Fictional Case Study on Semantic-based Modeling for Information Systems

Enabling Risk Analysis in Conceptual Models by Using Semantic Annotations

http://www.omilab.org/web/semfis

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Introduction

Imagine that you have been hired as a consultant in business informatics by a large Austrian bank. Based on your expertise in the area of conceptual modeling and knowledge engineering you are asked to advise the IT-department of the bank in developing an IT-based solution for process-oriented risk management. As you know from your previous investigations, risk management is today of utmost importance for any enterprise and in particular for those in the financial sector. Although the bank at hand possesses extensive knowledge about the management of its financial risks, the risks in some of its business processes are currently not actively managed. In a first step you are therefore asked to investigate one of the core business processes of the bank for identifying potential risks in this process. The business process that has been selected for this purpose is the "Opening of a private banking account" process. In the following you will be given detailed information on this process.

Process Description

The opening of a private banking account process typically starts with the event that a customer has interest in a new account and comes to a local office of the bank. On the side of the bank the first step is then to check the detailed requirements of the customer. This is accomplished by a customer agent and takes on average 8 minutes. Subsequently, the customer agent has to explain the conditions and options for the type of banking account the customer is looking for. This can take some time as there are a number of legal and regulatory conditions that need to be explained in detail. Typically, this can be accomplished within 15 minutes. After this, there are some steps that can be accomplished in parallel. While the customer fills out the application form W32887-9 (Duration 4 minutes), the customer agent acquires the customer's data such as name, address, and phone number. For this purpose he asks the customer for an ID, also for identification purposes (Duration 1 minute). The customer agent enters all the customer data in the Bank-ERP application by creating a new customer profile (Duration 5 minutes). If the customer already has some business relation with bank, the ID-Detector-System system detects this and merges the data about the new account with the existing business information about the customer. After these steps have been completed and the customer has filled out the form correctly, it has to be decided whether other persons should be added to the account in terms of authorization. If yes, the customer agent notes these authorizations in the Bank-ERP system (Duration 2 minutes). The agent then prepares the necessary forms that need to be completed and signed by the additional persons and hands them to the customer (Duration 3 minutes). If no other persons are to be added, it can be immediately advanced to the step where the agent fills out the forms for the signature probes of the customer (Duration 2 minutes). After asking the customer for any additional services that he would prepare in the meantime (Duration 3 minutes), the customer agent hands the signature probe forms to the customer. The customer fills out the forms (Duration 3 minutes). Subsequently, the customer agent scans the forms and

performs an electronic check of the signature probes (Duration 3 minutes). The customer agent then asks the customer if an initial deposit of money shall be made on the account. If the customer wants to make a deposit and the amount is greater than 100.000 EUR, the customer agent asks the customer for a written explanation by the customer or makes an official note (Duration 2 minutes). After the potential depositing of money, the customer agent forwards all signature forms to the IT department for scanning (Duration 3 minutes). The customer agent then performs a final check of all information entered in the Bank-ERP system and the other forms (Duration 3 minutes). Finally, the customer agent forwards the remaining forms to the inspection department (Duration 2 minutes). The process is ended with the event that the account is opened.

Some additional information on the decisions taken in the process: In 50% of the cases other authorized persons are added to a bank account; in 30% of the cases money is initially deposited in the account and in 20% of the cases the amount to be deposited is greater than 100.000 EUR.

Information about Risks in the Process

For identifying risks in the above described process, you decided to conduct a number of workshops with several bank employees executing activities in this process. In these workshops you learned that there are risks related to the improper reporting of required data, risks due to the unavailability of customer agents for executing the process, and risks related to the involved IT systems. Concerning the risks for the reporting of data, you found out that there is a 10% chance, that the acquisition of customer data is faulty so that in the end the account cannot be opened and the process has to be restarted from the beginning. In regard to the customer agents, there is a certain chance that not enough customer agents are available for executing the process. On average this happens in about 15% of all cases when a customer wants to open an account. The process is then delayed on average by 15 minutes. Also the IT systems involved in the process lead to certain risks. For the Bank-ERP system it has been assessed that there is a 5% chance that the system is not able to complete requests at once, thereby leading to a delay of the execution time of 50 seconds. Additionally, there is a 0,02% chance that the Bank-ERP system does not respond at all due to failures in the underlying IT infrastructure. Then, a service technician needs to manually switch to a backup infrastructure, which takes about 3 minutes on average until the user clients can fully interact again with the system.

Required Tasks

In your role as a consultant on the above described matters you are asked to provide a representation of all relevant information in a way that can be communicated within the bank. In addition, this representation will need to be in a format that can be later easily updated, e.g. to take into account changes in the business process and changes on the information about

risks. Furthermore, it should be possible to process the representations also in terms of algorithms, so that other consultants working on the quantitative assessment of risks in the bank can directly use this information for calculations.

Solution Approach

As a solution you decided to use the approach of semantic-based modeling for information systems (SeMFIS). In particular, you want to use SeMFIS for representing the business process in BPMS notation and adding information about the risks by an ontology via semantic annotations. In this way you will be able to simulate the business process using standard simulation algorithms and at the same formally represent and analyze the risks occurring in the process.

To make the information about the risks easily exchangeable with other parties and systems, you decided to represent it as an OWL ontology. Based on a risk classification set up by the German BSI, you learned that risks can be classified into Elementary Threats, Force Majeure, Organizational Shortcomings, Human Failures, Technical Failures and Deliberate Acts. Risks always have a certain impact expressed in a numerical value, a certain impact target (e.g. the execution time of the process or an activity), and a certain probability.

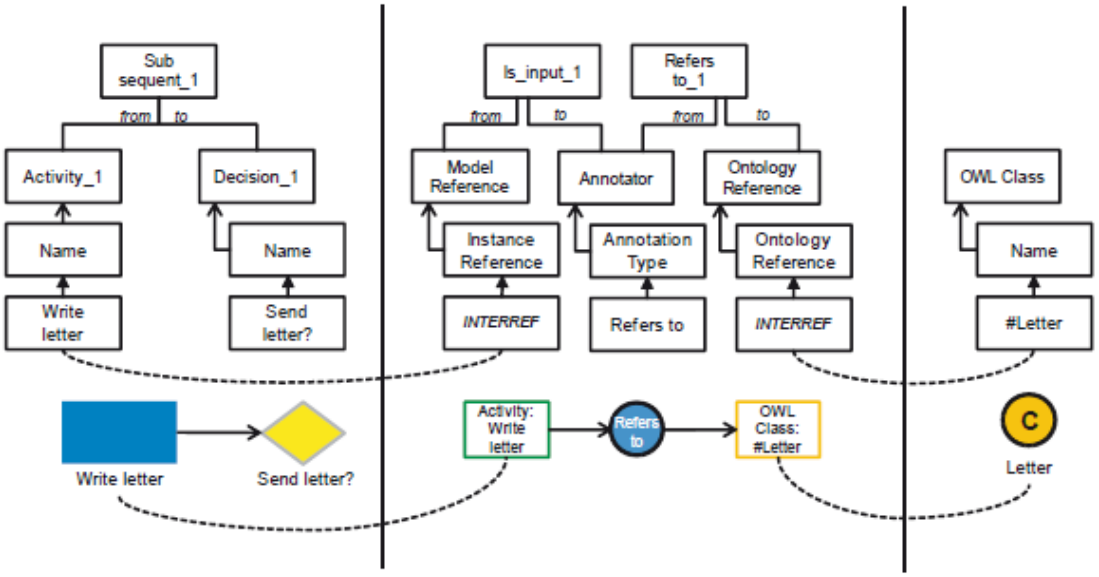

Figure 1: Semantic Annotation of Conceptual Models (Source: Fill, Hans-Georg (2011): On the Conceptualization of a Modeling Language for Semantic Model Annotations, in: Salinesi, C., Pastor, O. (2011): Advanced Information Systems Engineering Workshops, Springer.

Suggested Solution Steps for the Case Study

1. Download and install the SeMFIS modeling toolkit (http://www.omilab.org/web/semfis).
2. Represent the business process using the process model type, which provides the BPMS notation.
3. Conduct a path analysis of the process using the built-in simulation component to check whether all formal constraints for BPMS have been correctly met by the model. Save the results of the path analysis in a file.
4. Familiarize yourself with the concepts of OWL ontologies as used in SeMFIS. Investigate in particular how classes and properties can be represented in OWL as well as inheritance relationships, domain and range definitions.
5. Create an OWL ontology in SeMFIS using the Ontology model type for representing the information about the risks. Make sure that you link all elements correctly (e.g. for expressing inheritance, domain, range definitions). Alternatively, you can also create the ontology in Protégé 4.x and use the SeMFIS Protégé plugin to transfer the ontology to SeMFIS.
6. Set-up an annotation model in SeMFIS and define the linkages between instances of risks in the OWL ontology and elements in the business process.
7. [Optional Expert Exercise!] Use an AQL query to retrieve for a specific activity all risks associated with it. Hint: Use the semantic annotation model as a basis for the query. Save the AQL query in a text file.

References and further Literature Sources

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