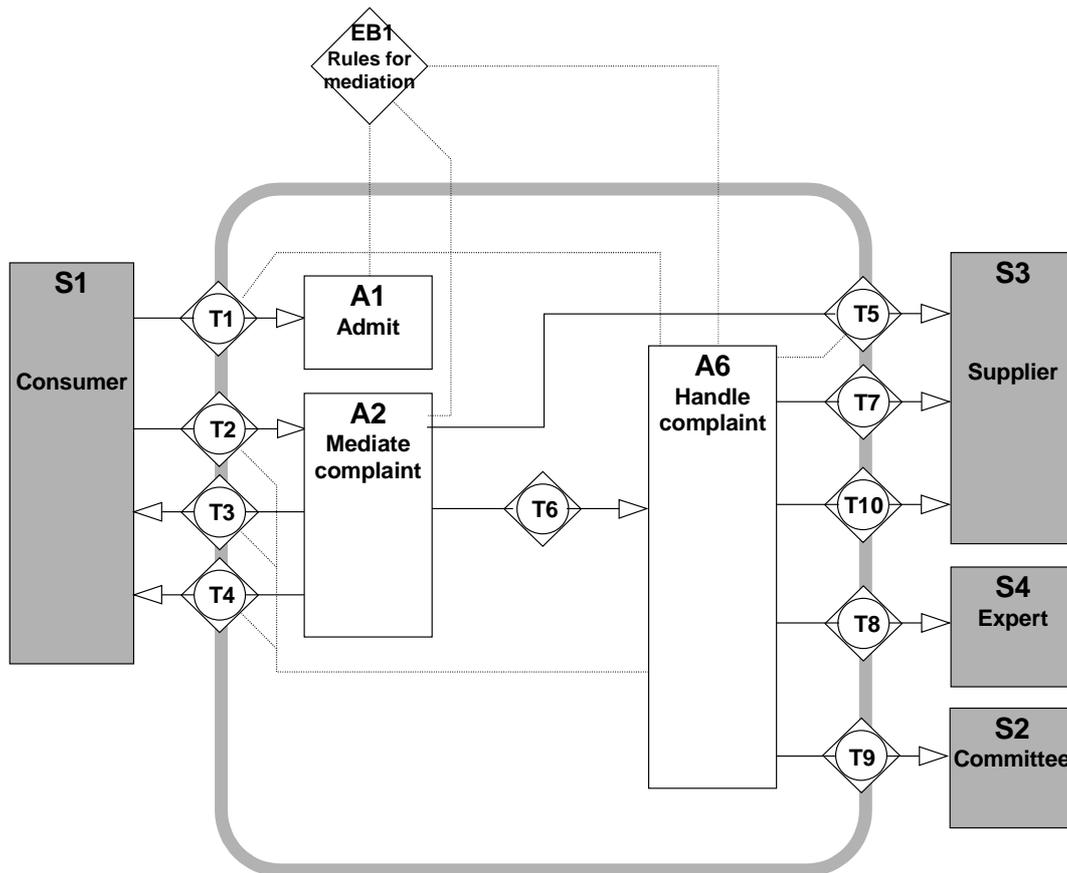
Transaction type		Transaction result	
T1	Admitting_complaint	F1	The complaint <Co> is declared to be admissible
T2	Mediating_complaint	F2	The complaint <Co> is mediated
T3	Paying_consumer_fee	F3	The consumer complaint fee concerning complaint <Co> is paid
T4	Depositing_invoice_amount	F4	The remaining invoice amount of complaint <Co> is deposited
T5	Depositing_bank_guarantee	F5	The bank-guarantee concerning complaint <Co> is deposited
T6	Dealing_with_complaint	F6	The complaint <Co> is dealt with
T7	Defending_complaint	F7	The complaint <Co> is defended
T8	Obtaining_expert_advice	F8	The advice from expert <Ex> concerning complaint <Co> is obtained
T9	Passing_judgement	F9	The judgement concerning complaint <Co> is passed
T10	Paying_supplier_fee	F10	The supplier complaint fee concerning complaint <Co> is paid

**Table 7: The transaction table of the current way of working of SGC**

Transaction type		Initiator	Executor
T1	Admitting_complaint	Consumer	Admit
T2	Mediating_complaint	Consumer	Mediate-complaint
T3	Paying_consumer_fee	Mediate-complaint	Consumer
T4	Depositing_invoice_amount	Mediate-complaint	Consumer
T5	Depositing_bank_guarantee	Mediate-complaint	Supplier
T6	Dealing_with_complaint	Mediate-complaint	Handle-complaint
T7	Defending_complaint	Handle-complaint	Supplier
T8	Obtaining_expert_advice	Handle-complaint	Expert
T9	Passing_judgement	Handle-complaint	Committee
T10	Paying_supplier_fee	Handle-complaint	Supplier

**Table 8: The transaction-actor table of SGC**

The transaction structure of SGC is displayed graphically by means of a communication diagram (a combined interaction and interstriction diagram) as presented in Figure 23 below. By combining the interaction and interstriction diagram in the communication diagram, we get the total communication picture on the one hand, but on the other hand it disguises some of the existing informative links that are covered by the initiating or executing links.

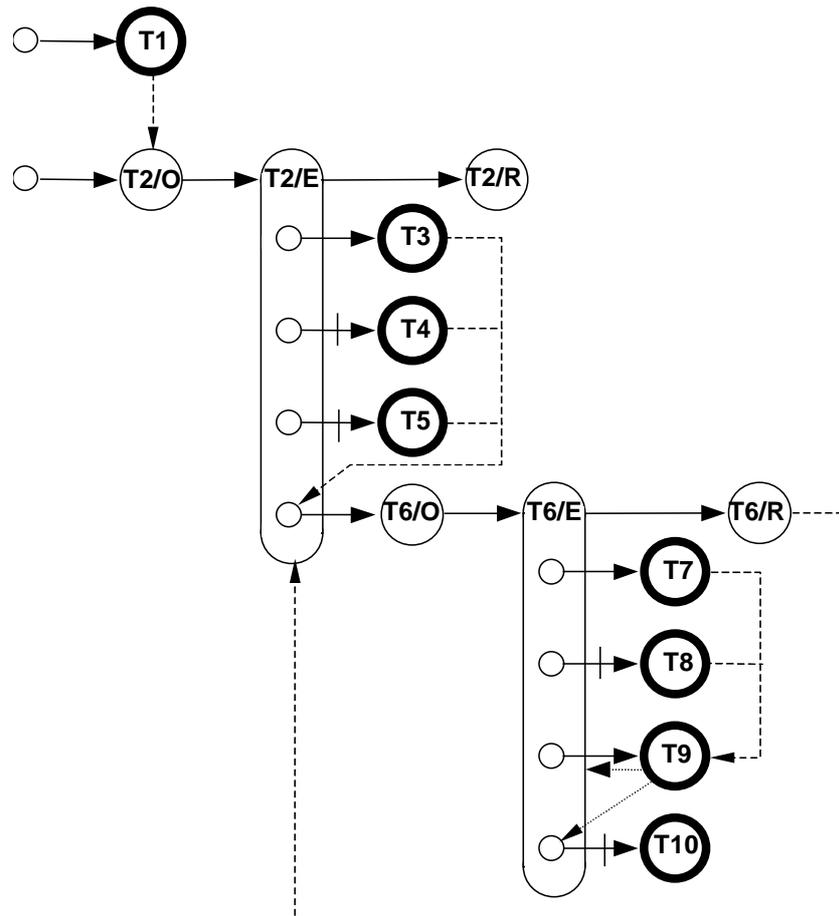


**Figure 23: Communication Diagram of SGC**

In the communication diagram we have identified one external bank. This bank contains the regulations and rules for the mediation of complaints by SGC. Parts of these regulations are inspected during mediation process by each of the actors of SGC.

The DEMO communication diagram provides an overview of the organisation as a network of communicative commitments. It does, however, not show the relationships in time and interdependencies between the transaction types. The process model Figure 24 is used to highlight these relationships.

If relationships between the transaction types of SGC are considered, a more detailed understanding of the working of the organisation is achieved. We can see that not all of them need to be executed for a successful mediation. Transactions T4 (Depositing\_invoice\_amount), T5 (Depositing\_bank\_guarantee), T8 (Obtaining\_expert\_advice), and T10 (Paying\_supplier\_fee) are optional. For example, if the complainer has already paid the total amount of the invoice, the payment of a deposit is not requested. Similarly, when the committee decides that the complaint of the consumer would not lie, the supplier does not have to pay for the mediation.



**Figure 24: The Process Diagram of SGC**

Insights in the object world of SGC are obtained with the fact model. Since this model was not covered in the Structo case, we will briefly explain the model.

This model provides a complete and precise specification of the fact types that are created and/or used as well as their mutual relations. The facts model is represented with the NIAM-like Facts Diagram (for details on NIAM see: Nijssen, Halpin, 1989; the Facts Diagram is explained in Dietz, 1996; Reijswoud, 1996; Rijst, Reijswoud, 1995). In Figure 25, a small part of the facts diagram of SGC is presented.

In the example below the fact diagram of the actor A1 is presented. The circles denote object classes with their class names written above. The objects play different roles in a fact. In the fact diagram these roles are indicated by numbers in rectangles and referred to in the sentences below the roles. In Figure 25 the fact types used and/or created by actor 2 Mediation of SGC are expressed. Central in the diagram is the object class complaint. The fact diagram also shows that there is a description related to a complaint (this is a special object class containing textual description of the complaint), that a complaint is requested for mediation on a particular date and has been mediated on a particular date, that a complaint is mediated by a particular committee, and finally that a complaint is submitted by a complainer and relates to a particular supplier. The uniqueness constraints depicted as bold line above roles describe that every complaint is unique (identified with an unique identification number in the daily practice of SGC) and thus may not appear more than once in the extension.

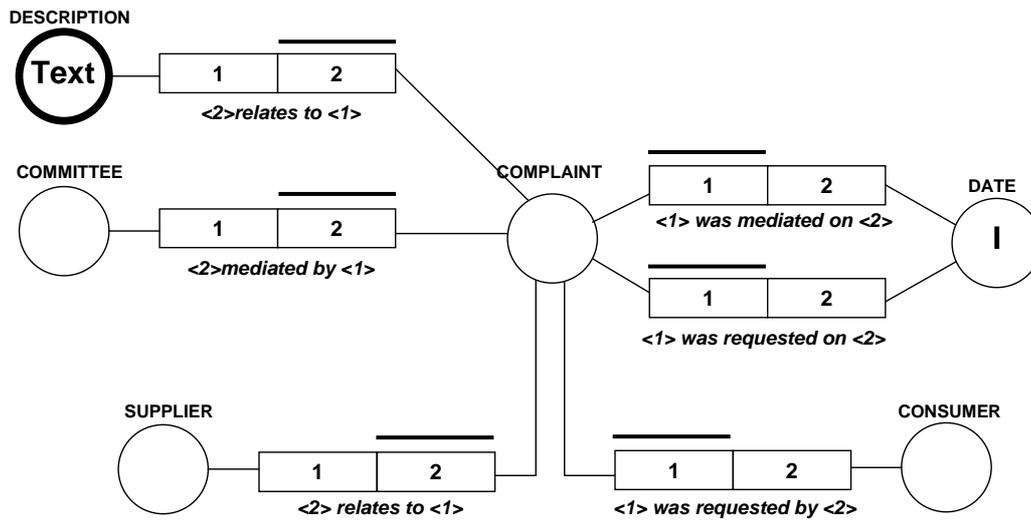


Figure 25: The Fact Diagram of actor A1

In Figure 26 the procedure regarding the execution phase of 'T2 Mediating\_complaint' is depicted (T2/E in Figure 24). The arrows represent precedence relationships. The execution of the procedure consists of the following of the route from the start of the procedure at the top to the end of the procedure. The first white box on the left-hand side shows the communicative act by which SGC requests the complainer to pay the complaint fee. The waiting condition below indicates that the complaint fee has to be paid before the procedure can continue. The two elements next to the initiation of T3 are optional. T4 and T5 are only initiated when the question in the triangular shapes is answered with 'Yes', otherwise the procedure continues to the synchronisation. After the synchronisation the execution procedure of transaction T2 proceeds to initiation of transaction T6. On reaching this point the procedure will halt until the transaction T7, T9 and the optional T8 and T10 as part of T6 are completed. The execution of the transactions is described in the action diagram of actor A6 Handle-complaint. When T6 is carried through, the actual objective action of T2, the mediation of the complaint is executed. The result of the execution of this objective action is realised in the notification (statement) of the outcome of the mediation of actor A2 of SGC to the consumer. Normally, this becomes tangible in a notification letter of SGC to the consumer.

In the action model we have included the informational and documental realisations of the essential actions are included. The informational and documental realisations are added in the grey boxes.

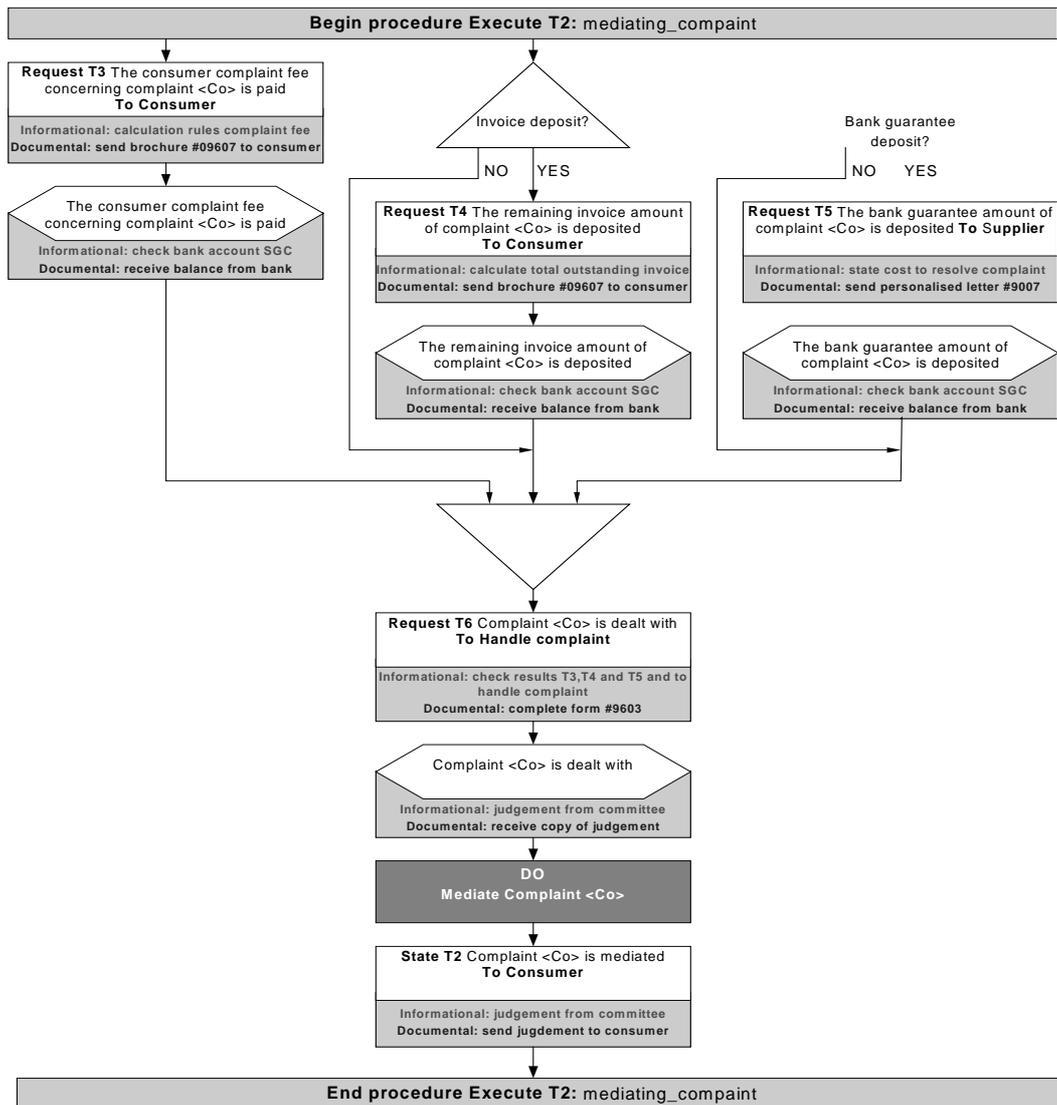


Figure 26: Action Diagram of the Execution phase of transaction T2

### 5.3 Analysing SGC with BAT

Action Diagrams and a process diagram present the BAT-analysis of SGC. When SGC’s business process were reconstructed a total amount of 6 Action Diagrams where used. In this paper we have chosen to show all the Action Diagrams for the complete mediation process, i.e. from initial request from the consumer to the notification of the judgement. These action diagrams are shown in figures 27, 28, 29, 30, 31, and 32. As can be seen in the figures descriptive connectors link the Action Diagrams to each other. The table below shows the descriptive connectors for each figure.

Descriptive connector	Business context	Figure
REQ	Handling of initial request	27
FREQ	Producing formal request	28
Hand	Processing the formal request	29
SC	Supplier checking	30
MEDH1	Preparation for mediation	31
JUDG	Mediation and winding up	32

Table 9: Descriptive connectors for the Action Diagrams

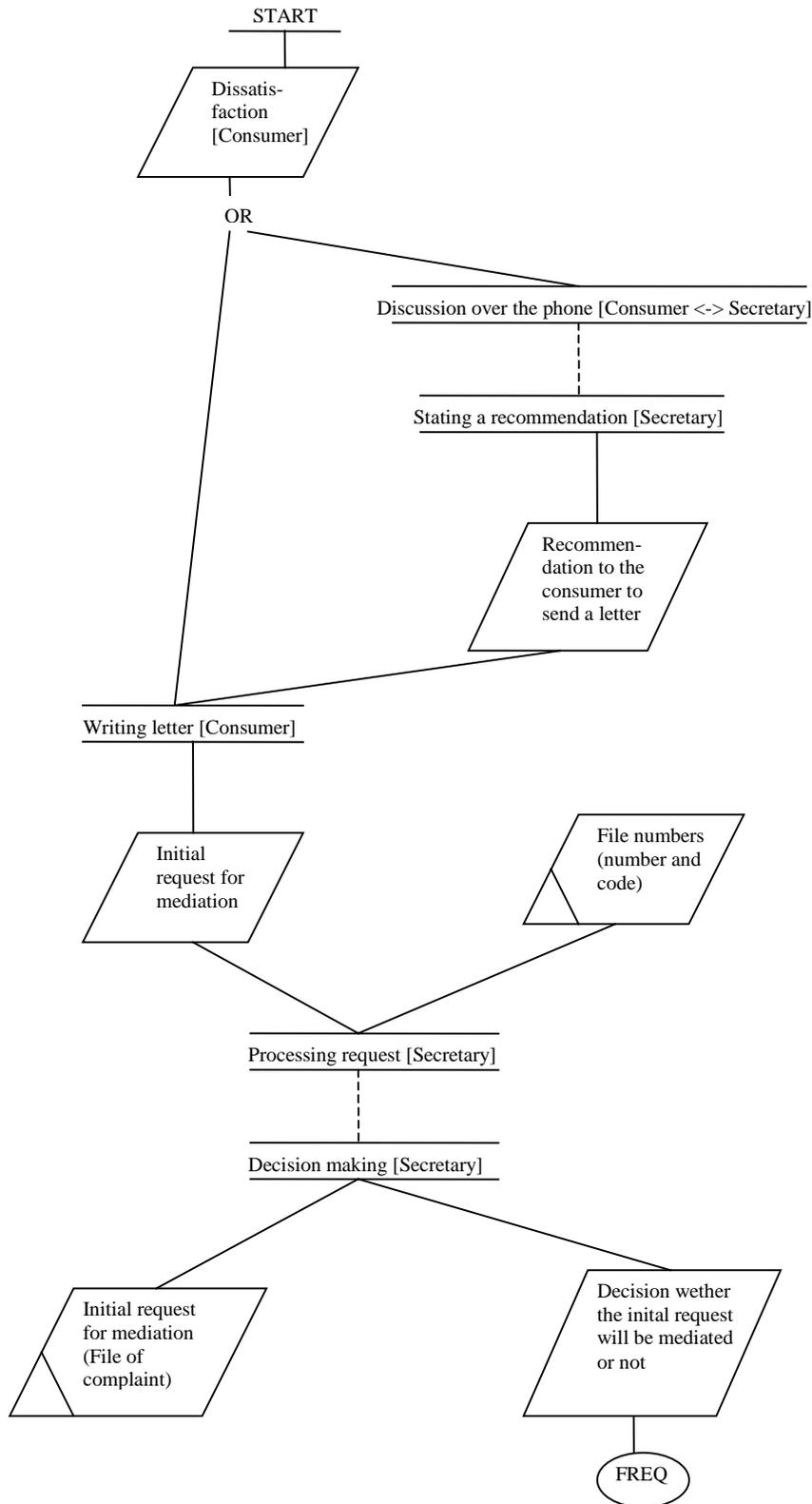


Figure 27: Action Diagram concerning Handling of initial request (REQ)

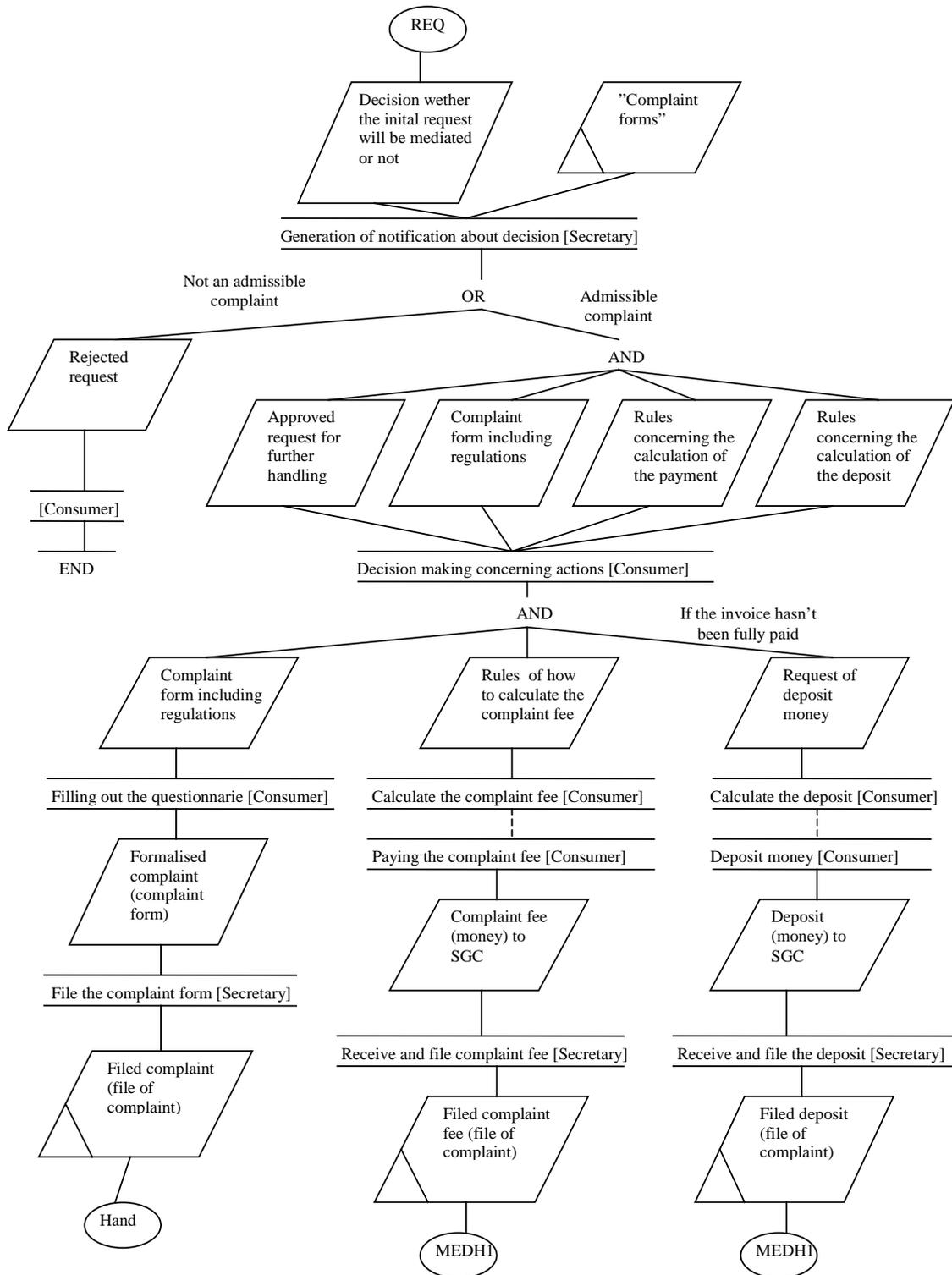


Figure 28: Action Diagram concerning Producing formal request (FREQ)

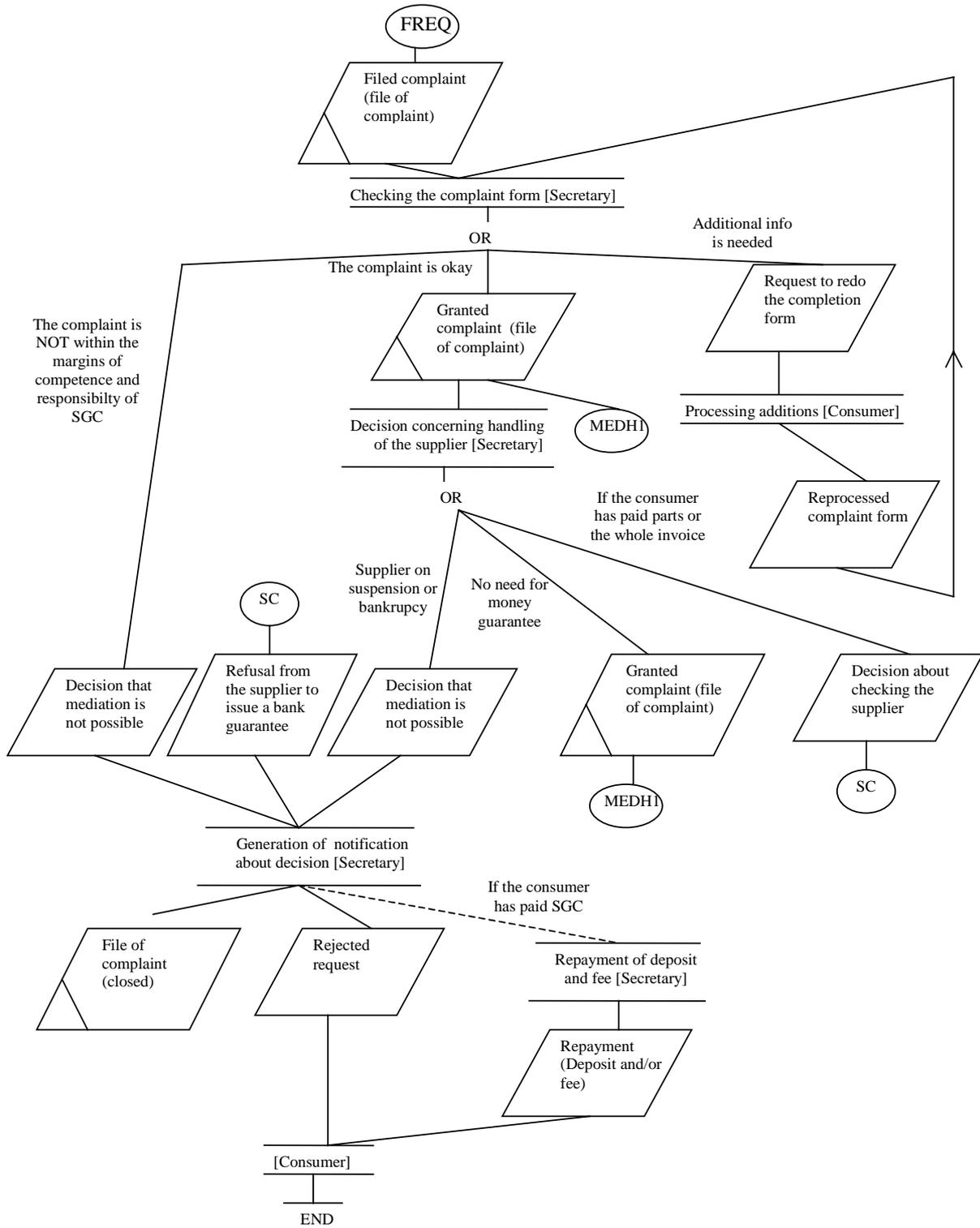


Figure 29: Action Diagram concerning Processing the formal request (Hand)

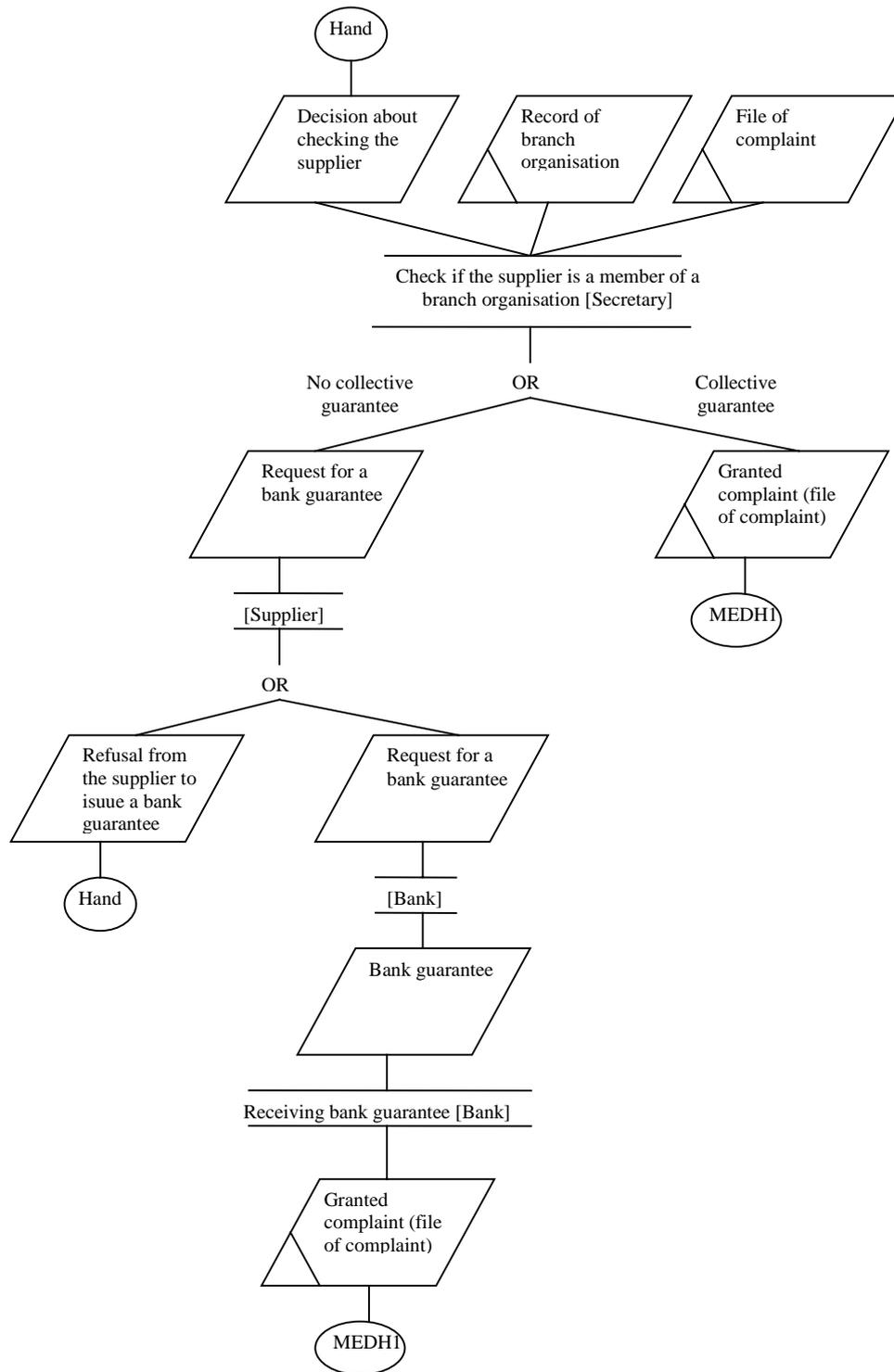
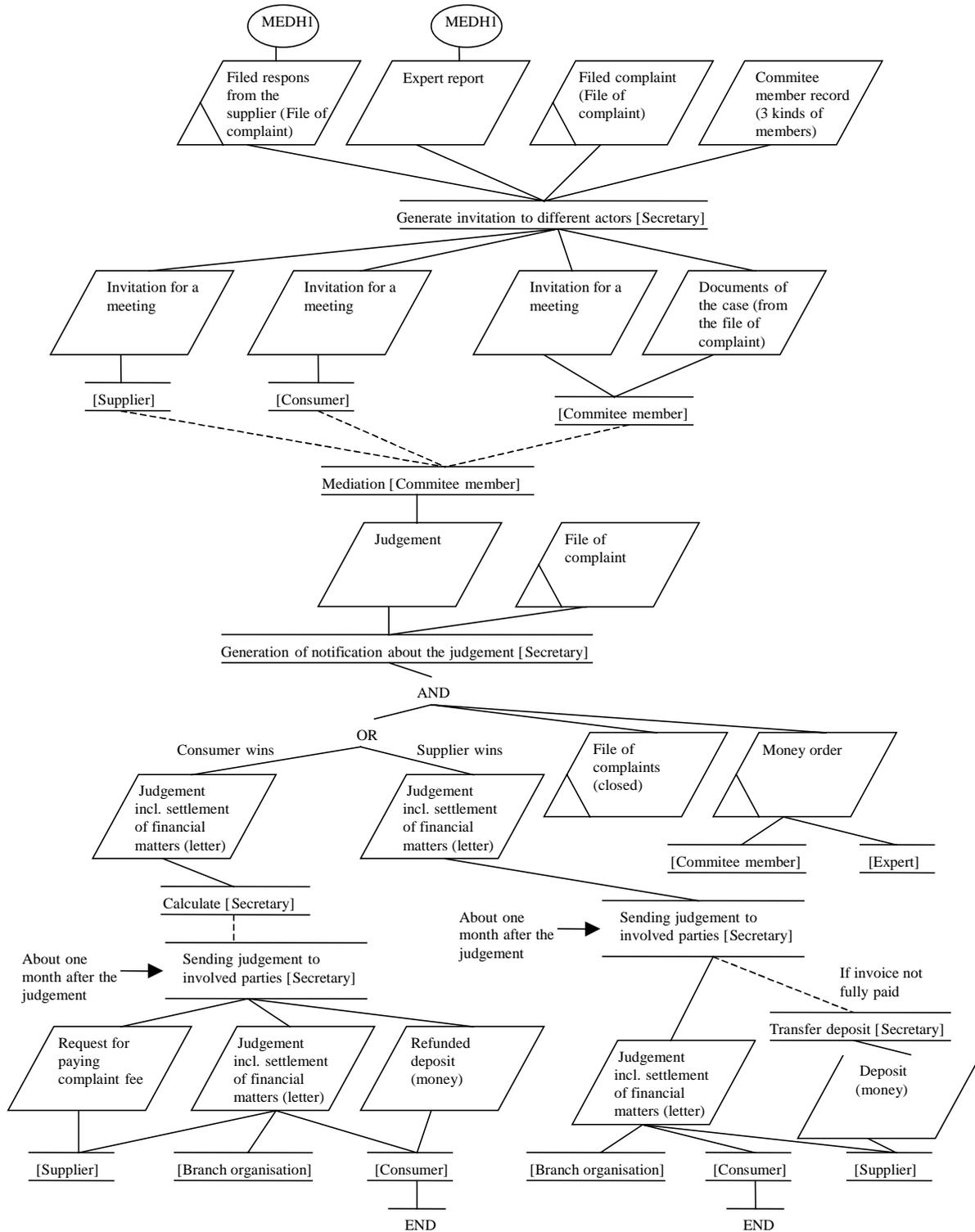


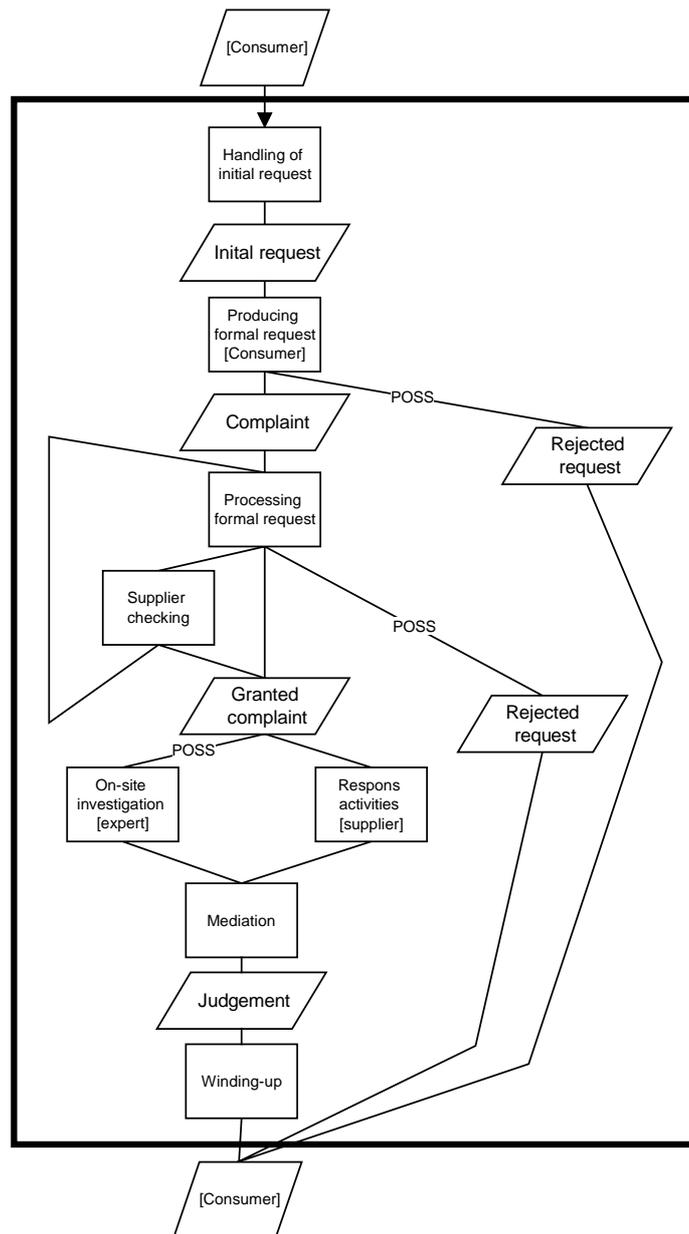
Figure 30: Action Diagram concerning Supplier checking (SC)





**Figure 32: Action Diagram concerning Mediation and winding up (JUDG)**

Action Diagrams have been generated for the business contexts concerning the business process at SGC. In the SGC-case different variant processes are not treated. The reason for that is that different ways of handling different types of claims have not been emphasised when the case study was performed. A process diagram has been generated out of the Action Diagrams in order to get a survey view of the business process at SGC. Figure 33 shows the process diagram.



**Figure 33: Process Diagram concerning the business process at SGC**

The action and process diagrams show that there is a lot of effort put upon preparing the fulfilment of the business process. The fulfilment is done in the sub process mediation, which result in a judgement. All activities prior the mediation is done to come to agreement of the assignment.

The process diagram emphasises actions that are performed to treat a specific complaint. As can be seen we have not looked upon any side processes for SGC. The business process at SGC has been looked upon from the SGC-perspective. Most sub-processes shown in the process diagram are performed by SGC. We have although chosen to highlight production of the formal request as a sub processed performed by the consumer. The reason for having a consumer performed sub-process in the process diagram is to achieve a higher degree of understanding for the business context.

We have also chosen to show some essential action objects in the process diagram, which are highlighting two aspects. First, one can see how the status of the arrend is being altered, i.e. how the initial request becomes a judgement, which helps us in understanding the purpose behind different sub processes. Second, we have chosen to highlight where in the process flow that the business process can be interrupted. Showing the possible rejected request does this.



## 6. 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 described at the theoretical level and then they were applied to two case studies. Both the theoretical perspective and the practical application form the basis for the comparison in this section. On the basis of the comparison, some preliminary conclusions are drawn.

### 6.1 Comparing the theoretical perspective

The main similarity between the two methods is located in their underlying theoretical basis. Both approaches are firmly founded in the philosophy of language, more specifically in Searle's theory of Speech Acts and Habermas' theory of Communicative Action. This implies that the main focus of both methods is on the utterance of speech acts by people in an organisational context, and the way these speech 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 describe all possible steps that can be taken in business communication. When the structure of the generic framework is compared with the transaction process model, we can see that the generic framework is composed of several business transactions. In other words, we can say that the DEMO business transaction is a composition of speech acts and the BAT generic business framework is a composition of business transactions.

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 business communication processes. The analysis at the essential level is used as a starting point for information systems design or redesign of the organisation.

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 is lacking this formal definition, but finds itself in social theoretical principles.

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.

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.

### 6.2 Comparing the application

In the application of BAT and DEMO to the two case studies 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 apply action diagrams and process diagrams.

The differences between application of the methods relate to their way of working as well as 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 starts 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 represent 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, fact 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 observe that there are both similarities and differences. At first glance the DEMO communication diagram and the process diagram show great resemblance with the BAT 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 action diagram show little resemblance. The BAT 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 fact model, is not performed in a business analysis with BAT. When modelling for information systems design a detailed activity specification may be performed.

In BAT a business is analysed in terms of variant processes. For example different lines of production and customer relations (see the Structo case) 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.

### 6.3 Conclusions

In this paper we have applied business modelling with both BAT and DEMO to two case studies. Since the Structo case was first modelled with BAT and then modelled with DEMO and the other way around for the SGC-case we need to be careful with the interpretation of the results. An ideal situation would have been if the BAT and DEMO analysis had been performed separately on each case because the analyses would not have influenced each other. On the other hand by taking two case studies performed where each method had been applied first we have tried to overcome the observer bias.

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 mainly uses a combined bottom-all/bottom-up approach. Therefore the resulting diagrams of BAT are very detailed compared to the DEMO models. In BAT this is needed in order to create aggregations of a range of aspects.

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 formed a useful reference model for identifying the communication processes between customer and supplier. It may provide a guideline when identifying the business transaction between customer and supplier in the DEMO approach. 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.

Finally we have observed that DEMO could be used as a supplement to BAT in order to distinguish essential business transactions when performing business optimisation. The system analyst would then be guided in to the essential business transactions.

### 6.4 Further research

Further research should focus in the possibilities for the integration of DEMO and BAT. This integration should focus on different levels such as perspective (way of thinking), framework (way of working) and method components (way of modelling) (see Goldkuhl et al, 1997). In the first place it needs to be established how each method can contribute to each other, a question that is not answered satisfactory in this paper. In this paper we

have mainly highlighted similarities and differences. The next step would be to highlight how such integration can be performed and what each of the methods would gain.

One of the steps to perform this further research is to execute a controlled experiment in which both methods are applied to identical business situations that have not been modelled with either of the methods.

## Acknowledgements

This paper is the result of a 3-day working meeting of the two authors on 5-7 November 1997 at Delft University of Technology.

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