UML FOR A BETTER FINANCIAL AUDIT

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ABSTRACT

The Unified Modeling Language (UML) became a de facto standard in the field of information systems analysis and design during the last decade, and its scope and applications constantly increased. Among this language's auxiliary applications (called extensions), the business process modeling extension is particularly important, due to the large area of applicability as well as the interdisciplinary aspects of the implementation areas. The present paper is an attempt to familiarize financial audit professionals with the field of business modeling, including a proposal and an analysis of an original way of using business modeling for the benefit of the financial audit mission: building business models for the business processes which are to be audited, in order to accustom the audit team with the audit object (the entity), as prescribed by the International Standard on Auditing 315 – Understanding the Entity and Its Environment and Assessing the Risks of Material Misstatement. As seen by the author, this approach has important benefits for the financial auditor, as it requires no high level of computer knowledge; it does affect neither the auditor's independence, nor his professional reason. This approach is only meant to transform the understanding of the audited entity and its environment in a coherent and well-structured process, and is, in our opinion, fully compatible with the financial audit mission's objectives, the financial auditor's interests, as well as the ISA 315's requests.

Business modeling, business process, unified modeling language, business entity, financial audit mission

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INTRODUCTION

Business modeling, also known as *business process modeling*, is a quite new area of use for the Unified Modeling Language (Eriksson & Penker, 2007). Business models allow for the description of the business processes in UML-specific terms, especially by means of *activities* and *collaborations*.

The actual purpose for this sort of modeling varies from the need to acknowledge the audited entity's business activities to the need to fundamentally improve its business processes (Harvey, 2005). Apart from some extreme cases where a complete reengineering of the organization activity is required, the scope of business modeling is usually limited to a single business process or a set of tightly interconnected business processes. As more business processes migrate to the virtual environment, becoming partially or completely computer-based (or even *Web*-based), business modeling evolves into an indispensable technique, required to provide the information technology's compliance with the underlying business process.

Unlike *business process engineering* (which aims directly at business process re-design and improvement), business modeling performs, in most cases, a visual documentation of an entity or organization's activity (Zairi & Sinclair, 1995).

1. RESEARCH METHODOLOGY

This paper was designed as a synthesis of a doctoral research whose final results were publicly defended foreseeing validation from the scientific and academic community. The main goal of the aforementioned research was to *identify new areas of applicability for modern information technologies in the field of the financial audit*.

In order to provide a set of valid and well-founded opinions concerning the practical ways of improving the financial audit mission's efficiency by using information technologies, the author's proposals were preceded by an ample documentation process, along with a critical review of the relevant literature. This process allowed for the author's getting in terms with the main views and opinions in the research area, as well as with the present level of interconnectivity between the information technology and financial audit research fields. Identification of the field practitioners' expectations was attempted by means of questionnaires and direct interviews. The quotation of other authors' opinions or previous research results was performed only with explicit mention of the cited source, author and paper.

2. BUSINESS MODELING AS A POTENTIAL TOOL FOR THE FINANCIAL AUDITOR

Business modeling was developed as a response to the design team's need to gather answers to a series of questions of vital importance for the overall success of the design project, for example:

- How can we make sure that all the use cases were identified?
- Which activities do users perform prior to using the information system?
- What is the value added by the information technology to the overall business process?
- Which is the exact content of the business process underlying the future information system?

Regardless of the information system type to be implemented in an organization, the organization itself already has some active business processes, and, by consequence, the future software applications are to be used by people already involved in one or more existing business processes. In order to make sure that the soon-to-be-developed solution is able to provide for its users, the design team has to take into account one or more of the following:

- The environment of the future information system;
- The future users' roles and responsibilities;
- The object of the business process, as the foundation of the future information system development.

The last decade brought the developers to a new way of looking at business information systems and software development. According to this new perspective, the internal view of the business stands for the optimal point of view needed to fully understand the information system being built (Kulak & Guiney, 2003). This approach is vital for *e-business* or *e-commerce* information systems based on the latest wave of Internet-related technologies, such as *Web services*. The success of such an information system or software mainly depends on its accuracy and overall ability to emulate the "real world" business processes, along with the extent the new technologies and new business communication channels are put to use.

A well-designed and well-implemented *e-business* information system allows for the service provider to operate more efficiently and the service beneficiary (or the customer) to get better and faster services. For example, in the area of the virtual environment-based financial audit services, if the continuous audit service available on-line has not the same quality or does not provide the same assurance level as the classic version (the audit mission), the Web-based audit service e will be no longer required and used, and, by consequence, all the analysis, design and implementation costs will become a liability for the audit firm. A detailed proposal for the implementation of such a service will be presented in a separate paper.

One important asset of the business process modeling is that allows for the gathering of a more complete set of requests, as a way to provide superior integration of the future system with the organization. Once the business models have been built, the setting of some correspondences between the business models and the system's requests will lead to a very strong integration of the business process modifications with the new information system development, and, as a consequence, the two will be able to evolve simultaneously. Taking into account a financial audit assistance software tool, regardless of the specific area of use (audit mission planning, audit mission acceptance, internal controls evaluation, audit reporting etc.), the natural cost-related constraints are followed by another set of vital importance constraints, referring to the quality of the final product, because the quality of such software may affect the auditor's findings and conclusions, the auditor's opinion and, by consequence, the auditor's reputation itself.

In the author's opinion, performing business processes modeling with UML has an overall positive influence over the information system or software being built, both in terms of costs and quality, as follows:

- In terms of costs:
  - *Fast and thorough understanding of the design object* – the development of a business process models set may lessen the overall costs of design and implementation, as a superior business process familiarization level may reduce or eradicate the need for some of the iterations required by the initial design process;
  - *Reasonable access to the direct users of the future software or information system* – in many situations, the future users of the information system or software, whose opinion is vital for the final product acceptance, are missing from the requests design meetings. Building business process models does not entirely solve this problem, but may be able to reduce its negative impact, as the design team's requests for feed-back or comments may be more accurately focused;
  - *The ability to perform testing even during the early phases of the project* – the costs of error correction increases as far as the project development advances. Moreover, the most dangerous and "expensive" errors are not source-code level errors, but requirements level errors, which may be easily avoided or identified by means of a business process model;
  - *The support for iterative development* – in the area of large-scale, complex information systems, following an iterative process is no longer an option, but an imperative. Each iteration has a definition based on the project manager's decision, depending on the assessed risk level and the functionality of the prototype at hand. By means of a deeper understanding of the business process, the
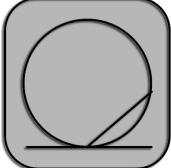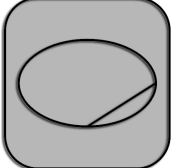
project manager has the ability to take more conscious decisions, able to decrease the number of necessary iterations, increasing the overall efficiency of the design process.

- In terms of quality:
  - *Business process architecture and software system architecture harmonization* – the information system architecture, as well as the software system architecture have to be permeable to change (to be *sustainable*). As the need for change may arise from the business process itself, and not from the information technologies employed, the information system has to be structured according to the abstraction of the business process. Business process modeling provides such an abstraction, allowing for easier understanding by all the stakeholders;
  - *Increase of the software system's degree of compliance* – business process modeling provides a common conceptual framework as well as a notation easily understandable by both business experts and software experts (programmers), leading to software systems which address the real needs of the business process;
  - *A foundation for the parallel development of the information system* – the use of an unified conceptual framework allows that definition, design, implementation and testing are performed simultaneously, as they are based on the same information set;
  - *Perspectives (views) harmonization* – business modeling provides a common starting point for all the stakeholders, as the foundation for team building and tasks assignment processes;
  - *The ability to build robust systems* – business modeling describes real-life processes in an exhaustive manner able to cover aspects regarding requirements definition, results testing against the requirements, quality testing etc., resulting in a superior quality software system;

Business process modeling is not a completely new perspective, but the integration of the unified modeling language allows for effective communication among business process analysts and information system or software analysts (Kettinger *et al.*, 1997). The following table (*Table 1*) represents a synthesis of the business modeling-specific UML notation, which is mostly similar to the "standard" UML notation, but also encloses some slight differences enabling the designer or the user of the model to tell the business objects from the information system objects.

The main advantage of using UML for business process modeling is the ability to use a common, unified, known and standardized notation for all the design work requests, IT visual design or assistance tools included.

Table 1. **UML notation for Business Modeling**

VISUAL REPRESENTATION	REPRESENTATION NAME AND UML DESCRIPTION
	Business Actor People or information systems from outside the business process, but having relevant interactions with the business process.
	Business Worker A role from within the business process, able to interact with other business workers by using business entities.
	Business Entity An element used by the business workers in order to fulfill their mission within the business process.
	Business Use Case A sequence of actions from within the business process, able to produce noticeable results, significant for a certain business actor. May be used to represent a whole adjacent business process.
	Business Use Case Realization A set of diagrams depicting the manner business workers and business entities are deployed in order to execute the business process.
	Organizational Unit A set of business workers, entities, relations, use case realizations, diagrams etc. able to structure the model by dividing it into manageable components.

The main benefit of using business modeling when performing a financial audit mission is, in the author's opinion, an obvious one: a detailed description of the business processes performed by the audited entity allows the auditor to gather a higher level of knowledge of the structure and performance of that entity. According to the *International Standards on Auditing*, this is a mandatory part of

any financial audit mission. The international standard on auditing *ISA 315 – Understanding the Entity and Its Environment and Assessing the Risks of Material Misstatement* clearly states (IFAC, 2008):

> "The auditor should obtain an understanding of the entity and its environment, including its internal control, sufficient to identify and assess the risks of material misstatement of the financial statements whether due to fraud or error, and sufficient to design and perform further audit procedures."

The same audit standard, along with some complementing regulations, state the possibility of using IT or software assistance tools in order to achieve this goal. Among the mentioned tools are: flowchart diagrams, graphs and charts, blueprints, schemas, as well as other kinds of drawings.

The inclusion of a formalized and widely accepted visual modeling process among these tools and practices is, in the author's opinion, an important asset for the audit mission, as well as for the audit firm. The auditor's goal is to fully understand the processes and the activity flows whose financial results are being audited, so the main goal is not to entirely comply with the requests of a solid design process, but to attain the highest possible level of significance and representativeness of the final results (the diagrams). In our opinion, a required first step for the achievement of the aforementioned goal is to define a *business use cases diagram*, able to depict the interactions between the services provided by the audited entity (*business use cases*) and the recipients of the services being considered (*business actors*). The following figure (*Figure 1*) depicts an example of business use case diagram employed to describe an ordering and contracting process for an order-based (*Just-In-Time*) production entity (a factory).

Such perspective may be used as a starting point for a detailed documentation of all the activities describing the business process depicted by the use cases. The documentation may be built either by using plain text or visually, by means of an activity diagram. Even if it may seem redundant at a first sight, an exhaustive documentation should include both description types, because some members of the audit mission may find the UML representation (the activity diagram) puzzling or hardly accessible.

The *activity diagrams* will further describe the business process by using the activities and information flows of the process itself. Each diagram should provide a simple and comprehensible illustration of the following:

- The activity flow content *per se*;
- The possible parallel activities (by means of the *synchronization bars*);
- The potential alternatives to perform the flow of activities (by means of the *decision points* and the *fusion points*);

Figure 1. **Business use cases diagram**
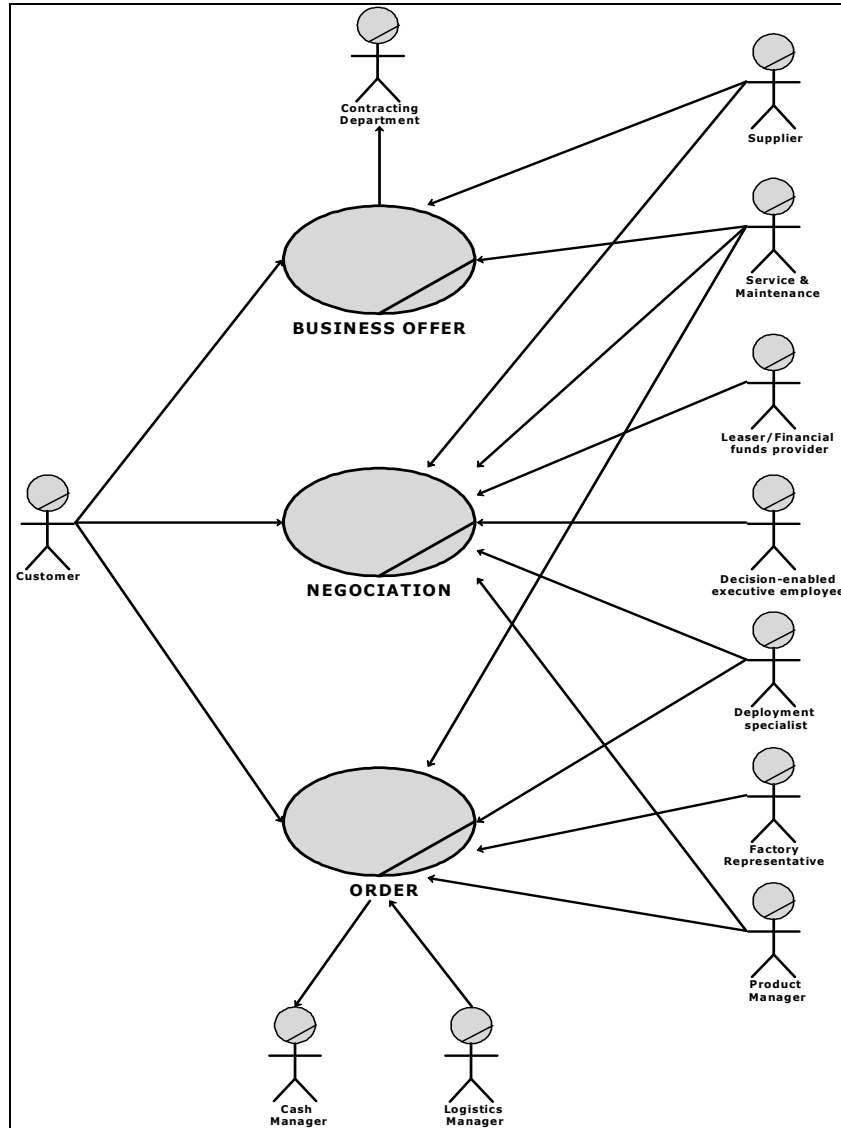
Activities diagrams may also be used to describe *roles* or *responsibility areas* from inside the business process, the necessary actions of each contributor to the process being clearly stated (Dumas & Hofstede, 2001). *Roles* are depicted by means of *swimlanes* superimposed over the diagram itself and able to state the participants to the activity flow being considered. The following figure (*Figure 2*) offers a

detailed description of the "*Business Offer*" business case, as depicted by the business process use case diagram (*Figure 1*).

Figure 2. **The description of a use case by means of a two responsibility areas activity diagram**
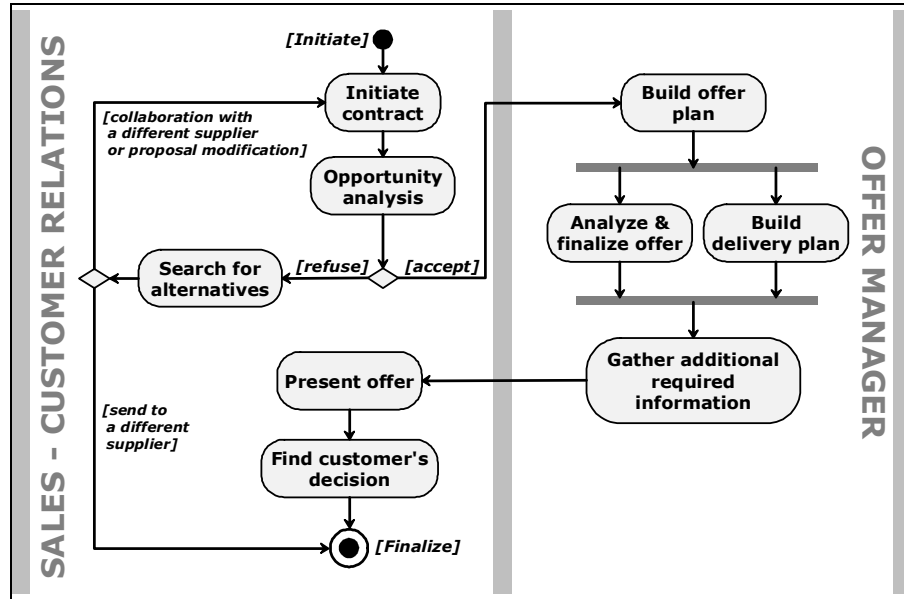
Roles representation is optional for an activity diagram. A usual way to organize these diagrams implies building a general activity diagram with no mention of the roles, but only the general process flow together with the "macro-activities", subsequently complemented by a set of detailed diagrams which use more *swimlanes* to provide an accurate and detailed description of each *business worker*'s responsibilities. In addition to the responsibility areas and specific activities, the activity diagrams may also reveal the *business entities* involved in the abovementioned activities. Business entities may be regarded as objects able to support *creation*, *update* or *use* operations along the business process. This category may include documents, organizational units or even data structures affected by the flow of activities. The figure below (*Figure 3*) represents a reworking of the previous activity diagram (*Figure 2*), participating *business entities* being added.

*Figure 3.* **Business entities-integrated activity diagram**
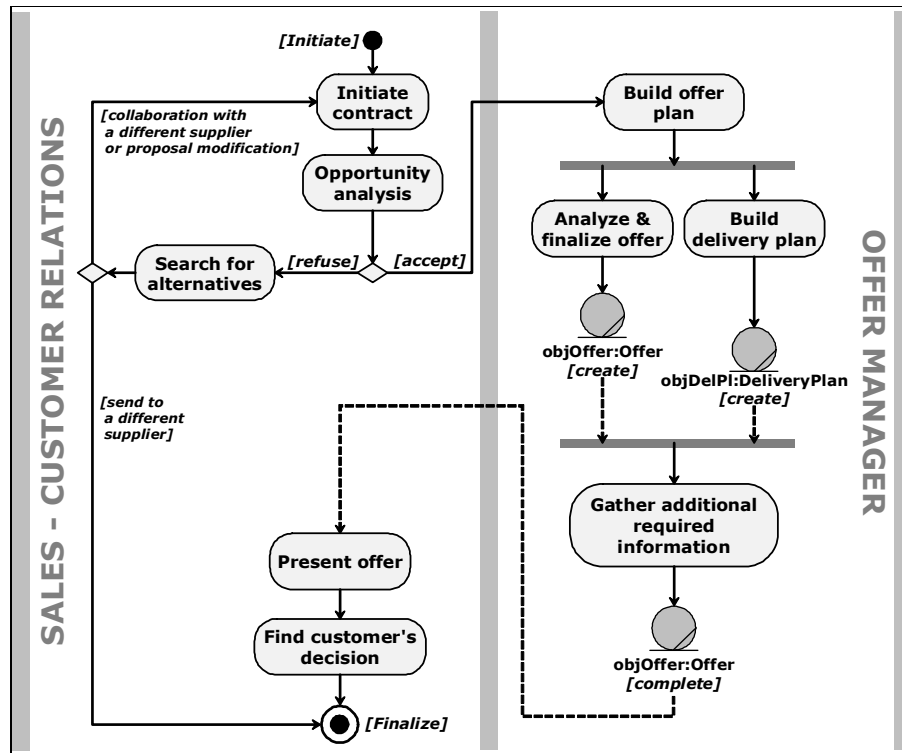
In business terms, the *class diagram* depicts the internal structure of a business process (Dennis *et al.*, 2000). Each *class* within the diagram is whether a *business worker* (an employee of the audited entity) or a *business entity* (an element affected by the business process).

The purpose of the class diagram is to document the existing relationships among the business workers and business entities, so as to become obvious:
- *Which* business workers and business entities collaborate in order to perform the business process;
- *What* are the relationships established among the business entities from within the static structure of the business process.

As a result, the class diagram takes the role of an *organizational chart* for the business process (as depicted in *Figure 4*).

Figure 4. **Business process structure represented by means of a business class diagram**
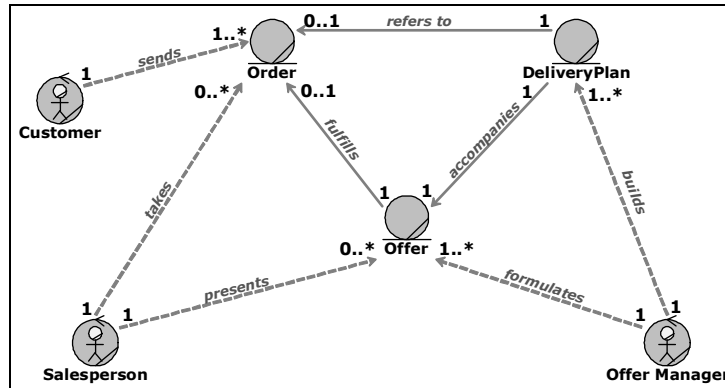
The relationships enclosed in the class diagram may be subsequently detailed by the means of *interaction diagrams*: the *sequence diagram* and the *collaboration diagram*. As a general rule, collaboration diagrams are more easily drawn and understood, but sequence diagrams are more rigorous and offer a higher level of compliance with the representation of complex interactions.

In business terms, a *collaboration diagram* documents the manner business workers and business entities interact in order to implement a function of the business process, also depicting the messages exchanged in order to fulfill a business use case. Such diagrams may be used as the foundation for some recommendations concerning the improvement of some business processes or internal controls, as they depict the business workers in charge with each task. The figure below (*Figure 5*) describes the "*Business Offer*" use case (also mentioned by the diagrams above) by means of a *collaboration diagram*:

Figure 5. **Business use case realization depicted by means of a collaboration diagram**
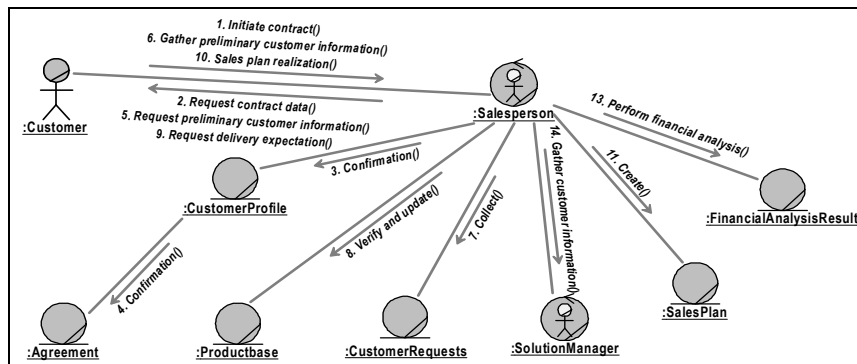
CONCLUSION

To sum up, the UML diagrams that auditors are able to use in order to reasonably understand the audited economic entity and its business environment may be classified in two major groups:

- *The business use case model* – depicting the audited entity's activity from an external perspective. This model includes a description of the business actors and business use cases, along with the interactions between business actors and use cases, and then some higher (or general) level activities diagrams able to describe the activity flows pertaining to each business use case;
- *The business objects model* – which explains in detail the way business processes are *internally* implemented. This model encloses a description of the *employees* (depicted as *business workers*), the *business entities* (documents, projects, datasets etc.) they interact with, as well as the *operation manner* able to lead to the execution of the business process (by means of the detailed *activity diagrams*, *class diagrams* and *interaction diagrams*).

The abovementioned models and implementation techniques are fundamentally based on the *Web services* paradigm and, as a result, compliance with a *Web application* UML design idiosyncrasies is mandatory. In our opinion, the optimal manner to provide reliable description for this course of action is the adoption of *UML extension for business processes* (Object Management Group, 1997), as stated earlier in this paper, because this extension is a tool able to provide accurate representations of the workers, workflows, entities and activities pertaining to the development process by means of a standardized and accessible notation.

ACKNOWLEDGEMENTS

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