BUSINESS PROCESS MODELING WITH UML

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Abstract: This paper focuses the reasons and advantages of the application of the Unified Modeling Language (UML) in organizational architecture modeling. A presentation and description of the methodology to apply business modeling is made, namely, the organization of the modeling in views and the application of those views. A case study is presented, as an illustration.

1. INTRODUCTION

Currently the organizations operate in a highly competitive global market, which leads to the necessity to increase its competitive position. This implies to increase the quality of the produced goods and services, to reduce lead times of those same goods and services, minimizing the costs and increasing the profits. The organizations, to reach these competitive goals, must optimize their internal operations.

This optimization requires a business model that represents the business composition, allowing the organizations to do the analysis and simulation of change before its implementation. In the past, the business has been only represented with hierarchical models of the organizational structure of the respective companies. However, the business can be improved through the optimization of its business processes. A business process represents the organizations way of work, horizontally, allowing an analysis of the workflow through their internal and external boundaries. The reasons that take the organizations to do business modeling are presented in the first part of this paper. Then, the characteristics and concepts that make UML an adequate business modeling language are described. Finally, the business modeling of a case study, an industrial apparel company, is made.

2.   BUSINESS MODELING

The business processes modeling has some distinctive characteristics according to the software modeling relatively to the definition and characterization of the objects. The definition of object accepted by the community of software engineering is the following: an object is a piece of software that includes actions, passive data and reacts to internal or external events through the execution of actions. An action results in the alteration of the state of an object. However the objects that represent business processes own some interesting characteristics that require special attention in an object-oriented model (Bider-Khomyakov, 1998):

− They are time-based
− They are history based.
− They are human assisted
− They are not deterministic.
− Its actions can evolve with the time.

Such as in the software engineering, where this community has created standards of common situations to promote the components reutilization, organizational engineering has come to cover a similar way to create patterns of business processes, since, different organizations execute similar processes in the conduction of its businesses. One team of the Sloan School of the MIT has come to develop one project called "The MIT Processes Handbook Project" (Malone et al, 1999) that intend to help people to:

− Redesign the existing business processes in the organization.
− Create new business processes (especially those that take advantages of the information technologies).
− Share ideas concerning practical organizations.

The methodology used in this project for the business processes representation is very close to the one used in the software modeling, with some subtle differences. Instead of existing an object specialization, a process specialization exists. The object oriented software modeling includes a hierarchy of specialized objects, who can have associated actions (or methods). The business processes modeling, includes a hierarchy of specialized actions (or processes) that can have associated objects. That is, the object oriented software modeling owns a hierarchy of names, while the object oriented business processes modeling involves a hierarchy of verbs. However, the two approaches are formally equivalents.

The goal of the business modeling is the production of descriptions or abstractions of complex realities, capturing the core business functions. Some of the reasons to proceed with the business modeling are:

− To better understand the key mechanisms of one determined business;
− To act as base of support to the information systems;
− To improve the business;
− To change business radically;
− To identify new business opportunities;
− To identify outsourcing opportunities.

The business model can have several views and each view is expressed through one or more diagrams. The diagrams can be of several types, depending of the situation or specific structure of the business that needs to be portrayed. The diagrams capture the business processes, rules, goals, objects of the business and its relationships as well as interactions.

3.   THE UML AND THE BUSINESS MODELING

UML is a modeling language that can be used for business modeling, such as it has come to be used for software modeling. It is a language that can be extended and customized. The UML has nine predefined diagrams that, together describes the structure, behavior and architecture of a system.

The business architecture is a tool to manage the complexity of an organizational system. The architecture captures an ordered set of elements related between themselves. The elements and its structure represent the organization and the behavior of a business system and show the abstractions of the key processes for the system. Through out the definition and documentation of the business architecture it is possible to argue, communicate, adapt and improve the business. Is difficult to find the correct detail level to represent the architecture and depends on the intention of the architecture it self. In this work, it was adopted the proposal of Eriksson and Penker (Eriksson-Penker, 2000) for the business architecture, second which the architecture is defined in four distinct views, each one of which have a certain number of diagrams.

3.1   Concepts

The concepts used for defining the architecture are the following ones:

− Process - It is an abstraction who shows a certain numbers of activities that form a set of input objects and create one set of output objects, that

own value for a customer (internal or external to the organization). The input and output objects and the objects used during the process are considered business resources. A process has a goal and is affected by events.

- Event – It is a state alteration which announces that something happened in the business. It is generated by a process and received by one or more other processes
- Resources – Are concepts or things used by the business, such as physical things (e.g., a machine), abstract things (e.g., a contract), people, or informational resources (e.g., information concerning other resources).
- Goals – It is the desired state of one or more resources. The goals are linked to all the business and are processed by business processes.
- Business Rules – Are premises that define or restrict some aspect of the business, and represent knowledge of the business.
- General Mechanisms - The general mechanisms can be used in all the diagrams. For example, one reference note can contain the name of an external document or another diagram to show where we will be able to find more information concerning the model.

3.2 Views

There are four distinct business-modeling views:
- Business View – It is the general business view. This view describes a goal structure for the company and illustrates the problems that must be solved in order to reach those goals.
- Business Process – This view represents the activities and the value created by the business. It also illustrates the interaction between the processes and the resources in order to reach the goal of each process. This view still demonstrates the existing interaction between the diverse processes.
- Business Structure – This view represents the structure of the business resources, such as the business organization or the structure of the manufactured products.
- Business Behavior – It represents the individual behavior of each resource and process of the business model.

These views are not separate models, but different perspectives of one or more business aspects. When together, the views create a complete business model.

4.   THE CASE STUDY

4.1   The company

The company in study initiated its activity, aparell manufacture for man, in the 60's. Today the company has 400 employes and is classified among the 1000 bigger companies of Portugal.

The company sells its products in Portugal (where counts more than 260 customers) and in the foreigner, whose exportations represented 49% of the total of its business volume, being 29% destined to the European Union market and about 18% for countries of the American continent, Japan, Koweit, etc.

Currently the company produces complete suits, pants and coats for man with three proper brands. In 1999 the sales reached 2.5 billions of escudos. Since its creation the company keeps the spirit of traditional hand made suits in order to mark an image of quality and differentiation of its products.

4.2   Vision and Goals

The business vision view contains the express ideas of business and its goals in a *vision statement* and a goal model. It can be difficult to formulate a business vision statement and the goals of the business without defining the concepts key of the business, thus the conceptual model can be created in parallel to complement this view, in order to clarify the key concepts of the business.

4.2.1   Goal Model

Figure 1 shows the company business vision and relates concrete business goals and its processes. The goal of the goal model is to serve as point of departure for the implementation project of the business vision, and in this case it has the following statement vision: "To be the image of quality, innovation and success of upper middle gamma of apparel for man", and "to keep and to consolidate the leadership in the internal market and to increase the share of external market".

4.2.2   Conceptual Model

The conceptual model, as shown in Figure 2, complements the goal model. This model defines
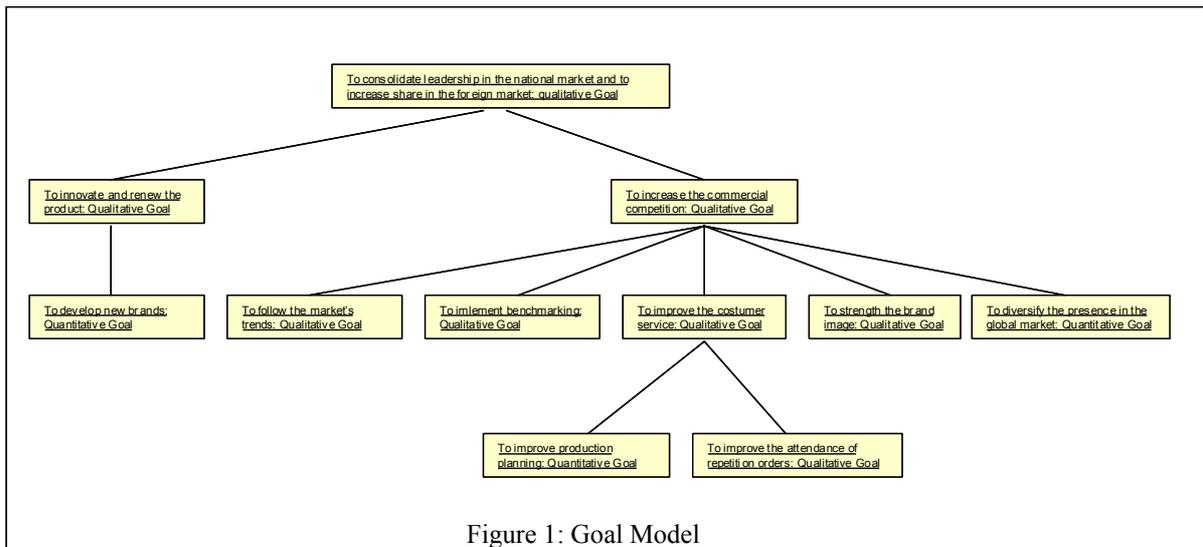
Figure 1: Goal Model

the key concepts that are important for this business modeling.

4.3 Business Processes

The business processes view focuses the way to reach the business vision and the goals delineated in the vision statement, goal model and conceptual model. The process diagram is shown in Figure 3, and is used to model the business process "Sale". Each sub-process have a specific goal to be reached. The business processes can also indicate the necessary steps for the
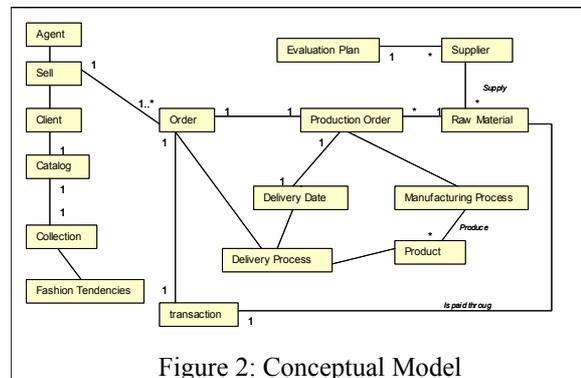
Figure 2: Conceptual Model
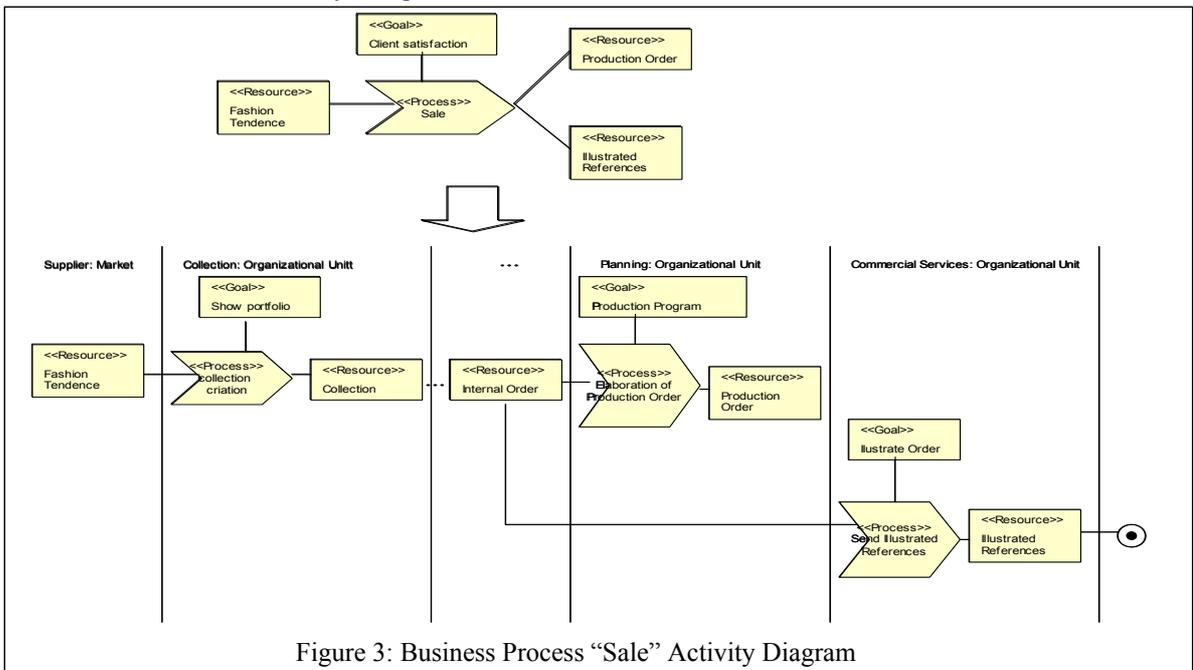
Figure 3: Business Process "Sale" Activity Diagram

improvement of the business or the systems that support it.

4.4 Organization and Resources

The resources and the organization are modeled in the business structure view. The organization model shows the human resources structure, and the resources model shows the structure and the behavior of other resources, such as products, documents and machines. The resources in the resources model are basically those that are used in the processes model. The conceptual model describes the general business concepts and is a precious aid in the construction and exploration of the resources model and organization model.

4.4.1 Resources Model

Order is one of the key concept of the company conceptual model. The behavior of the resource "order" is modeled in Figure 4 through a state diagram The Figure 5 shows the order resource and its relationship with the other resources, such, products, type of products, supplier, collection, etc.

The assembly lines are necessary to produce the products. The suppliers supply raw material, that constitute the products. The product types (e.g. suit) are used to organize and to group the products (e.g. coats, pants). The colections are the portfolio of types of product for a determined season (e.g. Spring/Summer colection 2001).

The resources model is complemented with business rules. As example, a business rule can be a restriction to the limit of credit of determined customer, or the relationship between the orders entered and the capacity of production.

4.4.2 Organizational Model

The business structure view also includes the organizational aspects of the company. The structure of the organization is not only important for reengineering intentions, but also for clarify the responsibilities of each organizational unit. The object diagram of Figure 6 intends to clarify the structure of the organizational units of the company.


Figure 4:
Resource "Order" State Diagram

Figure 5: Resources Model

Figure 6: Organizational Model
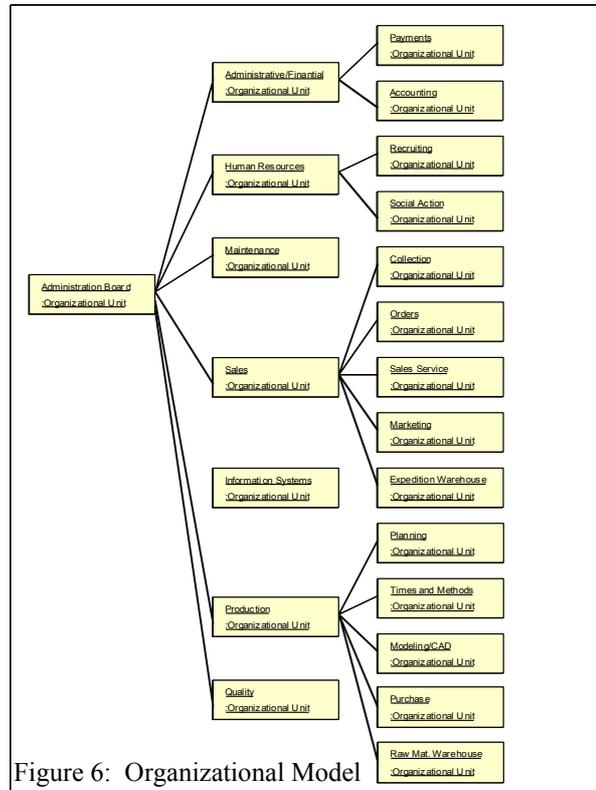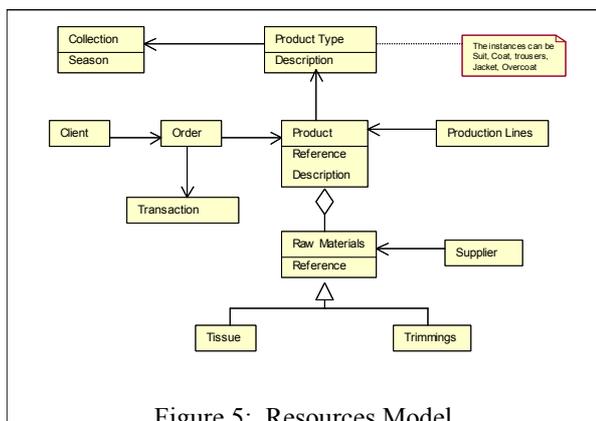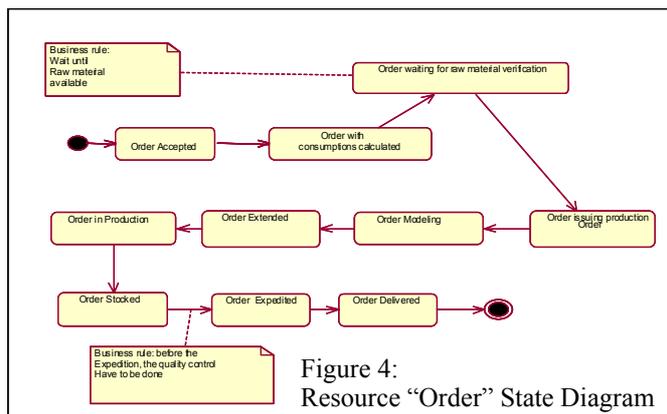
4.5   Interaction Analysis

The business behavior view uses the interaction analysis to place responsibilities and business processes to the organizational units. The interaction analysis is carried in parallel to the organizational modeling and business process modeling. The UML sequence diagrams are used to show the interactions between the organizational units as well as the processes that occur through each organizational unit.

An interaction is sequence or scenario which starts with a business event, that can be a question or an order, and finishes with a result.

The Figure 7 shows the sequence diagram for the business process "Sale".
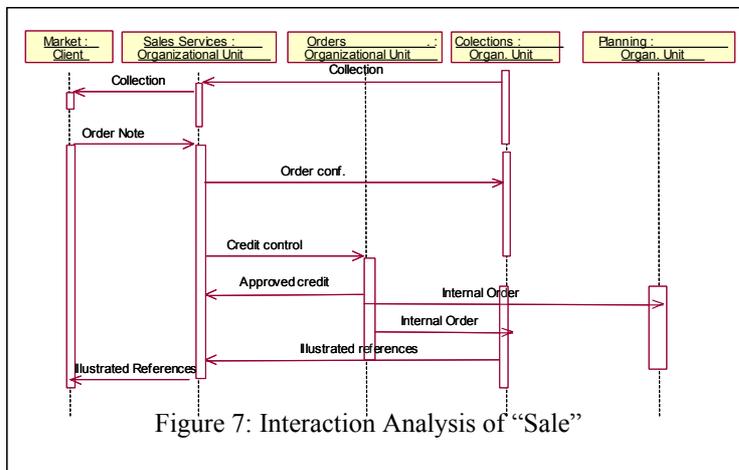
Figure 7: Interaction Analysis of "Sale"

a process is through a sequence of activities, executed in order to reach a goal (Alexander, 1998), by that, the UML activity and interaction diagrams can be considered appropriate, user-friendly, and even necessary for the specification business processes. The static structures, such as the organizational structure or the goal decomposition can be represented by the UML static structure diagrams (respectively, class and object) almost intuitively, since it allows to omit some details, that although are important for the software development, it are not in such a way for representing the concepts associates to the business modeling.

The business process modeling allows the improvement and redesigns of the business and organizations. This process can be critical in the strategically positioning of the companies face to the globalization and the new challenges of entrance in the digital economy. The solution for the entrance in this type of economy does not pass only for the application of the technology, also passes for the modeling and analysis of the existing business processes in order to realize which processes have to be redesigned. These business changes will be propagated to the information systems, the technology that support them and the people who execute the business processes.

5.   CONCLUSIONS

We have presented, in this paper, the concepts, views and rules used in the business modeling with the UML, which has been used to model the business of an industrial company of apparel. The UML owns a complete set of notations, that can be considered complicated for people, who although work in the businesses, do not have liaison to the world of the information systems. However the UML has advantages that make of it an appropriate language for the business modeling, namely:

− The UML is a notational standard for the software development community;
− The UML can be used to a general level, where the implementation details can be omitted.

The description of business systems consists of a business processes description and static structures. The more intuitive model to represent

REFERENCES

Alexander, I., A., 1998, *A Co-operative Task modelling Approach to Business Process*, Workshop on Oriented Business Process Modeling, Ecoop 98.

Bider, I. and Khomyakov, M., 1998, *One OO Approach to Business Modeling*, Proceedings of OOPSLA'98

Eriksson, H-E. and Penker, M., 2000, *Business Modeling with UML – business Patterns at Work*, John Wiley and Sons, Inc.

Malone, T. et all, 1999*, Tools for Inventing Organizations: Toward a Handbook of Organizational Processes*, Management Science 45(3) pp 425-443, March 1999.

Proforma White Paper, 2000, *Business Process Improvement*, Proforma corp.

Proforma White Paper, 1998, *Integrating Business Processes, Workflows and Object Models via Use Cases*, Proforma Corp.