

Business Process Modeling

1. Introduction and Motivation

In analyzing and designing business systems, business processes appear more and more at the center of interest. This tendency reflects a change of view concerning the enterprise that is becoming more and more complex. The prevailing, more static and structured view is being replaced by a dynamic and behavior-oriented view.

- A characteristic for the static and structured view is the division of an enterprise into organizational units (profit center, business units) in order to keep the complexity of business systems under control. Dynamic features are barely considered. As a result rivalries between business units may arise, thereby preventing necessary structural changes.
- The dynamic and functional view puts the company's productive aspects into the foreground. The enterprise is being looked upon in a holistic way as a system of business processes. It is supposed that the enterprise either undergoes a process of permanent structural change by adjusting its behavior to continually changing environmental conditions.

The implementation of the behavioral oriented view in the analysis and design of business systems requires explicit modeling (in the sense of recording and specification) of business processes. The related models, methods, and activities are summarized under the notion of **business process modeling**. Business process modeling itself is a precondition for **business process redesign**.

The utility of business process modeling in the analyses and design of dynamic aspects of business systems becomes especially clear in the following areas:

- **Value chains:** Modeling business and cross business processes requires a thorough examination of the value chain. By doing this, business processes define service processes in a process-oriented interaction of business and cross business organizational units (process oriented cooperations). The individual service processes run through all of the business functional areas; one cannot derive them from the tasks of the individual functional areas.
- **Critical success factors:** The definition of service processes is based upon critical success factors. Since business processes are indeed processes, it is possible to take into consideration the strategic factor time and to effect a quicker reaction to changes in the market place (time to market). The

necessity for short reaction times or for faster operational processes is a consequence of shorter life time of products and quick environmental changes.

- **Organizational learning:** A permanent alignment to business goals and an adaptation to changing environmental conditions require a process-oriented organization of the company. The functional division of tasks (Taylorism) is optimized for a static handling of the running business, not for processes of learning and replacement. The ability of an organization to learn however is the only enduring advantage of competition.
- **Process cost accounting** and transaction cost estimates : The process-oriented treatment of overhead expenses opens an approach to judge the efficiency of value chains. Furthermore, transaction cost estimates can be taken in account in the concept of process cost accounting.
- **Business information systems:** The main task of the information system is to direct business processes. A process oriented information system enables the complete control of operational service processes. The modeling of business processes is the starting point for a holistic analysis and design of the automated parts (business application systems) as well as the non-automated parts of the business information system.

2. Characteristics of Business Processes

The terms "business process," "*Geschäftsvorgang*," and "*Geschäftsvorfall*" are often insufficiently differentiated in contemporary literature. For this reason fundamental formal and subjective aspects of business processes are developed in the following sections.

2.1 Formal Aspects

The formal aspects of business processes are differentiated in the form of the following system of terms. This system of terms serves as a meta-model to specify business processes.



Fig.1: Business process as a transaction relation between objects.

A **business process** is a transaction or a series of transactions between business objects. The subject of the transaction is the exchange of services and/or messages between objects (fig.1).

Each transaction of a business process requires a task for each related object. Each individual task specifies the subjective goals and, if necessary, the formal goals of an object related to a certain transaction. If an object is involved in several transactions, then a commensurate number of tasks is assigned to it.

Therefore, a transaction is specified by the task-goals of several objects. A transaction can only be carried out if the subjective goals of the related tasks are compatible and, if necessary, a compromise goal can be found if formal goals are divergent. This compromise goal can be the result of a negotiation between the objects.

Every business process involves at least two tasks by its related objects. A task is triggered by an event. The tasks which are tied together by events form a **task chain** or a **task net** respectively (fig.2).

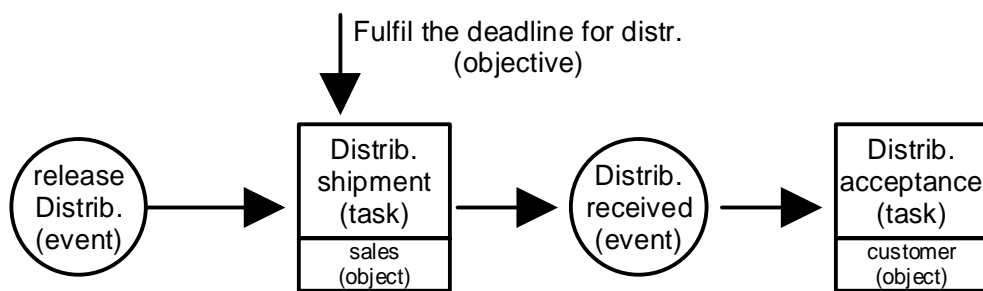


Fig.2: Detail of an elementary task chain for the transaction "Delivery" (fig.1)

The above analysis shows that transactions are the elements of business processes. An examination of the task chain alone does not sufficiently satisfy the requirements of formal characteristics since the coordination of the goals of the tasks which are involved in a transaction as a necessary prerequisite for performing a transaction is not addressed.

In contemporary literature, however, one can find the use of terms which differ from the above system of terms or which are less precise than the above system of terms. Examples are:

- On the operational level the term „Geschäftsvorfall“ (event) covers the term „Geschäftsvorgang“ to treat events [Wöhe86, 867].
- Instead of the term business process the term „Geschäftsvorfall“ is used. The elements of „Geschäftsvorfall“ are activities [MLHH93, 75].
- There is no differentiation between the task chain and the business process [Sche90,34].

Other definitions of the term business process implicitly refer to the modeling component transaction. For example, Elgass and Krcmar define a process as a "series of activities, having a logical context to one another, and are self contained so they can be isolated from tasks that come first, are parallel or come last" [ElKr93, 43]. The necessary logical context can be derived from the characteristics of a transaction.

2.2 Subjective Characteristics

Aside of the described formal characteristics, business processes have some subjective characteristics which are important for business process modeling. These characteristics involve the following considerations:

- A business process can be judged with regard to its function within the value chain and its contribution in reaching the company's goals. Business processes that do not get a sufficient rating are to be eliminated. This action leads to a lean organization and to a more efficient enterprise.
- The identification and evaluation of business processes begins at the strategic level and is refined uniformly down to the operative level. In decomposing business processes one needs to take the generality of service processes into account and try to avoid friction between the business processes.
- Beyond the service processes (main processes) that are directly involved in the value chain, we can differentiate indirectly-involved support processes (transverse processes) which support service processes, as well as control processes which manage the service processes and support processes.
- Since business processes define the dynamics of the company as a system, business process behavior regarding delay and stability should be examined to establish their effect onto the whole system.

3. Approach to Modeling Business Processes

The following shortly characterizes some current approaches to business process modeling. A detailed representation will be found in the literature cited.

- **Business Systems Planning (BSI)** [IBM79] uses the modeling components business process and class of data, and describes with it sender-receiver relations among the business processes of a company. The communication model that is generated from this, with classes of data as communication channels, is used to derive an architecture for application systems. BSP does not use a hierarchy of business processes and does not give any clues to identify business processes. Neither formal nor subjective characteristics of business processes are explicitly used for modeling. A business process is defined as a group of logically related decisions and activities [Hein92, 293]. The lack of a modeling component event prevents the description of dynamic aspects.
- **Information Engineering (IE)** [Mart90], like BSP, seeks to differentiate suitable application systems, and uses a communication model with the modeling components business process and entity or data subject, respectively. Business processes are looked upon as tasks and may be coupled by events. To identify business processes a model of business functions is introduced which lies above the communication model which registers the tasks that can be derived from the company's goals. During the transition business functions are decomposed into business processes.

Since relation to transactions is not identified, the formal and subjective characteristics of business processes can only be used in a limited way. The modeling of business processes is restricted to decomposition structures; dynamic aspects show up in the communication model only.
- **Scheer** [Sche90] models business processes as task chains diagrams. The automation of single task as well as their relationships to structural organizational units are identified. The tasks are underlaid with data structures and functional structures. The relation between a single task and the subjective goals of the company is not explicitly modeled.
- In the **Approach of Scherr** [Sche93] business processes are modeled on the base of customer-supplier protocols. These protocols are the starting point for an analysis of the coordinating relations among the actors that are involved in a business process. The coordinating relations are registered as roles, relations, and agreements, and are represented complementary to the actual task chain.
- The **Semantic Object Model (SOM)** [FeSi93, FeSi93a] promotes the modeling of business processes using business transactions and objects as a starting point for further analysis and design of an business information system. Important characteristics of business process modeling with the

SOM-approach are the general orientation of transactions and objects to meet the company's subjective goals, the explicit modeling of the coordination of objects in executing transactions, and a hierarchical concept to decompose objects and transactions.

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