Specific Modeling of the Business Processes

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Abstract: - The paper describes a specific problem - the process of damage claim processing in insurance companies that is reported for earlier underwritten risk. During the analysis of this problem the model has been created that can be used in similar cases for the transfer of knowledge and facts from the real system in the information system model. These processes are normatively regulated to a feasible extent. Analysis of the implementation of the proposed model shows that the model may offer beside the transactional level also a component of intelligent systems, namely a component of monitoring activities. This model is based on domain modeling and it can be used in the context of the software product line - SPL because its characteristics fit into the setting of this approach in the development of the system.

Key-Words: - business processes, intelligent systems, domain modeling, software product line - SPL

1 Introduction
Insurance is complex financial activity. Insurance companies are engaged in risk-taking and damage claim process that might occur for assumed risks. Underwriting and damage claim involves highly formalized model, in which all the processes are normatively regulated as much as possible.

These facts are of paramount importance in design and implementation of information systems for insurance companies. The developed information system should be able to monitor the activities and processes in real systems. Through its maturation it should enrich the achieved transaction form, provide the real system and its customers with the additional value, e.g. with a component of intelligent systems such as generation and analysis of information, prediction; component of monitoring activities and processes, etc.

This paper describes the process of damage claim process in insurance companies that is reported for earlier underwritten risk with an emphasis on the way of modeling processes.

2 Description of the real system
Processing of any damage in the insurance company involves a sequence of activities that must be implemented to process the damage claim. A strictly prescribed procedure must be implemented and is subject to internal or external control and audit. The procedures can vary in accordance with the type of insurance for which the damage occurred, but in general they are very similar.

Let’s first describe the procedure of claim notification for the car insurance. When the insured reports the claim, it is first checked whether the damage was caused by the insured of the insurance company during the period of insurance. An insurance company is required to receive a notification of claim by the insured even when the cause of damage is not known, in which case the claim is marked differently.

Notification of the claim can be immediately recorded in the information system by utilizing interviews and recording of data or the insured may submit the application via any other medium (fax, e-mail, mail) or it can be manually filled out. The next step is to create the document appraisal of damage. After the registration of claim notification, the insurance company may or may not request the report from the police department, meaning that this document is not mandatory for all cases.

After obtaining a police record the damage is submitted to the legal department in order to obtain the legal opinion on whether the circumstances in which the damage occurred are covered by the insurance policy of the insured and whether the policy holder is responsible for the damage. The delivery of the legal department is a legal opinion which is mandatory for all damages. The result of the decision may be a rejection of the damage claim, which means that the claim is forwarded to the fraud claim processing department and is archived there.
The result may be an acceptance or partial acceptance of the legal merits of claims.

As it has been mentioned above the document stating legal opinion is obligatory. If the damage is intangible the opinion of doctors’ censors is requested in order to be able to get all the information necessary for the calculation of the damage. Censor’s opinion is necessary only for certain types of damages. Immediately after obtaining of the document legal opinion, or after obtaining opinions of censors, the claim is forwarded to the department for the claim settlement. There, the calculation of the amount of the damage is made based on the appraisal of damage, the legal opinion and censor’s opinions. The next step is signing the document “Compromise on the amount of damage” by the insured that might be accepted or not.

**Figure 1. State diagram of damage claim processing**

If signed, the document “Order for claim settlement” is prepared and sent to the department of finance, representing the basis for the payment of the claim to the insured. If the insured does not accept signing of the document “Compromise on the amount of damage” the insurance company pays the amount of damage which is considers being uncontested. The insured may complain through the court and seek a change in the amount of claim payment. In that case the claim gets the status of litigation case and the court will decide on the basis of relevant evidence on any additional responsibilities of an insurance company for insured. The result of the litigation could be confirmation of position of an insurance company or order the company to make payment to the insured.

Insured can submit complain at any time until the claim is marked obsolete and request reprocessing of the claim after which claim must resume and go through some of the stages of processing claims. Also, the insurance company in case of any new information can reactivation the case and reprocess through some of the stages.

Description of damages may include also some details that for the global view of claims processing are not relevant, but often make problems in the solutions that exist in practice.

### 3 Description of the system

For description of normatively regulated activities NRA it is necessary to define the following basic concepts: Activities, actions that are performed by actors who are role holders, states or phases which the action is executed through, rules for bringing about the actions i.e. transition from one state to the other, resources and document [12].

a) Activities. An activity is the specification of a parameterized sequence of behaviour.

b) Actions. An action represents a single step within an activity. Actions are denoted by round-cornered rectangles. Constraints can be attached to an action. Participant in the activities undertake actions that initiate activities, perform different tasks during activities and bring final assessment or document. Participants that perform the actions are called actors. Each action that is performed by actors brings some additional knowledge into given situation and also causes change of activity state.

c) States and Transitions From State to State. Performing of an activity causes successive change of state i.e. phases of activity performing. The additional states come after the legitimate actors take out requested actions. Because of that, for each state it is necessary to identify rules-transitions that define required preconditions to come into that state. States in organizational activities are generally defined by a set of information accumulated by transition into that state.
States in NRA defined not only by informative content of state but also with per formative content of state:

Informative content of state presents complete set of the information accumulated by performance of the activity till that state. It is determined by new information content in the action, which precedes that state. This can be documents (filling the forms, claim file, medical report) and data (vehicle ID, vehicle type, claim type, type of the event that caused the damage, etc.). If there are more sequences of the actions that are led to the same state, then each of them generates different set of the information i.e. different information structure. Performative content of state describes normative effects transition to that state. This can be different responsibility and obligations of the actors, permissions or prohibitions, accreditation of a document with legal effect or accreditation of a role. As example, state in which regularity of facts is confirmed causes election of adjuster; after adjuster is elected, which is a new state, a duty to submit report about claim in requested time frame is automatically established.

d) Roles and Actors. Roles are defined independently from actors and employees in the organizations and present set of duties and responsibilities, which are assigned to specific actors.

In our model we define organization roles, actors and employees in the organization. Roles are defined independently from actors and employees in the organizations and present set of duties and responsibilities, which are assigned to specific actor. More roles can be assigned to one actor.

Actor presents position profile i.e. manager, programmer, appraiser, which is assigned a particular employee in the organization. More than one employee can be associated with one actor. For each actor we introduce actor identification, description of the actor, and identification of the roles that are assigned to him, and for each employee (agent) we introduce personal data of agent, agent identification and role identification (key for the employee), authorization code, period of the authorization validity.

e) Resources. It is necessary to make evidence for all resources in the system, and to give a type for each resource: is it divisible or no divisible resource. After that, for each activity that has connection with some of the resources the type of the connection is given: does activity use resource, does it arise in that activity and does activity spend that resource.

f) Document. By describing the activity we also introduced a concept “document”, which contains important elements to route case and its regular execution. For each document we will introduce identification of the document, document name, type of the document (internal, external), identification of the subject that produces the document, content of the document, date of issuing. Content of the document consists of information, obligations, responsibility i.e. normative content and time clauses (it is valid from date d1, it is valid till date d2, it has to be applied till date d3 etc.). Documents and information are requested and used inside the activities and that is the way how they are produced inside the activity.

During the execution of the event, it is important to respect temporal constraints. Temporal constraints are different rules that regulate the time component of business process. Temporal constraints are classified as basic temporal constraints (also called duration constraints), limited duration constraints, deadline constraints and interdependent temporal constraints.

4 Intelligent system

Analysis of the implementation of the proposed model showed that the model may offer besides the transactional level [2] also a component of intelligent systems, namely a component of monitoring activities. Objective is to achieve the level of maturity of Information System that allows optimization of the real system.

For example, the model can help to make an analysis of the duration of individual stages and the time required to create some documents in the processing of claims. The analysis can help to insights that are the bottlenecks that obviously have to be changed.

5 Domain Modeling

The challenge for each information system is that it is possible to faithfully copy of the real system in the information system. Absolutely mapping is probably not possible because the definition of model, model is abstraction of phenomena in the real world. The aforementioned objective is to achieve the level of maturity of Information System (IS) that allows him to help to optimize the real system means the development, in which one who develops model of the system knows the real system in detail [3]. The most common problems in practice in development is related to the improper transfer of knowledge and facts in the IS model. In practice is very common the principle of a separate definition of the functionality of the system from decisions related to development, platform, etc. (domain engineering process and application engineering process) [4]. This division is sometimes justified in terms of investment, because investment in one segment does not mean automatically and investment in other segments. The proposed model is based on this approach.
We can make reference to definition of the model as [5] “An area of knowledge or activity characterized by a family of related systems. A domain is characterized by a set of concepts and terminology understood by practitioners in that specific area of knowledge.”

Complex and challenging requirements can be met only by the proper frame. Systematic identification and appropriate management of system characteristics is a key advantage of this approach to the development of the system. Depending on the goals that were set up in an insurance company (in this example of how it is possible to process claim) through the frame set it is possible to change the scenario (rules) such as installing new or removing existing documents or checking some of documents obligatory and some do not in processing claims. It is unrealistic to consider a framework, no matter how many facts including, the full solutions to all possible situations in the real system, but its usefulness can be measured by a number of situations where it did not prove successful.

Following implementation of this model in the real system the problem of “claim reactivation” occurred. Disregarding the fact that the Claim was resolved and paid out for some reason (party's appeal, some new facts unknown at the time of claim settlement) can be reactivated. For our model this means damage from the status “resolved” may return to the status "claim reported”. It is obvious that the damage can be processed in several iterations because it is not excluded that the reactivated damage that has been resolved reactivates again. Claim in different time intervals may have the same status, but in different iterations of processing. Documents generated during the processing of damage also can occur several times (the legal basis, the claim settlement).

As a solution for the above mentioned "problem" the indicator of iteration next to the number of claim as a unique indicator of claim (the key) for all records of processing is introduced. This solution does not violate the proposed model, and provides monitoring of the status of damage history as well (Figure 1.).

In addition to its roles in the development of the system, the model of the system has the great importance in maintenance and evolution of the system. All changes in the real system should be made both in the model of the system and in its information system, and in such a manner that the evidence of changes in the real system is enabled as much as possible. This way of doing things is common in other engineering disciplines (architecture, construction etc) and needs to be applied in Software Engineering as well. System modeling is a duty of an architect and model implementation is a duty of a construction engineer.

6 Software Product Line

As previously mentioned damage claim processing for other types of insurance is similar but not identical [6]. Differences may be in: documents needed for damage claim processing, as some documents are obligatory and some are not; conditions in which the damage can be found and etc. Regardless of the changes made, it is always a model that is very similar to the previously described model of processing claim damages arising from car insurance. Important features of the proposed model are aspects of intelligent system and domain-oriented approach and as a very important feature of the proposed model can be mentioned the opportunity of developing each new case using the existing one, or use the Software Product line [7]. A software product line (SPL) is a set of software-intensive systems that share a common, managed set of features satisfying the specific needs of a particular market segment or mission and that are developed from a common set of core assets in a prescribed way. [8].

This definition is consistent with the definition traditionally given for any product line. But it adds more: it puts constraints on the way in which the systems in a software product line are developed. Why? Because substantial production economies can be achieved when the systems in a software product line are developed from a common set of assets in a prescribed way, in contrast to being developed separately, from scratch, or in an arbitrary fashion. It is exactly these production economies that make the software product line approach attractive [9]. That is why the SPL approach attractive. The proposed model and its settings (actions, status, roles, documents, resources) fully fit into the principles of the SPL. It means that for any new type of damage claim can be easily applied existing or modified model. Why is this approach more economical? The most common objection to the development of the SPL is it takes time to create the initial version [10], which could be later used for reuse [11], however, the proposed model does not require any special additional efforts than those that are definitely needed to solve initial, and initial solution could be used as the basis for SPL.

In our case, due to this proposed model and based on it, can be relatively easily to create a model for any type of claim within the insurance company. It is very important to do all corrections in terms of broadening or
narrowing of the models, on the way how it was done with the basic model. Advantage of proposed model is significant especially in the collection of statistical reports. Insurance as an activity, and damage as one of its segments, is largely based on different statistical data. It is much wiser to use knowledge that was previously accumulated about statistical reporting on any other type of previously known type of damage, SPL. Later overlap of products that are the result of this kind of development is much easier (for example, reports on the damages a client by various types of insurance).

6 Conclusion
The paper describes a specific problem (case), the process of claims handling in insurance companies that reported for earlier underwritten risk. We proposed the model that can be used for similar problems (processes are as much normative regulated) to transfer knowledge and facts from the real system in the IS model. An important qualitative feature of Information System is providing a component of intelligent systems. This paper gives a short presentation of the concrete implementation of the proposed model, indicating some contribution related to the intelligent component.

This model is based on the domain modeling and it can be used in the context of the SPL because its characteristics are in accordance with settings of SPL approach in the development of the system.

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