Software Model for Support of the Normatively Regulated Organizational Activities

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ABSTRACT

This paper describes basic components and functions of the software system for support of the normatively regulated organizational activities. These activities are characterized by precise objective or purpose, participation of actors as role-holders, and norms and rules that govern the performance of these activities. Also, particular aspect and modeling of the normatively regulated activities are presented. They are typically found in insurance companies, banks, courts and many public administrations.

Keywords: Organizational Activities, Activity Modeling and Activity Support, Intelligent Software System

1.INTRODUCTION

Activities are organizational processes that consist of different actions such as decision-making, management controlling, communication, coordination among different actors, etc. In the organizations general rules and norms for performing actions exist. There are also expected ways of performing actions. In the practical situations activities are not usually performed according to strict rules and expectations. Reasons for aberration are different problems that are indicated during performing of organizational activities as inaccurate and incomplete definitions of activities, different perception about competence and responsibilities, different interceptions of the rules and norms to perform activities etc.

In this paper we are working on the class of the organizational activities that are normatively regulated. Activities that have a defined goal and task, time of realization, responsible actors and for which particular norms and rules of performing are in effect, are called normatively regulated activities - NRA. Norms, rules and obligations of the actors in the activities are defined to fulfill rights of all activities actors and to protect specific category of subjects (i.e. client in the bank, parties in the court). If it is proved that activities are not performed according to the norms and rules, NRA are announced as irregular and their results are cancelled.

To understand meaning of one activity, it is not enough to know that it happened and that it has particular result (i.e. "Credit approved", “Claim request processed”). Content is also derived from better knowledge of the process of performing activities: did all actors perform according to their role and their authority, was the process performed in expected phases and was it finished in expected time, was the legitimate procedure taken into consideration, etc. On such basis, it is decided whether the activity was regular and whether all activities were legitimate.

Typical transactional information systems were successful in data processing and in giving information to employees, but they were not efficient enough in treating norms and rules and in interaction with information system users.

Interest to support normatively regulated activities was initiated by increasing technological possibilities of the computers, communications and networks. Aside from this, organizations, which key activities are normatively regulated, such as banks, insurance companies, government administration, are requesting more and more “intelligent” information system that will be able to process rules and norms for performing these activities in efficient manner.

In this paper approach for modeling and computer support for normatively regulated activities are presented. Also model of the intelligent system, which is class of workflow system, is given. Next section gives short description of the claim processing in the insurance company and describes basic elements and formal model of normatively regulated activities that are essential for their modeling. Third section presents basic model of the software system for normatively regulated activities**.** In the fourth section functional components of the system are given. At the end, in the conclusion, direction for the future development, that considers development of the intelligent system for support to a developer during analysis of the system and an actor during performing, is presented.

2. MODEL OF THE ORGANIZATIONAL ACTIVITY

In this section the example of NRA-processing of the claim request in the insurance company will be described. After that, the description of the basic elements necessary for the modeling of the system will be presented and their formal presentation will be given.

Example of NRA

It has been already mentioned that typical examples of NRA are the processes in the insurance companies. To be familiar with one of these activities we will present only one segment of operation in the insurance company, which is full auto insurance claim processing. This activity is very complex and we will only describe the most important part of it. Claims processing is initiated by a client report that the damage has been made on the vehicle and the client has auto insurance policy that covers all kinds of damage. Employee who is receiving documents checks validity of the policy (is it issued by that insurance company, is damage done in the period covered by the policy, etc.). After that the client fills appropriate data about the claim and the claim is being processed. During processing, the authenticity of the data that client filled in, are checked, while records from the police, opinion from the police court, medical report if someone is injured, statements of the witnesses, etc. are requested. After actual cause of accident is determined, legitimate process is instituted i.e. is the policy covering that type of claim. Finally, accounting of the claim is performed and the client is notified about the result.

If the client is not satisfied, the process is revised. If the account can be changed without modifying norms and rules, it can be corrected. If such is not the case then the client can initiate the case on the court that is monitored by responsible lawyer from the insurance company.
The goal of the claim processing is to perform correct account of the damage and carry out payment to the client soon, but not later than fifteen days after collecting data on accident. During claim process all the norms for that part of the work has to be obeyed. To finish with payment, the complete claim case has to be verified, which requests collection of different documents. Whole process is segmented and very complex, and it is performed by number of employees. Usually, the process cannot be finished without communication with external institutions (police, other insurance companies, court, etc). To clarify this process, this complex NRA is presented with sub-activities: claim request, collecting documents, processing documents, account payment.

Basic Elements of the Activity Modeling

This short analysis of one NRA example shows that for its description it is necessary to define the following basic concepts: 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 documents. The short description of these elements is given below [3].

Actions.
When an actor issues a linguistic expression with an intention to produce change in a social environment, this linguistic expression is called 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. For each action there is responsible actor for bringing about the action, depending on his/her role, authority and obligations.

States and Transitions From State to State.
Performing an activity causes successive change of state i.e. phases of activity performing. As example, after claim report (initial state) is raised, responsible employer checks validity of the policy that can cause a) new state in which it is confirmed that policy is valid and claim is officially registered or b) new state in which it is found out that policy in not valid and client does not have permission for the claim. After state a), the client fills the data about claim and that brings the new state etc. Initial state is usually triggered by some external event (client report the claim). 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. In general case, transition is initiated by the action and accomplishment of additional prerequisites for that transition (legitimacy of the actors and their role, time frame, etc). Transition can be also done automatically after certain time period (i.e. decision is valid after seven days).

Roles and 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. Actors are marked in form A#n:m (n- identification actor, m-identification role)

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 non-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 (U), does it arise in that activity (A) and does activity spend that resource (S). Resources are marked as R#nX, where R is resource, #n is resource identification number and X can be marked as U, A or S.

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. Document is marked with symbol identification_document.

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 [2].
Particular activity that is performed according to given model is called *instance of NRA*. Number of instances can be performed under one model. As example, new instance of the activity model "claim processing" is run every time for new client who submit claim request. In that moment dozen of activities for claim processing can be performed for different clients i.e. different instances, which are generally in different states.

Formal Model of the Simple Type Activity

Basic elements of the theoretical model – actions, states and transitions, described in previous section, can be mapped into Petri nets. State is presented by place and active state is marked by mark in a place. Petri nets syntax support all construction of routing that activity (sequential performing, parallelism, selection, iteration) and gives formal correspondence with workflow constructors [2]. With this construction flow control is mathematically formalized. Furthermore, analysis of the normatively regulated activities brings to necessity for external and temporal trigger, as well as enabling of the tasks by the user. Envelope, clock and down arrow in Petri nets present external, temporal event respectively and arrow presents enabling task by user [2].

Beside mapped concepts recognized by analysis of business processes, in Petri nets the concept that cannot be directly mapped with existing syntax and to which we want to give special meaning, exist. These elements are actors, resource and documents, and we introduce marking for them with: A#n:m on the transition, R#n:X and mapping by symbol in place and on the transition, 🗎identification_document on the transition respectively. These elements can be presented by UML activity diagram [6][7]. In the following section, segments of the intelligent software model for the activity support are given.

3. SEGMENT OF THE INTELLIGENT SOFTWARE MODEL FOR THE ACTIVITY SUPPORT

After whole formal model of the activity "Processing_claim" is defined, it becomes probable to monitor and control each particular activity i.e. instance according to this model. This practically means that all actors in performing one activity (after submitting the claim) can, checking the model, identify their obligations at that moment, further actions that are mandatory (usually during certain time frame) or there is a possibility of choice between two or more actions, conditions for their execution and transition to the new state, etc. Formal model and its graphical representation are just ways of representing rules of performing activities that are usually described in normative act, decree, law, etc. Difference is that formal model NRA is exact and does not leave a possibility of arbitrarily interpretation. Using formal model to define a type of activity and monitoring instances based on that model, higher regularity and legality and also consistency of some instances are accomplished as well.
The main issue here is how to apply formal model and at the same time make easier performance of the activities for all actors. For that purpose it is proposed to develop software system that will allow assignment of different types of the activity in the form of the formal model and in the way that is most suitable for men natural way of presentation (the most of all graphically)
Link between performing activity in reality, activity model and following activity with support to agents presents basic elements of the software system for support of normatively regulated activities, which is presented on the figure 1.

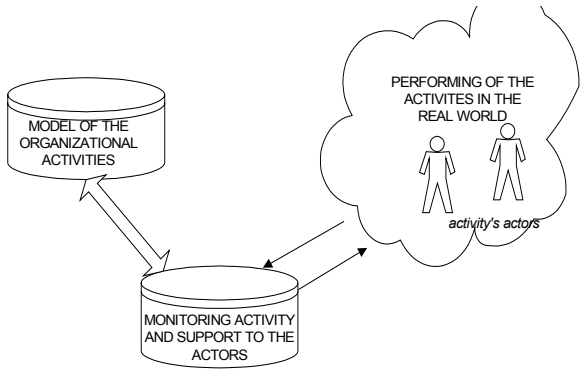

Figure 1: Segment of the software model for the activity support

We already described model of the organizational activities and activity in the real world. The detailed description of the monitoring activity and supporting the actors follows, and that is the main task of the intelligent software system. Basic functional component of the software system are described below.

4. FUNCTIONAL COMPONENTS OF THE INTELLIGENT SYSTEM

Basic function e.g. functional perspective of the system is described on the figure 2. System will coordinate, control and determine regularity of the business processes, and through those functions performs monitoring activity and support actors. System will enable different statistics and analysis.

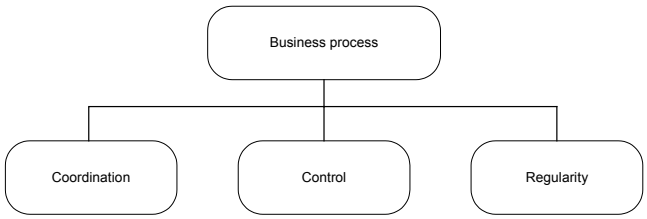

Figure 2: Functional components of the intelligent system

Examples of the business processes are issuing of the insurance policy, placing the order, call center etc.
Coordination is determined by starting the activity, assigning the tasks, remaining of the deadlines, alarming using applications or e-mail. Control is determined by control of the process flow, process deadline, process duration, access rights, established protocol of the behavior. Respecting of the norms and rules, authorization and respect of the time constraints determine regularity.
Beside to what is stated above, intelligent system has to be able to:
-Determine assignment of the actors to the roles
-Determine actors according to the parameters of the case for the specific case
-Create the work list for the actors
-Enable selection from the work list
-Enable usage of the resources
-Routing the case
-Monitoring and control of the case progress
-Stimulation of the case resolution
-Help in the case resolution, using base of the cases
-Negotiation and reporting to the management
-Reasoning about all future states
-Assigning and management of the resources

Each activity is performed several times and it is possible to gain some knowledge about the duration of the each activity in one particular state, when it will be terminated, who are the actors and also what are the problems in the performing of the activity. System will keep all relevant data about each instance and it will be possible to perform different statistics and analysis that will enable to:
-Discover number of the processed instances of the case according to different criteria
-Determine optimal number of the actors
-Determine efficiency of the actors
-Determine the priority of the case
-Determine the mean time for the resolution of the instance
-Determine the probability of the particular state
-Usage of the resources etc.

5.CONCLUSION

In this paper the concept of the normatively regulated activities and formal model based on Petri nets to describe these activities are presented. We introduced additional symbols in Petri nets that are discovered during the case study.

Formal illustration of NRA is the basis for design of the software system for their support. Using the elements and formal model, interface for analysis of the user needs created like forms on computer (masks) can be crated, and model can be recorded in the repository. Based on that information we want to build generic system for NRA, which should be able to define types of NRA in some organization and than monitor instances of particular types and give support to the actors.

Moreover, elements of the formal model can be built into reengineering of the traditional applications. Directions of the further research will be related to concept and development of generic software system. That kind of system will enable generating information system for support of the activities actually in the way of defining activities, actors and other elements from that organization. Using terms usual for in the systems for decision support, this type of the system will be used as a generator of the information system for support of the normatively regulated organizational activities.

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