

SPEECH ACT BASED COMMUNICATION AND INFORMATION MODELLING WITH DEMO

Victor E. van Reijswoud
Delft University of Technology
Dept. of Information Systems
P.O. Box 356, 2600 AJ Delft
The Netherlands vreijsw@is.twi.tudelft.nl

Hans B.F. Mulder
Essential Action Engineers b.v.
P.O. Box 58
2280 AB Rijswijk
The Netherlands
hans_mulder@inventive.nl

ABSTRACT

The field of speech act based modelling of information systems has attracted an increasing attention in recent years. On the basis of the research work of Winograd and Flores, several modelling approaches have been proposed. In this paper we discuss the speech act based modelling approaches in general and the DEMO approach in particular. Next to the discussion of theoretical foundations of this modelling approach we also illustrate the application of DEMO to a case study, and we report on the status of the resulting models for information systems design and business process optimisation.

KEYWORDS

speech act based modelling, business analysis, information systems design, business process redesign/reengineering

INTRODUCTION

Theories for modelling and designing information systems have evolved through different stages and on different foundations. Hirschheim, et al. (1995) describe seven generations that evolve from the developer's private methodological approach in the mid-1950's, through life-cycle, structured, evolutionary and participative approaches, to the emergence of emancipatory approaches to information systems development. This latest generation is very much in the making and gets considerable attention in both the practitioner and academic literature. Although these alternative approaches are a controversial topic in the field, they also offer new perspectives on information systems development (Iivari et al., 1996).

Approaches for information systems analysis and design that receive an increasing attention in the past years are the approaches that are founded in the Language/Action perspective (see Dignum et al., 1996; Dignum, Dietz, 1997). The Language/Action perspective (for a large part based on Searle's Speech Act Theory) which was introduced in the field of information systems by Flores and Ludlow in the early 1980's, can be considered to be a new basic paradigm in the information systems arena (Iivari et al., 1996). In contrast to traditional views of "data flow", the language/action perspective emphasises what people DO while communicating; how they create a common reality by means of language and how communication brings about a co-ordination of their activities.

In this article we will discuss a full grown modelling approach in the Language/Action perspective called DEMO[®] (Dynamic Essential Modelling of Organisations). DEMO provides a theory for the understanding of the working of an organisation and an explanation of its business activities. DEMO also provides a modelling approach based on this understanding. After a brief introduction to the Speech Act Theory of which the basic principles of the Language/Action perspective are derived, and to some approaches that are founded on this theory, the fundamentals of the DEMO approach are discussed in section 3. In section 4 we illustrate, using a case study, how the modelling facility of DEMO is applied. In section 5 two application domains (business process optimisation and information systems design) are discussed. Finally, some general conclusions are drawn in section 6.

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).

The ‘commitment analysis’ of Flores and Ludlow was extended in great detail by Winograd and Flores (1986). According to this approach, the Conversation for Action (CfA) is the central co-ordinating structure for human organisation. The CfA is conceptualised as an interplay of requests and commissives directed to explicit co-operative action. Next to the CfA, the conversations for clarification, possibilities, and orientation are identified. For more details on the different types of conversations the reader is referred to (Winograd, 1988).

The Conversation for Action Theory has been developed into a full-grown speech act based modelling approach within the Business Design Language by Action Technologies (Medina-Mora et al., 1992, Schäl, Zeller, 1993; Schäl, 1996). The basic modelling unit is the four step action workflow protocol. The basic unit can be connected with loops in articulated processes (see figure 1). Together these building blocks are used to model an organisation as a network of inter-related speech acts grouped together in workflow loops.

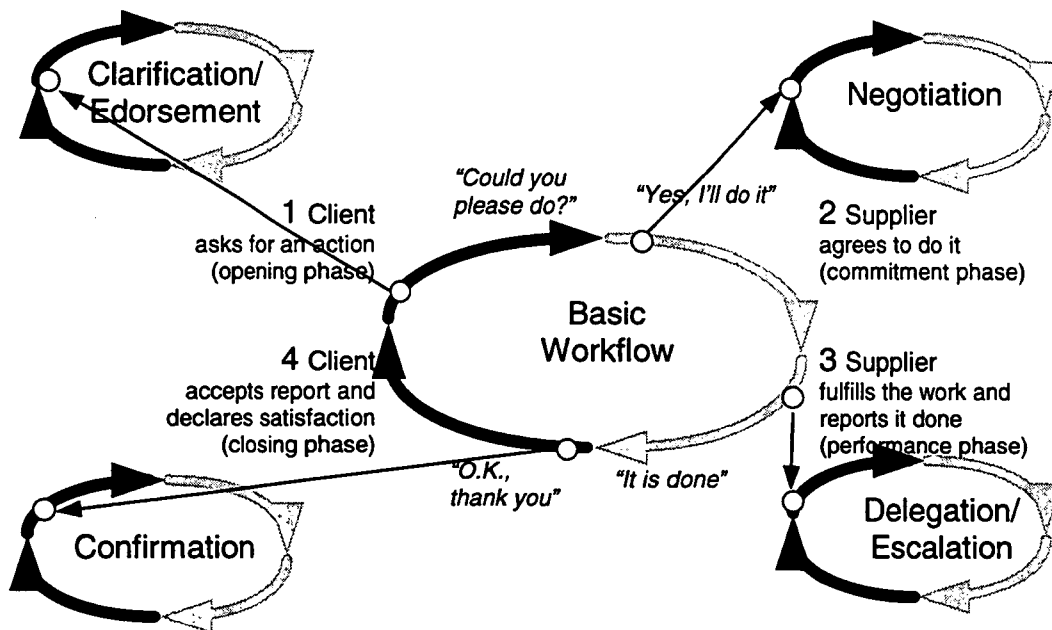


Figure 1 The interconnection of Action Workflow loops in articulated processes

Another important speech act based approach is SAMPO (Lehtinen, Lyytinen, 1986; Auramäki et al., 1988; Auramäki et al., 1991; Auramäki, Lyytinen, 1996). SAMPO studies organisational activities as a series of speech acts creating, maintaining, modifying, reporting, and terminating commitments. It offers a method for modelling organisations as systems of communicative action. The approach uses concepts of the Speech Act Theory and discourse analysis for the information analysis of organisations.

The modelling approach entails two domains: the entity domain (ED) and the action domain (AD). The ED comprises of static entities that persist over longer periods of time. The AD includes dynamic entities called acts.

Two types of acts are studied: Instrumental acts (IACS) and Speech acts (SACS). IACS accomplish changes in the ED. These changes are modelled. SACS are defined as symbolic deeds that result in linguistic expressions having a "meaning". SACS form larger wholes called conversations or discourses. The systematic regularities of these conversations are analysed.

SAMPO introduces an analysis and modelling method for discourses in organisations. After an analysis of the quality of the discourses, in which coherency, completeness, and ambiguity is defined, two main graphical models are used. The first model is the discourse graph. This model describes the overall structure of the discourse, and it delineates discourse objects and their properties and relationships. It can be seen to represent a partial "script" or "schema" for communications. The graph defines necessary and sufficient conversation possibilities for each discourse participant. The conversation graph is introduced to characterise the dynamic discourse features. It describes the stages and moves in a conversation as well as the conditions (in SAMPO called predicates) that restrict and control the performance of acts.

Both graphs describe institutionalised networks of acts and help to detect:

1. Principles needed in the set-up and control of commitments
2. Inconsistencies in the co-ordination of commitments
3. Possibilities for organisational development that simplify communication and control mechanisms

In the next section we introduce the DEMO approach. This approach builds on the same theoretical foundations as the CfA/Business Design Language approach and SAMPO, but is extended with a complete and integrated communication, information and behaviour modelling facility that provides both the basis for information systems design as well as business process optimisation.

MODELLING WITH DEMO

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.

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 2.

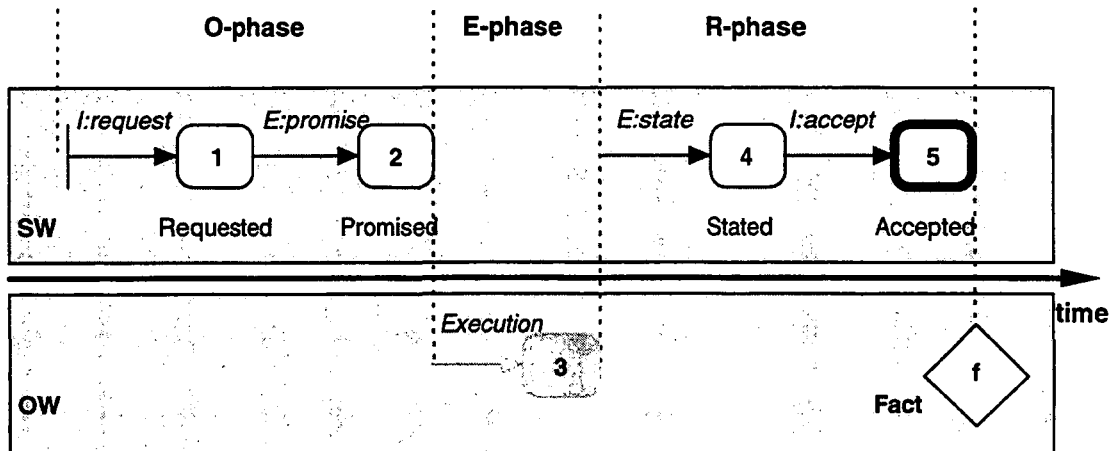


Figure 2 The basic pattern of the DEMO transaction

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 3.

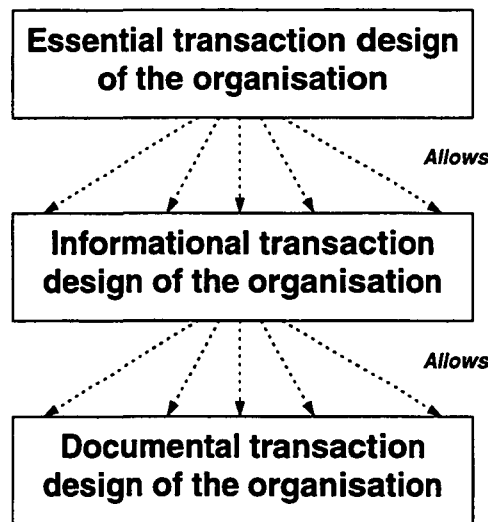


Figure 3 Transaction design and levels of abstraction

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 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 transaction initiating or transaction executing actors. The graphical notation used for the interaction model is the communication diagram. The *process model* describes to 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 is expressed in the process diagram, and the course of individual transaction processes in the transaction diagram. The *facts model* is the complete and precise specification of the state space of the object world. The facts diagram is used to represent the facts 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.

THE CASE STUDY: SGC

The Conciliation Board for Consumers (in Dutch abbreviated to SGC) 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 primary question of SGC was to reengineer the internal and external information handling processes of the organisation. Automation of these processes in a workflow management system was considered as one of the possibilities. The first step that was taken was to initiate an analysis of the current way of working. The DEMO approach was used to describe the current situation of SGC. Before the DEMO analysis of SGC is presented, a brief description of the current way of working is presented.

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 file is identified by 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. 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 money is transferred by the complainer, and the bank guarantee is provided by the supplier, 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 article 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.

The DEMO analysis of SGC

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 1 The transaction table of the current way of working of SGC

The transaction structure is displayed by means of a communication diagram as presented in figure 4 below. The actors are represented by numbered A-squares. The grey S-squares represent complex (external) actors of which we do not know (or do not want to know yet) the composition. The transactions are depicted by the T-numbered circle-in-the-diamond. The arrow connecting the transaction symbol to the actor points at the executor of the transaction, while the plain line connects the initiator to the transaction symbol. In figure 4 we have also included some dotted lines to represent informative links between actors and transactions types. The informative links are part of the interstriction model. These links represent an actor's need for (some of) the information stored as results of the execution of these transaction types for the execution of its transactions. For example, for the checking of the mediation requirements, and thus the possible initiation of the transactions by which the supplier is requested to provide a defence, the actor A6 needs the resulting facts that are stored in the T1, T2, T3 and T4 relating to a particular complaint Co. In the communication diagram there is also a external fact bank added (EF1). This bank contains the rules for the mediation that are laid down in the regulations of SGC.

For more syntactical and semantic details on the graphical notation of the communication diagram see (Dietz, 1996a; 1996b; Reijswoud 1996).

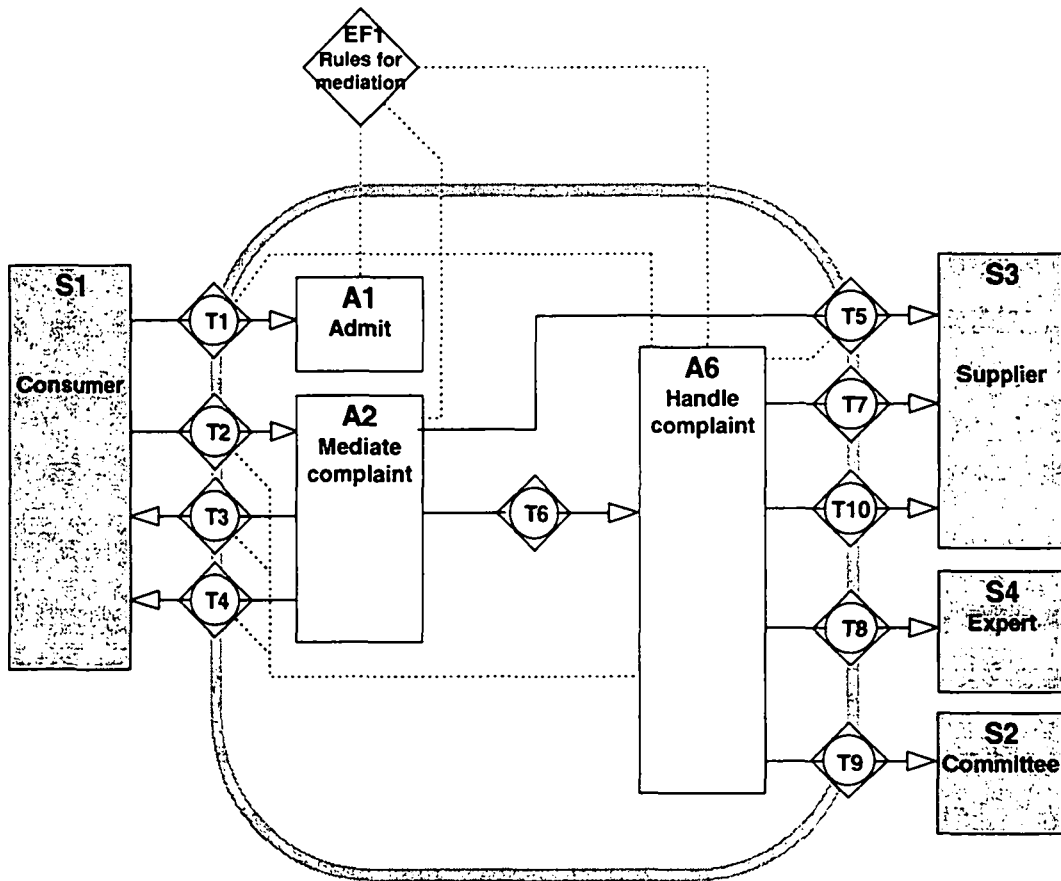


Figure 4 Communication Diagram of SGC

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 is used to highlight these relationships.

Below the process diagram is presented (figure 5) in which the relationships between the transaction types of SGC are depicted. Transaction types are represented by circles or stretched circles. The point of initiation is represented as a tiny circle. Causal relationships are presented as solid arrows while conditional relationships are presented as dotted arrows. Optional relationships are indicated with a small horizontal line on the causal relationship arrow. The different stages of a transaction (order, execution and result phase) are represented as a suffix to the identifier of the transaction type.

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.

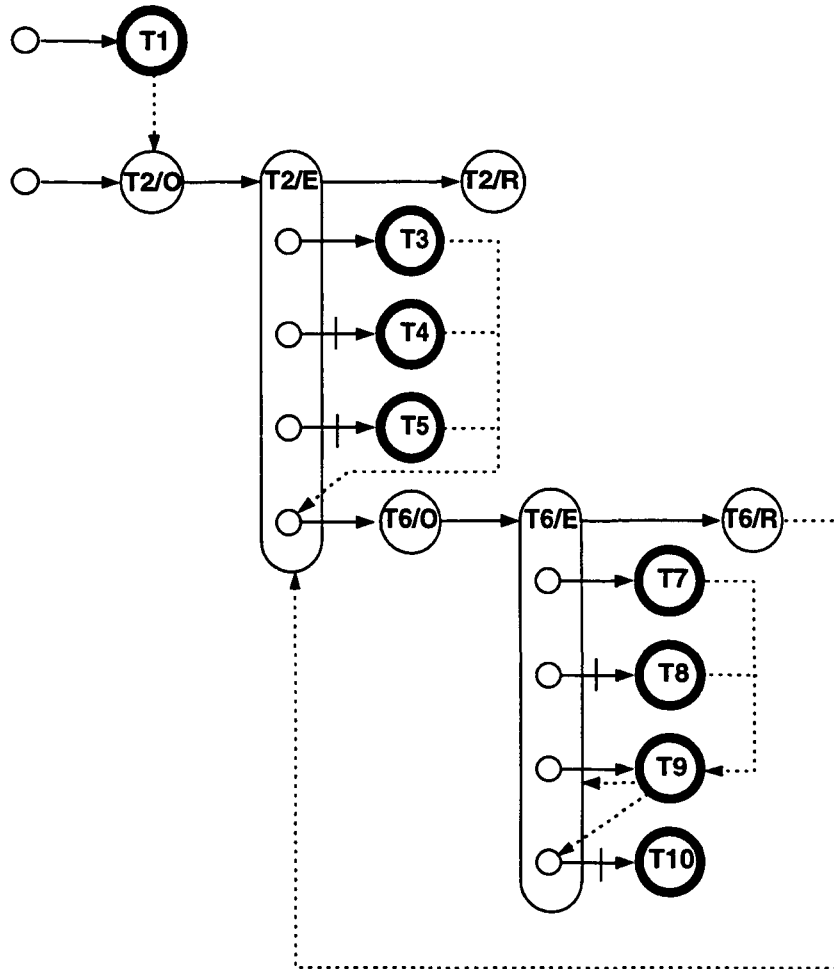


Figure 5 The Process Diagram of SGC

Insights in the object world of SGC are obtained with the Facts 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 6, a small part of the facts diagram of SGC is presented.

In the example below the facts 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 facts diagram these roles are indicated by numbers in rectangles and referred to in the sentences below the roles. In figure 6 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 facts 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.

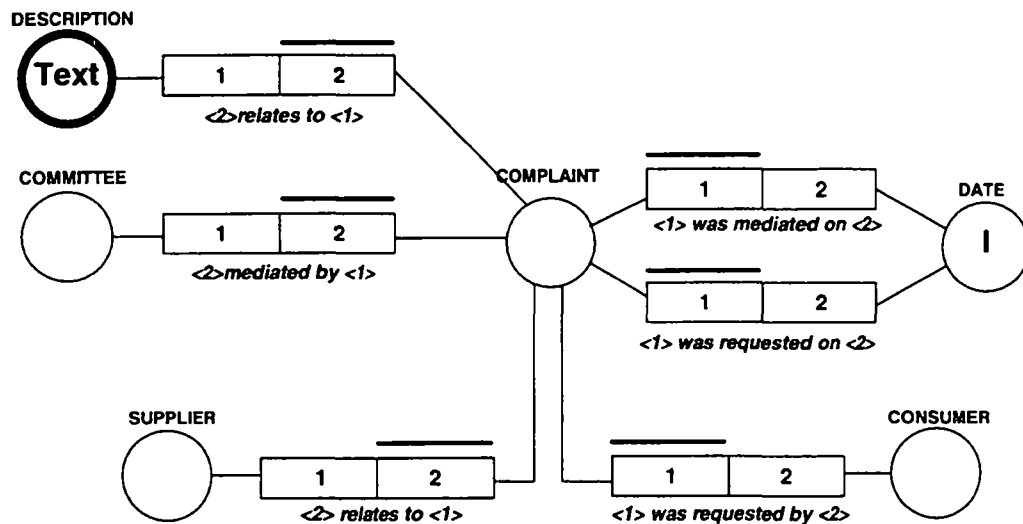


Figure 6 The Facts Diagram of actor A1

A complete understanding of the transaction structure of an organisation is achieved in the Action Model, the 'mother' model of DEMO. In the action model not only the transactional structure of an organisation at the essential level is represented, the essential transactions are also extended with their realisations at the informational and documental levels.

In figure 7 the procedure regarding the execution phase of 'T2 Mediating_complaint' is depicted (T2/E in figure 5). 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 are 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 are 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.

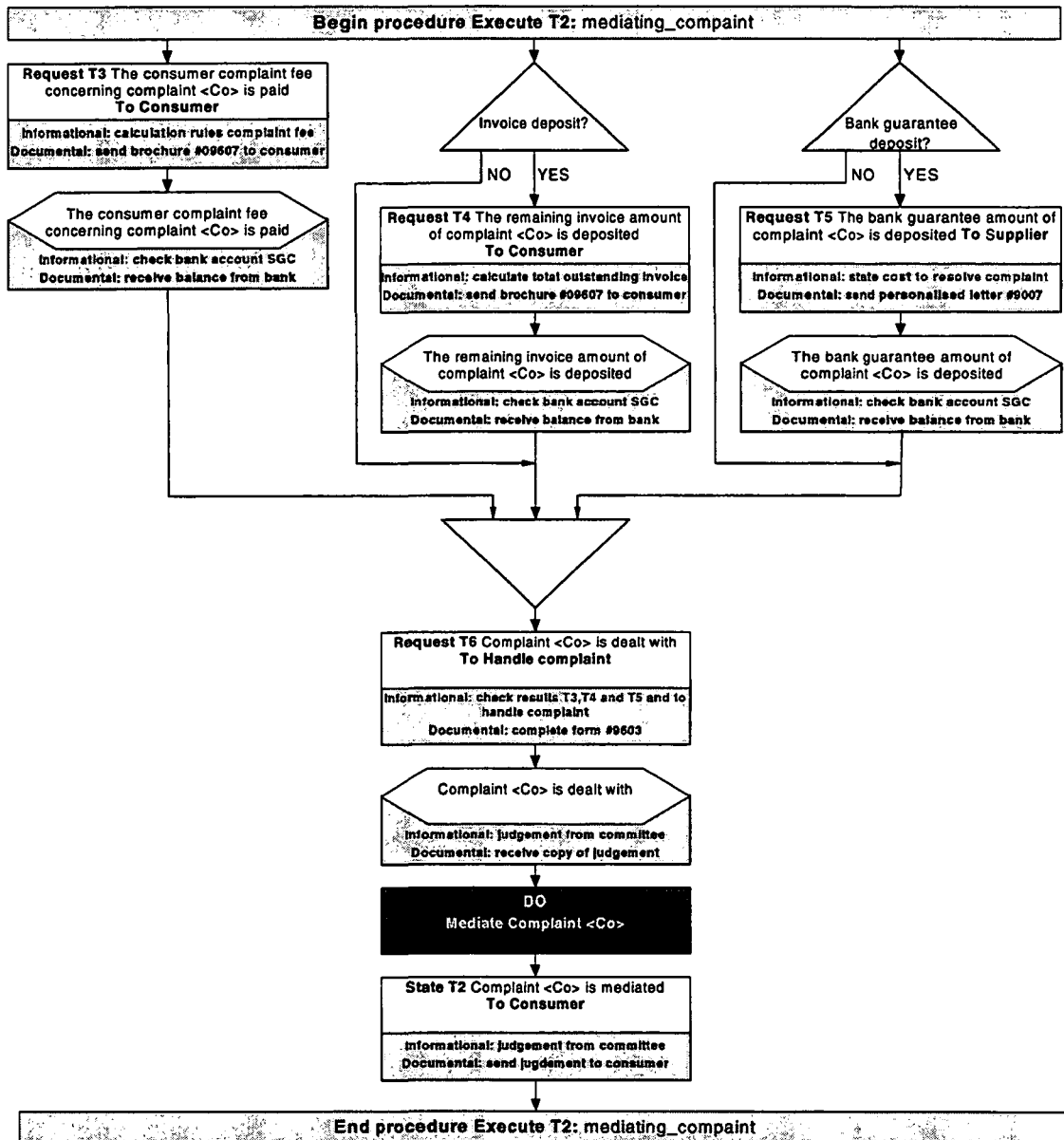


Figure 7 Action Diagram of the Execution phase of transaction T2

On the basis of the presented DEMO models in which the transactional structure of the organisation is described, a follow up project can be started. Two possible directions for follow up are presented in the next section.

APPLICATION AREAS

The speech act based business process and information modelling approach DEMO is applied in two main areas:

1. Business process optimisation,
2. Information system design.

Each of the two application areas is considered in more detail in this section.

Business process optimisation

The introduction of the term BPR has led to several approaches for business process optimisation under different names (Davenport, 1993; Hammer, Champy, 1993; Keen, 1991; Scott-Morton, 1991). BPR lacks a commonly accepted definition but the underlying claim that organisational change is necessary to maintain flexibility and

competitiveness of a business is clear (Davenport, 1995; Teng et al., 1992). By means of the introduction of the three levels of abstraction, the DEMO approach is able to provide a differentiated and well-founded definition of BPR and by means of the models a structured working approach for BPR is provided.

In the DEMO approach BPR is viewed as activities related to the three levels of abstraction. This means that organisational change can focus on the documental level, i.e. the production, storing transporting and destruction of documents performed by the organisational system of actors. Change can also focus on the informational level. This means that the system of actors that sends, receives, calculates and derives information in an organisation is changed. It is, however, important to realise that changes at the informational level necessarily cause changes at the documental level. In line of this reasoning, organisational changes can also focus at the essential level. These changes focus at the system of actors that are engaged in the execution of the business transactions. These changes are the most drastic for the organisation since they have also effects on the informational and documental structure of the organisation. At the same time it is important to note that only changes of transactional structure of the organisation at the essential level can cause drastic increases in efficiency and effectiveness.

The DEMO models provide a structured approach to more or less radical business process optimisation. Business process optimisation with DEMO primarily focuses on changes to the essential transaction design of the organisation. On the basis of the interaction model decisions can be made about the adding or deleting of transaction types. These changes have a major impact on the organisation. The business process model can be used to reduce the cycle time of the entire business process. Cycle times can, for example, be reduced by parallelisation of transaction types or changes to the conditional and optional relationships of the transaction types or transaction phases. Changes to individual transaction processes can be made to impose incremental organisational changes.

When the efficiency and effectiveness of the case study is considered several optimisation possibilities can be considered. On the basis of the communication diagram it was considered to delete transaction T1 Admitting_complaint. The questionnaire could be the medium to be used by the consumer to start a mediation in T2. Another proposal concerned the cycle time and was based on the process diagram. It was considered to reduce the cycle time by moving the conditional relations between T3, T4, T5 and T6/O (see figure 5) to T9, meaning that the committee will only gather to pass a judgement (T9) when the complaint fee and the deposit has been paid by the consumer, and when the bank guarantee is given by the supplier. The introduction of standardised (electronic)forms for the starting of a mediation was proposal for the optimisation of an individual transaction process.

Information system design

Modelling for the design of information systems is a well developed area (e.g., Lundeberg et al., 1982; Checkland, Scholes, 1990; Yourdon, 1989; 1990). However, designing on the basis of speech act models is hardly explored (Hirschheim et al., 1995). Most endeavours in this area have aimed at the understanding and optimisation of business processes (e.g., Denning, Medina-Mora, 1995; Dietz, 1994a; 1994b). Since the DEMO approach both integrates models of the subject world and the object world, it is well suited for the design of information systems.

When using the DEMO approach for the design of information systems, the aim is to develop a blueprint for an information system. This blueprint contains a description of the essential (core) information that is necessary for conducting the business, as well as the location of the creation of this information. The models also specify the external information, that is the information that is created outside the system that is under consideration. The core information of the business is described by the facts model. The model provides a complete and precise specification of this information. Therewith it contains the basic specification of the data model of an organisation. The interstriction model describes the location of the information and the actors that make use of this essential business information. It specifies the information support the individual roles in the organisation need. In other words, it provides the blueprint of the information architecture of an organisation. These blueprints can be used to determine the fundamentals a new information system, but more importantly, they can be used to evaluate the value of existing information systems. By determining a complete and precise understanding of the essential information in an organisation, criteria for evaluating the design of existing systems become available.

When the DEMO analysis of the case study is taken as a starting point, the blueprint of an information system can be determined. Based on the facts diagrams of the two actors (e.g., figure 6) the basic information needs are determined. Some of this information is created by the actor as a result of the successful execution of a transaction, and some of the information is obtained from other sources, like the rules for mediation from the regulations of SGC. From the communication diagram (figure 4) we can conclude that the facts that are created as result of the execution of transactions T1-T4 are important for the actor A6. For the information system architecture this implies that this

information needs to be made available to the persons in the organisation that play the role "Checking-Mediation-Requirements".

The goal of a DEMO analysis for the purpose of information systems design is to specify the conceptual scheme of the information system and the information architecture. Therewith it forms the starting point for informational (e.g., derived and aggregated information like management information) and documental (e.g., user-interface) filling-in resulting in an actual system.

CONCLUSIONS

Speech Act based modelling approaches provide an understanding of organisations that extends on information and document oriented modelling approaches. By focusing on the communication a richer understanding is obtained of the dynamics of an organisation, and therewith creates richer models.

The DEMO approach supports modelling of an organisation from different perspectives. The distinction between the essential level on the one hand and the informational and documental levels on the other presents a new perspective on both business process optimisation and engineering of information systems and infrastructure. It creates a direct relation with the core of the business (the essential level) and the informational and documental realisations of the core. The different models also allow different inter-related perspectives at the essential level. The interaction and the interstriction model describe an organisation as a structure of customers and suppliers, products / services, while the process model describes the organisation as a structure of activities. The facts model is concerned with the information producing and storing characteristics of an organisation. Finally, the action model highlights the organisation as a decision-making system. Together these models of DEMO provide a more detailed and richer description of an organisation than other speech act based modelling approaches do.

The DEMO modelling approach has been applied in some large scale projects and several smaller ones. Examples of large scale projects are the Dutch Telecom, and the Rotterdam Police Force. Smaller projects are projects like SGC, but also some small (production) companies.⁹ The purpose of the projects is diverse, however most of them concerned the optimisation of the business processes and the evaluation of the current information systems. The SGC project concerns the modelling for the implementation of a workflow management system, which is, at the time of writing, being implemented.

REFERENCES

- Auramäki E, E. Lehtinen, K. Lyytinen, 1988. A Speech Act Based Office Modeling Approach. **ACM Transactions on Office Information Systems**, Vol. 6, No 2, pp. 126-152.
- Auramäki, E., K. Lyytinen, 1996. On the Success of Speech Acts and Negotiating Commitments. In: F. Dignum, J. Dietz, E. Verharen, H. Weigand (Eds.), **Communication Modeling - The Language/Action Perspective**, Electronic Workshops in Computing Springer. <http://www.springer.co.uk/ewic/workshops/CM96/>
- Auramäki, E., R. Hirschheim, K. Lyytinen, 1991. Modeling Offices through Discourse Analysis: The SAMPO Approach. **The Computer Journal**, Vol. 35, No. 4, pp. 342-352.
- Austin, J.L., 1962. **How to Do Things with Words**. Clarendon Press, Oxford.
- Checkland, P. J. Scholes, 1990. **Soft Systems Methodology in Action**. John Wiley, Chichester.
- Davenport, T.H., 1993. **Process Innovation**. Harvard Business School Press, Boston.
- Davenport, T.H., 1995. Business Process Reengineering: Where It's Been, Where It's Going. In: V. Grover, W.J. Kettinger (Eds.). **Business Process Change: Reengineering Concept, Methods and Technologies**. Idea Group Publishing, Harrisburg, pp. 1-13.
- Denning, P.J., R. Medina-Mora, 1995. Completing the Loops. **Interfaces**, Vol. 25, No. 3, pp. 42-57.
- 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**

⁹ Most of the reports on these cases are in the Dutch language and in most cases confidential, but the authors can be contacted for English summaries.

- 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.
- 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.
- Dignum, F., J. Dietz (1997). **Communication Modeling - The Language/Action Perspective, Proceedings of the First 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/>
- Flores, F., J.J. Ludlow, 1981. Doing and Speaking in the Office. In: G. Fick, H. Sprague Jr. (Eds.). **Decision Support Systems: Issues and Challenges,** Pergamon Press, New York, pp. 95-118.
- Hammer, M., J.A. Champy, 1993. **Reengineering the Corporation: A Manifesto for Business Revolution,** Nicholas Brealy, London.
- Hirschheim, R., H.K. Klein, K. Lyytinen, 1995. **Information Systems Development and Data Modelling: Conceptual and Philosophical Foundations.** Cambridge University Press, Cambridge.
- Iivari, J., R. Hirschheim, H.K. Klein, 1996. **Five Emerging Approaching to Information Systems Development: An Analysis of Paradigmatic Foundations.** Manuscript.
- Keen, P.G.W., 1991. **Shaping the Future: Business Design Through Information Technology.** Harvard Business School Press, Harvard.
- Lehtinen, E., K. Lyytinen, 1986. Action Based Model of Information System. **Information Systems,** Vol. 11, No. 4, pp. 299-317.
- Lundeberg, M., G. Goldkuhl, A Nilson, 1981. **Information Systems Development: A Systematic Approach.** Prentice Hall, Englewood Cliffs.
- Medina-Mora, R., T. Winograd, R. Flores, F. Flores, 1992. The Action Workflow Approach to Workflow Management Technology. In: J. Turner, R. Kraut (eds.), **Proceedings of the 4th Conference on Computer Supported Cooperative Work.** ACM, New York.
- Nijssen, G.M., T.A. Halpin, 1989. **Conceptual Schema and Relational Database Design: A Fact Oriented Approach.** Prentice Hall, Sidney.
- 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, B.J. van der, V.E. van Reijswoud, 1995. Comparing Two Speech Act Based Modeling Approaches for the Purpose of Information Systems Development. In: G. Doukidis, R. Galliers, T. Jelassi, H. Krcmar, F. Land (Eds.), **Proceedings of the Third European Conference on Information Systems, ECIS'95,** Athens, pp. 353-365.
- Schäl, T., 1996. **Workflow Management Systems for Process Organisations.** Lecture Notes in Computer Science 1096, Springer, Berlin.
- Schäl, T., B. Zeller, 1993. Workflow Management Systems for Financial Services. **Proceedings of the Conference on Organizational Computing Systems, COOCS'93,** ACM, New York, pp. 142-153.
- Scott Morton M.S., 1991. **The Corporation of the 1990's: Information Technology and Organizational Transformation,** Sloan School of Management, Oxford University Press, New York.
- Searle, J.R., 1969. **Speech Acts: An Essay in the Philosophy of Language.** Cambridge University Press, Cambridge.
- 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.
- Teng, J.T.C., W.J. Kettinger, S. Guha, 1992. Business Process Redesign and Information Architecture: Establishing the Missing Links. In: J.I. DeGross, J.D. Becker, J.J. Elam (eds.), **Proceedings of the International Conference on Information Systems**. Dallas.
- Yourdon, E., 1989. **Modern Structured Analysis**. Prentice Hall, Englewood Cliffs.
- Yourdon, E., 1993. **Yourdon Systems Method: Model Driven Systems Development**. Prentice Hall, Englewood Cliffs.
- 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.