Deriving Concepts for Modeling Business Actions

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Abstract. We outline a procedure called communicative and material functions analysis that can be used to derive business modeling concepts. It is rooted in the language-action perspective on organizations and has its point of departure in Business Action Theory, an empirically grounded framework for modeling business processes from an action perspective. We apply this procedure to enhance an existing method, the Situation-adaptable work and Information systems Modeling Method. This extended method is then used to analyze a business situation in order to follow up the commitments that are made in the course of a business process with the ultimate aim of detecting flaws in that process.

1 Introduction

According to the language-action perspective a business is understood as a network of agents that interact via language. The literature on communicative action provides a broad spectrum of frameworks to describe business processes, e.g. Business Action Theory (BAT) [7, 8, 10], Dynamic Essential Modelling of Organizations (DEMO) [5, 6, 17, 20, 21], Action Workflow [4, 13, 18], Action-Based Modeling [14] and Conversation for Action [28].

Among these frameworks BAT can, in a certain sense, be seen as the most general because

- it does not commit the modeler to any specific method,
- it provides the most comprehensive set of phases, and
- its smallest unit of discourse is not a language act but a business act.

The first two issues are discussed in the next section. The latter is unique among the language-action approaches to organizational modeling and deserves specific attention. A business act comprises both a language act and a material act, i.e. it has a broader scope. A language act is an elementary communicative activity in spoken or written form directed from one actor to another with the aim of changing the mental state of the latter. A material act is an elementary physical activity directed from an actor to the material world with the aim of changing its state.

Strictly speaking, and as observed by Goldkuhl [7], language and material acts are not so much distinct and separate acts but in many cases rather functions (or aspects) of one and the same business act. For example, the business act of delivering goods is, perhaps in the first place, a material act. i.e. transporting “stuff” from one place to

another. But at the same time it has a communicative function, i.e. it implies the language act "We have fulfilled the commitment we entered by accepting the respective order."

This means that a deeper understanding of business action must be grounded in an analysis of these functions. We call this analysis 'communicative and material functions analysis' and use it as a basis for deriving concepts for modeling business actions. The objectives of such an analysis are

1. to find the communicative and material functions that are inherent in a generic or specific business act,
2. to classify the identified functions, and
3. to derive suitable concepts for business action modeling.

This procedure is applied to BAT itself to arrive at a rudimentary set of concepts that can be used as a starting point for developing a BAT method or, as in our case, to refine and extend an already existing method: the Situation-adaptable work and Information systems Modeling Method (SIMM) [7]. A case study shows that the extended method can be used successfully to analyse the commitment management within a business process and to detect flaws in that process that lead to "broken commitments".

The remaining sections are structured as follows: We first introduce the BAT framework and the generic layered patterns for business modeling. In the following section this framework is refined by combining phases and layers. We proceed by applying communicative and material functions analysis to the refined framework, followed by a classification of the resulting functions, and finally leading to the derivation of concepts for modeling business actions which are used to refine and extend SIMM. We conclude by presenting a possible application of the extended method for the purpose of commitment analysis.

2 Business Action Theory

As we already mentioned in the introduction BAT is not accompanied by its own method. On the one hand this is an advantage: The modeler can choose freely the method that is most appropriate in the actual application context. A possible choice would be that of SIMM as was suggested in the same paper that introduced BAT [7].

But on the other hand the lack of a dedicated modeling method also represents a disadvantage because choosing a method that was not tailored for BAT also implies that the modeler is not supported in applying BAT. The framework behind such a method might lack essential concepts of BAT or it might even be partially in conflict with BAT. For example, most of the frameworks mentioned above are accompanied by their own methodologies. Using them in the context of BAT might lead to conflicts. These issues have been explored in several papers comparing BAT with DEMO [22, 26] and Action Workflow [7, 26]. It can therefore be argued that the introduction of a BAT method is worthwhile as is the identification of suitable concepts for such a method.

Although the frameworks mentioned above are substantially different in many aspects they do largely agree on dividing a business process into phases. Among them BAT offers the most comprehensive phases:

1. Business prerequisites phase
2. Exposure and contact search phase
3. Contact establishment and proposal phase
4. Contractual or commitment phase
5. Fulfilment phase
6. Completion or assessment phase

The other frameworks address only a part of these phases and/or they give different names to the phases and/or they subsume several phases under one heading. As BAT is the most general framework and offers the most comprehensive phases it appears to be an ideal starting point for a business modeling method. But contrary to many others (and as already mentioned) it does not yet provide its own method. The author of BAT defends the corresponding decision with the "freedom of choice" argument [7] but this argument can be challenged as we have shown above. As a consequence we show in this paper how the existing method SIMM can be enriched with BAT concepts.

Business Action Theory (BAT) has been introduced by Goldkuhl [7] and was refined and adapted on the basis of further empirical evidence in [8, 10, 16]. It is based on Socio-Instrumental Pragmatism (SIP) [9] that combines communicative (social) and material (instrumental) aspects of actions. One of the roots of BAT is Speech Act Theory [2, 24] that views communication as action between (two) individuals, another one is the Theory of Communicative Action [12], which puts action into a social context.

According to BAT business interaction involves two principal players, i.e. the supplier and the customer, where the former sells to the latter. At the core of BAT is the so-called business transaction that consists of the six phases which we have already mentioned. Goldkuhl [7] identifies also a number of generic business actions that constitute the phases on the respective side of the transaction (i.e. supplier or customer). These actions are summarized in table 1.

Table 1. Generic Business Actions

Phase	**Supplier**	**Customer**
Prerequisites phase	Product/offer development	Identification of problems/needs
Exposure & contact search phase	Offer exposure	Contact search
Proposal phase	Offer	Inquiry
Commitment phase	Order confirmation	Order
Fulfilment phase	Delivery, Invoice, Receipt of payment	Receipt of delivery, Payment
Assessment phase	Acceptance, Claim	Acceptance, Claim

The business actions follow a certain execution logic but the whole transaction is by no means a linear, sequential procedure. In the proposal phase, for example, the supplier can make any number of offers concerning their products and/or services where each one will typically meet the customer's needs better than the preceding one. Likewise the customer can make a series of inquiries that usually become more and more "realistic". These loops terminate when offer and inquiry are sufficiently close to each other to reach an agreement whereupon we enter the contractual phase. In an ideal scenario this consists of the customer placing an order and the supplier confirming it. Both actions together constitute a contract the fulfilment of which is subject of the next phase. Here the supplier, again ideally, delivers the products/services and sends a corresponding invoice. The customer receives the delivery and makes the payment, which the supplier finally receives. In the completion phase each party decides whether they accept the receipt of the delivery/money or make a claim, i.e. request the fulfilment of that part of the contract they consider unfulfilled.

Orthogonal to the phases BAT offers another dimension, layers, that was introduced in [15]. They extend and modify the layers originally suggested by Weigand and van den Heuvel [27]. Layers refer to the granularity of an action and in BAT they are, from fine grain to coarse grain: business act, action pair, exchange, business transaction and transaction group. A business act is a communicative act (speech act, e.g. placing an order) or a material act (e.g. performing a delivery). It is directed towards somebody with the aim of changing the world, i.e. the material world or the mental world (state of mind) of the addressee. An action pair is a pair of actions where the first one is a trigger (initiative) and the second a response. Actions can have a dual function so the response of one action pair can be the initiative of another.

On the third layer an exchange consists of an arbitrary number of action pairs (but at least one). An actor gives something to another in return for something else. An exchange always concerns actions of the same type, i.e. a value is exchanged against another value (e.g. product against money) or a proposal is exchanged against another proposal (e.g. offer and inquiry). The fourth layer is called business transaction. It consists of a number of exchanges that correspond to the phases. There is an exchange of interests (contact search), an exchange of proposals (bidding), an exchange of commitments (contract), an exchange of values (e.g. products and/or services against money) and finally an exchange of assessments (claims or acceptances). A transaction starts when the (potential) customer has a need and the (potential) supplier has a corresponding ability (to satisfy the need). It ends when the need is (at least partially) satisfied or when the parties agree that this goal cannot be reached. In the latter case the actor in the customer role will search for a different supplier whereupon a new transaction begins.

On the fifth and final layer the same customer and supplier engage in a number of transactions over a longer period of time thus forming a stable business relationship [3,11]. In the next section we elaborate the generic business actions with the help of communicative and material functions analysis. We use the results of that analysis to develop a set of essential functions of business acts that can be basic concepts of a language for BAT.

3 Refining the Framework

A method for BAT would have to take into account both dimensions, phases and layers. Strictly speaking, the phases are only a refinement of one particular layer, namely the transaction layer. On the way towards concepts for such a method we also need a refinement of the other layers. Such a refinement is suggested in fig. 1 with the exception of the transaction group layer. The transaction layer is divided into the exchanges (or phases) that have already been mentioned. An exchange consists of two handover actions: One is directed from the supplier to the customer and the other vice versa. These handovers usually happen one after the other where the second happens in return for the first but the order is not predefined, i.e. in some cases the supplier hands over first and in others the customer. In certain cases, e.g. if the parties do not trust each other, the handovers can be near-simultaneous as for example in "delivery versus payment".

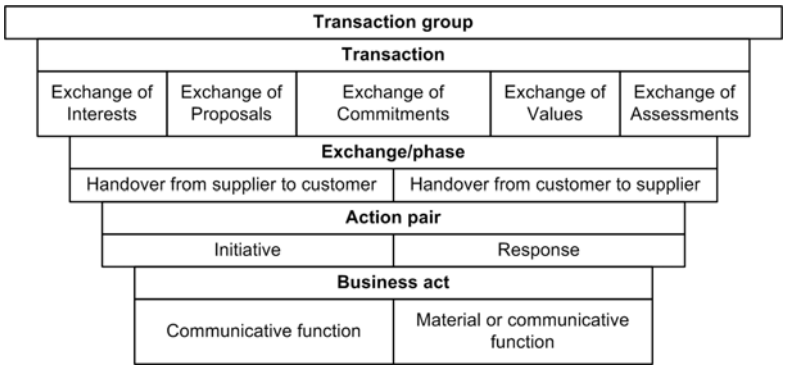

Fig. 1. Structure of the Layers

4 Communicative and Material Functions Analysis

An action pair consists of two business acts, an initiative and a response. They have already been introduced as trigger and response in [15]. On the lowest layer a business act consists of one or more functions. The importance of these functions was already recognized in [7] where they were named mixed communicative actions. This suggests that a business act can be further divided into distinct, separate acts. But the mixed actions are rather different functions of the same act than different acts. We therefore prefer to call them the communicative and/or material functions of a business act as outlined in the introduction. Goldkuhl [7] gives the examples of (commercial) offer and order. A commercial offer can be a single business act that has two communicative functions,

1. that of requesting the potential customer to buy (i.e. to place an order),

2. that of committing the potential supplier to sell (i.e. to deliver) under certain conditions.

These are two communicative functions that are often part of the same business act rather than two separate steps (i.e. distinct actions). The same holds for the order which has the functions of

1. requesting the supplier to sell (i.e. to deliver),
2. and committing the customer to buy under certain conditions.

If we apply the same kind of analysis, which we call communicative and material functions analysis, to the remaining generic business actions we get the results shown in table 2.

Table 2. Material and Communicative Functions of the Generic Business Actions

Business Action	**Material and/or communicative function**	**Business Action**
Offer exposure	*State* general offer	Offer exposure
Contact search	*Express* interest	Contact search
Inquiry	*Request* commercial offer + *Express* interest	Inquiry
Commercial offer	*Offer* delivery + *Request* order	Commercial offer
Order	*Request* delivery + *Offer* payment	Order
Order confirmation	*Promise* delivery	Order confirmation
Delivery	*Transfer* merchandise/*Perform* service + *State* delivery	Delivery
Invoice	*Request* payment + *State* contract fulfilment [supplier]	Invoice
Receipt of delivery	*Accept* delivery + (*Accept* contract fulfilment [supplier])	Receipt of delivery
Payment	*Transfer* money + *State* contract fulfilment [customer]	Payment
Receipt of payment	*Accept* payment + (*Accept* contract fulfilment [customer])	Receipt of payment
Acceptance	*Accept* contract fulfilment [supplier or customer]	Acceptance
Claim	*Request* contract fulfilment [supplier or customer]	Claim

These results show that a business act typically has one or two functions. The communicative function is always present (even in the case of material acts) but there might also be another function that is either communicative or material. This is reflected in the model of fig. 1. The generic business action “receipt of delivery or payment” can in some cases imply the acceptance of the contract fulfilment of supplier or customer, respectively. In other cases the acceptance is stated explicitly

(i.e. separately in the assessment phase) or a claim is made (also in the assessment phase).

We are aware of the fact that such a list of generic actions and their functions can only serve as a recommendation that covers some typical or common situations. It is not meant to be a prescriptive template for all business interactions. The main purposes of it are rather as follows: First it should give an example of how communicative and material functions analysis can be used to identify material and communicative functions. Using that analysis in a different context might yield different actions and even different functions concerning the same actions. But the results can nevertheless be useful, and that is the second purpose, to find a set of recurring material and communicative functions that can be used as a pattern for a modeling language.

5 Classifying Functions

If we compile the identified material and communicative functions and sort them according to the illocutionary points introduced in [25], adding a column for material functions, we arrive at the structure show in table 3.

Table 3. Classification of material and communicative functions

material	**communicative**				
	expressives	**declaratives**	**Assertives**	**commissives**	**directives**
Transfer	Express	Accept	State	Promise	Request
Apply			Reply	Offer	Ask
Transform					
			Perform		

The material functions are transfering and object (i.e. moving it in space), applying an object as an instrument and transforming and object (i.e. changing some of its properties) possibly with the help of an instrument (this is in accordance with SIP). The function “express” is used to show an emotion or an attitude (e.g. interest in a product). A directive is usually a request in a business context. A less formal and less compelling directive would be to ask a question. The reply is the corresponding assertive. There is another assertive, state, that carries a higher illocutionary force. It is a unilateral establishment of a fact, whereas the declarative “accept” is a confirmation of a stated fact, i.e. a mutual agreement on that fact. An “accept” must therefore always be preceeded by a “state” because one party alone cannot declare agreement. The commissives are divided into promise and offer. The former is an unconditional commitment, the latter is subject to some conditions. If these conditions are fulfilled (typically by the other party) the offer becomes a promise. To avoid confusion of the communicative function “offer” with the same term as used in a business context we have called the latter a commercial offer. The function “perform” refers to a business act that is elementary at the current level of abstraction (i.e. with respect to the model under consideration) but a complex action on some lower, more detailed level.

The development of a set of material and communicative functions was motivated by [7, 15]. Both stress the importance of this issue (in the latter paper it was called multi-functional business acts, in the former mixed communicative actions). We agree with Goldkuhl [7] that the illocutionary points of Searle [25] are too coarse for business modeling and have therefore developed the set of functions in table 3 which is somewhat more elaborate and more adapted to business interaction. But nevertheless such a classification should be seen as a suggestion rather than a fixed template. Such a set might require adaptation to a particular modeling scenario.

A classification of speech acts has also been done by Reijswoud et al. [23]. They employed a purely theoretical method that consisted in viewing the one-dimensional classifications of Searle and Habermas, respectively, as two dimensions of a matrix. As a result they got the six speech acts question, answer, request, promise, state and accept. These are also found in table 3. Our classification can therefore be seen as an extension of that of Reijswoud et al. [23].

Based on the suggested refinements, the next section derives a set of concepts that are fundamental for modeling business actions.

6 Deriving Business Action Concepts

The development of a full-blown language or even a method is a huge project. Such a project is only justified if the new language or method really offers something substantially new. As we have mentioned earlier, there is already a number of methods that "implement" language-action concepts to some extent. We do therefore not propose a comprehensive new language but rather a set of concepts that can, for example, be used to extend existing languages. In this context we refer to these concepts as language elements. The techniques for such an extension are offered by (situational) method engineering [19]. The idea behind method engineering is to design methods in such a way that they fit the particular modeling situation. This can be done in different ways. One way is to extend an existing method. Another one is to create a new one from chunks of existing methods by performing method chunk selection and assembly. The third way is to construct a new method from scratch with the help of a suitable meta-model or paradigm. Using the first approach, method extension, we enrich and refine the language of SIMM with the concepts introduced in this section.

We propose that a business action language requires at least three basic categories: actors, actions and (action) objects. As SIMM has the most elaborate concept of an action object, we borrow both the notion and the notation of an object from SIMM. Examples of information and material objects are shown in fig. 2 but SIMM offers many additional types. Actors are denoted by a rectangle containing the name of the actor as is common in many approaches. The actions themselves are divided into two categories according to the layer: business acts (layer 1) and the other layers. Actions on layers 2 to 5 are represented by a rounded rectangle with a double line. An additional classification symbol can be used to identify the particular layer: two intersecting circles for an action pair, two arrows pointing towards each other for an exchange, a "T" for a transaction and a "G" for a transaction group. For business acts

in general we also use the rounded rectangle, for material acts the octagon. Both shapes have only one line to show that the act is elementary. The box can either contain the name of the business act or the respective material or communicative function where the function header is italicized. In the case of multiple functions the box can be divided into horizontal compartments, one for each function. If material and communicative functions are mixed we can also mix the respective shapes. Fig. 2 shows an overview of the business action concepts and their notational representation.

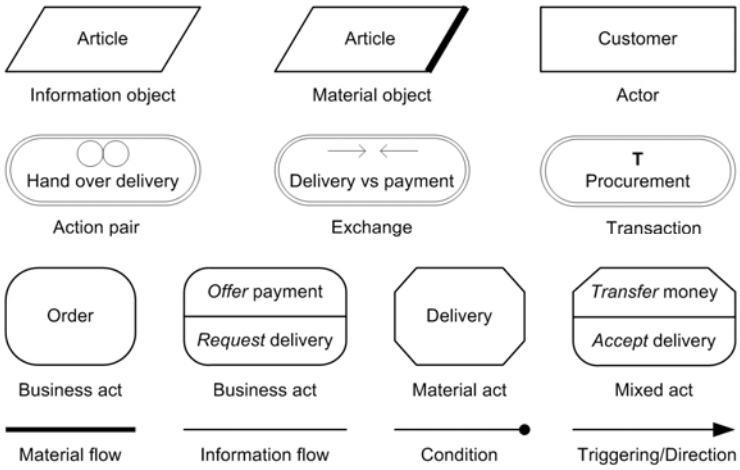

Fig. 2. Concepts for business action modeling and their notation

Among the notational elements there are also four types of arcs. Two undirected arcs that represent an information flow (thin arc) or a material flow (thick arc). These have been borrowed from the SIMM Action Diagram where the direction of the flow is coincides with the drawing direction (from top to bottom). The condition arc allows us to show that one action is a condition for another action. The end with the black dot is attached to the latter action. The arrow serves two purposes. If it points from one action to another, the former triggers the latter. If it points from one actor to another, it represents an action that is directed from the first actor to the second. In this case the name of the action is written along the arrow. It can be accompanied by a symbol denoting the layer. For layers 2 to 5 we use the classification symbols introduced above. For communicative or material acts we use a small rounded rectangle (or circle) or a small octagon (or diamond), respectively. As an alternative to the arrow form of the action the boxed form of the action can be interlaced with the arrow.

In the next section we apply the extended method for the analysis of commitments.

7 Applying the Extended Method: A Case Study

Commitment analysis in terms of language action was introduced by Auramäki et al. [1]. They used discourse analysis to develop a discourse graph, a conversation graph

and finally a network graph of actions and commitments that shows in which way the actions influence the commitments. This helped them to discover flaws in the way that commitments are handled. As the main objective in our case project was business process re-engineering we used the existing business process analysis as the point of departure instead. The project involved two companies that have a very close business relationship. One of them is the headquarters of a retail chain in the home textiles and decoration industry. The other is a third-party logistics provider, let us call them LogPro, that performs all inbound and outbound logistics for the retailer.

Our goal was to discover the major problems in their relationship and to suggest appropriate solutions. For this purpose we carried out a thorough analysis of the relevant business process, order processing and delivery, that involved, apart from Headquarters and LogPro, also the shops of the chain which are organizations in their own right although they do maintain a very close, franchise-like relation with Headquarters. For the analysis of the interaction between these players we first used the Interaction Diagrams of SIMM. But then we discovered that we also need information on the type and level of an action so we enriched the Interaction Diagram with the features introduced above. The resulting diagram is shown in fig. 3.

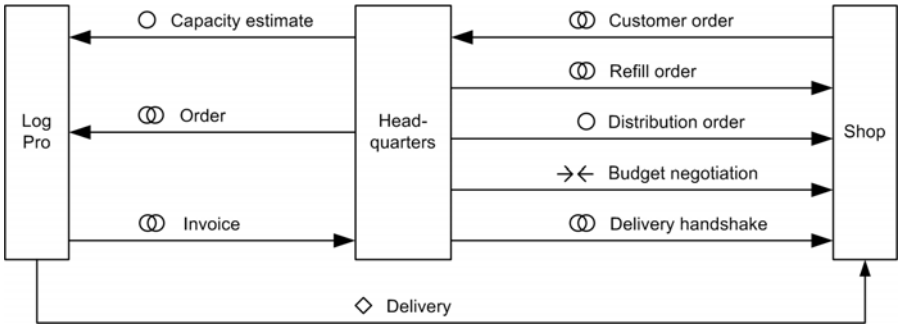

Fig. 3. Enriched Interaction Diagram

The process starts when Headquarters send an estimate regarding the capacity required for executing future orders. Such estimates are send six months, two months and two weeks in advance of the time of delivery. Shortly before that time the Shop can place different kinds of orders. A customer order is iniated by the Shop on behalf of a customer who wishes to buy an article that is not currently available in the Shop. The refill order is triggered by Headquarters whenever the Shop's stock is running low on articles of the basic assortment. Both actions are on the action-pair level because they require some kind of confirmation from the partner. The third type of order is called a distribution order. It is based on the budget that was negotiated before and the shop has to accept it as part of its franchise obligations. The distribution order is therefore only a single speech act that has a more informative character. The negotiation of the budget on the other hand is a bilateral process that is initiated by Headquarters but consists of an exchange of budget proposals.

Orders of all types are combined into one order by Headquarters and forwarded to LogPro. As a consequence LogPro will perform the delivery to the Shop. Headquarters inform the Shop about the upcoming delivery and receive a

confirmation that is has arrived (delivery handshake). In regular intervals LogPro bill their services to Headquarters.

On the basis of this overview we developed detailed Interaction Diagrams for the interactions between Headquarters and Shop as well as between LogPro and Headquarters. The latter is shown in fig. 4. This diagram is on the business-act level, i.e. all actions in it are business acts. It shows that Headquarters send a capacity estimate first. On the day of delivery a pick file is transferred to LogPro that contains the order data. This is used by LogPro to pick the appropriate articles from the shelves and to pack them for delivery. As soon as the articles are on their way, LogPro reports the delivery to Headquarters. At the next billing occasion LogPro send an invoice and Headquarters makes the respective payment.

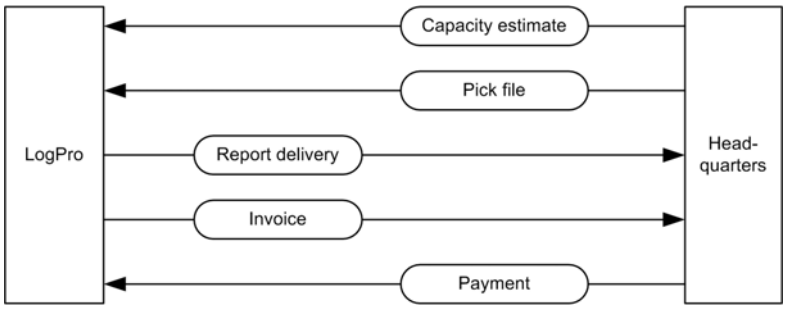

Fig. 4. Detailed Interaction Diagram

For performing a commitment analysis we need more detailed information about how the actions are related to each other. This means that we have to exhibit the communicative and material functions that the actions have. These functions are the ones that lead to the establishment or fulfilment of commitments. When they have been made explicit we can show the conditional and causal relationships between the functions. This in turn helps us to uncover broken commitments. For this purpose we have created a new type af diagram, the Business Act Diagram. A diagram of this type for the relation between LogPro and Headquarters is shown in fig. 5.

Each actor box covers the actions that are performed by this actor. The capacity estimate is an action that implies both a request to provide this capacity and a promise to place an order that requires approximately the requested capacity. LogPro makes an offer to provide this capacity subject to Headquarters' order in general and their offer of payment in particular. This offer is implicit (i.e. not communicated) because LogPro is required to provide the respective capacity by the terms of the frame contract. The provision of the capacity is a condition for the ability to perform the delivery that is triggered by the respective request from Headquarters that is a function of the order. The other function, offer payment, is subject to an accepted delivery. The performed delivery triggers a respective report (state delivery) which in turn triggers the invoice (request payment). The latter triggers the payment (transfer money) but only if the Shop has confirmed the arrival of the delivery. Headquarters does not explicitly accept the delivery towards LogPro but does so implicitly by paying the invoice. Therefore "Transfer money" and "Accept delivery" are functions of the same business act.

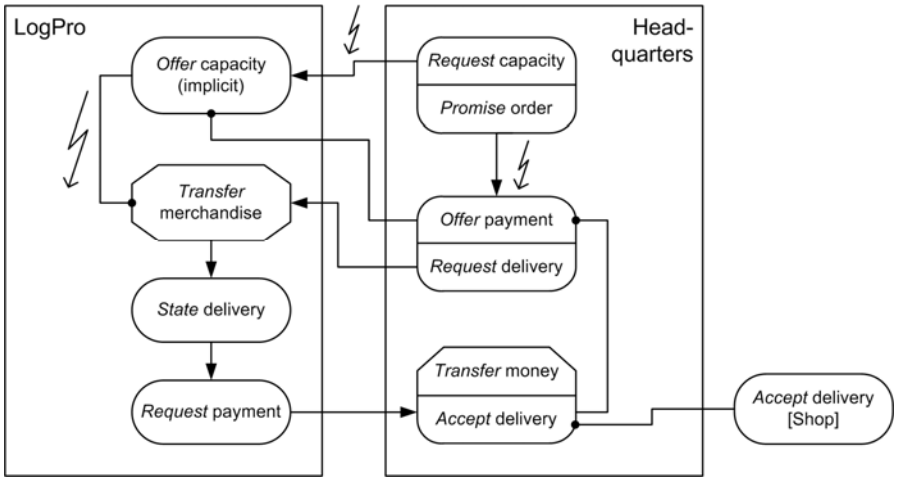

Fig. 5. Business Act Diagram

The Business Act Diagram has shown us that the commitment concerning capacity is broken in three different places (see the flash symbols in fig. 5):

1. Headquarters promise that the order will require the capacity that was requested. But in reality the orders often deviate substantially from the estimates.
2. The request for the capacity is not in a for LogPro suitable format so that they can hardly plan for providing this capacity. But Headquarters assume that the capacity is provided.
3. As a consequence of 1 and 2 the condition for performing the delivery are not given in many cases. This leads to higher costs and sometimes failure to meet the deadlines for delivery.

We have used this approach for other parts of the business process where we also succeeded in finding mistakes in commitment management. Among the problems we have identified this way are:

1. Indistinct communication structures: It is often unclear who communicates with whom regarding which issue.
2. Lack of trust: Different interpretations of the frame contract by the parties lead to expectations that are not fulfilled.
3. Lack of information: LogPro is not provided with suitable information for reliable capacity planning, This is not specified clearly in the existing frame contract.
4. Excessive communication: A considerable amount of personal communication between organizations is spent on handling everyday work. This is only necessary because of insufficient specification of routine procedures in the frame contract.
5. High transaction costs due to ad-hoc solutions.

8 Conclusion

Business Action Theory is a stable framework for analysing business processes. It can guide the modeler in finding appropriate abstractions of the studied process and in relating different parts of the model to each other. These features are achieved by rooting the theory solidly in an ontology, i.e. Socio-Instrumental Pragmatism, that describes all important aspects of social behaviour in general and business behaviour in particular. Other cornerstone of BAT are the existence of different dimensions, layers and phases, and the multi-functionality of business acts. All these features contribute to better business process models. But the support of the modeler can be strengthened by providing a modeling language that reflects these features of BAT. We have suggested a number of concepts of such a language and we have shown two ways in which they can be used: to refine the exisiting modeling methods SIMM and to define new diagram types that are adapted to a particular modeling situation.

As an example for such a situation we have used the analysis of commitments that are created and fulfilled (or broken) in the course of a business process. An enriched Interaction Diagram and a Business Act Diagram, two examples of newly defined diagram types, have proved useful in this context. But the concepts are only potential language elements. How they can be introduced into existing languages and whether they can contribute to the development of new languages depends on the context of use of such languages. This is subject to future research.

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