Principles for Support of the Business Processes

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Abstract: - This paper describes basic components and principles 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. In order to perform normatively regulated activities efficiently and effectively, actors need proper information and documents, but also have to act in accordance to relevant norms and rules. This paper focuses on a particular aspect and modelling of the normatively regulated activities. Particular example of processing claim is described as the formal model. Some aspects of applicability of object view on normatively regulated activities are described as the improvement on the more complex case of procurement activity.

Key-Words: - Normatively regulated organizational activities, object oriented modeling, business processes

1 Introduction

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 fulfil rights of all activities actors and to protect specific category of subjects (i.e. client in the bank, customer with registered service call, etc). If it is proved that those 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 process", "Service call 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 users of the information system. Interest to support normatively regulated activities was initiated by increased 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, service providers are requesting more and more “intelligent” information system that will be able to process rules and norms for performing these activities in efficient manner [11]. In this paper approach for understanding and view of the normatively regulated activities is presented. Next section gives short theoretical description of NRA and describe problems during its performance. Third section describes basic elements and of normatively regulated activities that are essential for their modelling. Fourth section gives formal and graphical model of the simple type activity. Fifth section shows mapping an presentation of the same model using Petri nets. Sixth section presents functional modelling. Seventh section presents object view of normatively regulated activities while eight section gives some additional observation of whole process.

2 Problems During NRA Perfomance

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. Problems that are the most often present during the performance of NRA come in the phases:

-during the planning of the activity (prediction of the duration and dynamics of the activity, allocation of the human resources and responsibility for

performance some activities, mutual coordination activities which are in any possible way restrict or connected, focusing on the cooperative and coordinative aspects).

-during the performance of the activity (monitoring of the actual state and timely respond of the actor responsible for particular activity, availability of the relevant knowledge for the estimation of the situation and selection of appropriate action, prediction of the action effects and future states, discovering (non)regularities in the actions performed in the past and in the actions that will be performed, determining legitimacy of the actors to perform particular action, prediction of conflict situations and resolution of this situations if they happened. The criterions of the quality in the performing of the activities are efficiency of the realization (finishing activity as soon as possible), effectiveness of the realization (archiving the aim of the activity under existing constraints) and regularity of the action performance (according to regulated norms). The fist two criterions can be found in all models of decision-make processes and it depends of the process itself which one has higher significance. Efficiency and effectiveness can be considered in the sense of one or set of the activities in one organization. The third criterion, regularity of the action performance, had an essential importance for the activity, which is described in this paper. In the performed empiric research, which will be present, regularity of the activity became the main criterion for the successful activity performance. Primary motive in the designing of the computer support is assistance to activity actors to achieve bigger effectivity and efficiency of the activities, and also to help in the realization of the "regular activities". Software systems that give support to this type of the activities will be called intelligent computer system.

Examples of the business processes are issuing of the purchase order, insurance policy, placing the order, call centre 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, and established protocol of the behaviour. But there are still many systems that do not comply to some, and very often with most of these components. Issues are raised in understanding the activities. We heave to understand what activity is, what its components are and how to gather knowledge about these activities.

3 Elements of the Activity Modeling

For description of NRA 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 document [1].

a) 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.

b) 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 sate. States in NRA defined not only by informative content of state but also with performative 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.

Perfomative 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.

By some action normative contest can be changed, new roles or new role holders can be established. That is expressed in performative content of state, which is not further discussed in this paper.

Distinction between informative and performative content of state activity reflects distinction between "objective world" and "social world", as it is defined by Habermas [10]. Informative content of state is related to objective world i.e. to entities and states for which we can claim that exists and about which we express allegation that they were existent (happened), or they can happen or they will happen as the result of some intervention (action). Authenticity of the assertions can be confirmed i.e. statement is compared with facts (as example, existence of some document;

evidence about claim). Criteria of the validity of informative content of state are authenticity statement about reality.

On the other side, performative structure is related to legitimacy, obligations and responsibility of the actors and on their actions in the given social and normative contest i.e. in social created reality. Performative content of state consists of set of activated (applicable) rules during performing of the actions that cause that state. Examples of these rules are: only authorized clerk can report claim into system; only registered adjuster can do adjust of the damage; adjust has to be done in determined time frame. Analyzing of the performative content of state it can be determined whether the activity is regular and are the consequences legitimate.

In the activity model following states can be observed:

* initial (start) state

State is initial if we can come into that state only by external action (it does not belong to activity). Initial state is starting activity.

* terminate (last) state

State is terminal if we cannot go from that state into any other state inside one activity. This state is related to the end of activity. Because, activity can be finished in more different ways, it can be more terminal states.

The rest of the states are called inner states.

c) 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. Actors present position profile and they are marked in form A#n:m (n- identification actor, m- identification role).

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.

For each agent, task to perform is assigned. Also, performing of the task can be cancelled for each agent. Namely, our task is to introduce active authorization, which means that rights of the subject are not static, but they are changing with actual state of the system and with the tasks that subject should perform. Each authorization has its time to live, and after that all permissions are invalid. Criterion for cancellation can also arise based on history of agent performing similar instances.

d) 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 (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.

e) 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.

4 Formal and Graphical Model of the Simple Type Activity

In this section we will first present formal and graphical model of the normatively regulated organizational activities. For better understanding of the peer, we will concentrate on the simple type of the activities. Formal model of the activities is described on particular activity of processing claim.

Let A presents NRA set for one organization. Each element of the set Ai is determined by its set of the states Si, set of actions ai and set of transitions Ti. One set of activity Ai can be defined in following way:

. Ai □ A: Ai={ Si, ai, Ti}

Formal expression for type of the action from activities Ai that is performed at time t is:

ai.j(Actor: action_predicate(arg1,...,argp) ON t)

where ai.j is index of a type of action (jth action of the activity i).

Action can have only one index if it is clear from contest which given action belongs to. Identification actor ai is redundant because 'action_predicate' is uniquely defined action, but it is introduced for brief expression of the action, and it is called action denominator. Arguments of the 'action predicate' are the attribute types that take exact value when the actor reports performing of the action.

State Si.j that presents the element of the set Si is expressed as a clause:

Si.j (state_predicate (arg1,...,argq) IN (t1,t2))

Si.j is denominator of state (jth state of the activity i). 'state_predicate' represents state in performing of the activity and uniquely identified state in the model; arg1..argq are the states arguments; t1 are t2 times when states start and end respectively.

In state set Si={Si.0, Si.1,...,Si.end} initial state is represented as Si.0(the lowest index) and terminal state Si.end (the highest index).

Transition can be defined in the following way. Transition Tikm from state Si.k to state Si.m, as the result action ai.j inside activity Ai can be represented in the following way:

. Tikm □ Ti: Tikm =(Si.k, Si.m, ai.j □□, CDikm,CQikm)

while Si.k i Si.m □ Si, ai.j □ ai,

CDikm represent a necessary condition for transition and CQikm represent result of the transition.

(Remarks: Indexes k and m are sufficient to uniquely define transition and if we know the activity only Tkm can be used).

Empty set is shown in the statement is because transition can occur after expiration of some time without performing the action. State sequence in the model of activity is determined by the rules that describe transition from state to state. Each transition is occurring from state with lower index t state with higher index.

. Tikm □ Ti ->k <m for k,m=0,1,...end

Exceptions from this rule are complex NRA models in which repeating of some states is presented.

Graphical representation of the model of activity (GPMA) is final oriented graph which consists of:

-nodes which present states and which are marked by denominator of state

-arcs which present transition from one state to another and which are marked by denominator of the action which cause that transition

This graph contains elements of action sequences, exclusive disjunction, choice, transition after time expiration, temporal negation, parallelism and repetition.

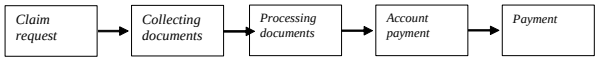

Fig. 1: NRA claim processing with sub activities

We will illustrate a formal model of the activities and its graphical representation on the example of process of the claims in insurance company. According to described model of processing of the claims on the figure 1 and implemented formal model in this section we can give the following statement:

S={S0,S1,S2,S3,S4,S5}

State S0 is start state and it is initiated by arrival of the client on the counter for submission of the claim.

The rest of the states related to figure 1. can be expressed as:

State S1 "Claim_submitted",
State S2 "Documets_collected",
State S3 "Documents_procesed",
State S4 "Settle_claim_amount",
State S5 "Claim_payment"

All states can be formally described. As example, state S1 and S2:

S1 (Claim_submitted (client id., policy number, claim number, submitted document) IN (t1,t2)

S2 (Documents_colletcted (claim number, adjuster report, police report, report from police court, medical report, ...) IN (t3,t4)

To come into one state, sequence of the actions has to be performed and defined requests have to be fulfilled. As example, to come into state S2 it is necessary to: identify client (a2), check client's insurance policy and data on the policy (a1), give to client forms to fill data related to accident (a3), mark claim assigning unique number (a4), and at the end enter basic data related to claim in to the computer (a5).

Formal description of the activities is a1, a2, a3, a4, a5.

a1(Employee_OZ: check_policy (tyep of the policy, insurance company, policy number and date of the valid) ON t1)

After completing action a1, and if it is discovered that policy is not of the appropriate type or it does not belong to that insurance company or the date of policy is not valid then action a12 is performed, and it can be described as:

a12(Employee: decline_of_document_repetion (explaining to client about the reason for rejection of document) ON t12)

After execution of action a12 it is going to terminal state.

If it is determined after action a1 that policy belongs to that insurance company and that the date is valid, then action a2 follows, which can be described as:

a2 (Employee: client_identification (ID number, permanent address, telephone number,...) ON t2)

After action a2, actions a3,a4,a5 are executed:

a3 (Client: filling_form (entry of place and time of accident, description of damage, information about witnesses) ON t3)

a4 (Employee: mark_claim (opening new case for processing, assigning a unique claim number) ON t4)

a5 (Empolyee: entering claim in the computer(unique claim ID, policy number, basic data for submitted form,...) ON t5)

By analysing data that are the results of performed action "Claim_submitted", necessary actions to initiate activity "Coscuments_collected" can be performed. Performing described actions it is obligatory to respect certain norms (steps in a process of submitting claim) and certain rules (i.e.: confirming data on the policy).

On the figure 2 is presented application of the elements of the graphical model in order to represent normatively regulated graphical model activity "Claim_submitted".

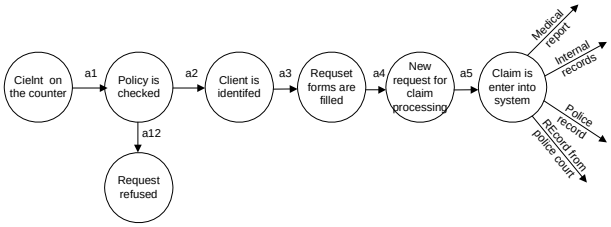

Figure 2: Graphical model of the activity "Claim submitted"

After whole formal model of the activity "Processing_claim" is defined, it becomes possible to monitor and control each particular activity i.e. instance according to this model. This practically means that all the 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 among two or more actions, conditions for their execution and transition to the new state, etc. Formal model and its graphical representation are just a way 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.

5 Mapping Using Petri Nets

Different models can be formalized using Petri nets [13]. 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. 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. 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_documument on the transition respectively. 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. Detail description of the formal model is out of scope of this paper.

Described elements	**Petri net**
Actions/transitions	Transitions, triggering of the transitions
State	Place
Active state	Mark in place
Flow control with all elements of syntax	Flow of the relation which is mathematically formalized with construction of routing
Case attributes	Colored marks, local variables
External event	Envelope
Temporal event	Clock
Enabling task	Down arrow
Roles and actors	A#n:m on the transition
Resources	R#n:X and mapping by symbol in place and on the transition
Document	identification_documument on the transition

Table 1. Mapping of the NRA to the formal Petri net model

We select to model activity as transition because in high level Petri nets duration is assigned to transition. State is presented by place and active state is marked by mark in a place. Furthermore, Petri nets syntax support all construction of routing that we discovered during analysis of our activity (sequential performing, parallelism, selection, iteration) and gives formal correspondence with workflow constructors. With this construction flow control is mathematically formalized. 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.

6 Functional Components of the Intelligent System

Basic function e.g. functional perspective of the system is described on the figure 3. 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.

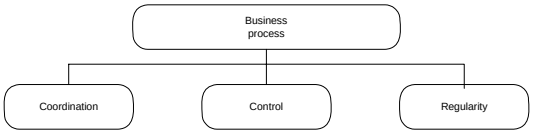

Figure 3: Functional components of the intelligent system

Examples of the business processes are issuing of the insurance policy, placing the order, call centre 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 behaviour. 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

-Creation of the work list for the actors

-Enable selection from the work list

-Enable usage of the resources

-Route the case

-Monitor 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, efficiency of the actors, the priority of the case, mean time for the resolution of the instance, probability of the particular state

-Usage of the resources etc.

Additional demands on this system are:

-Control and self-control of the employees (topics of many discussions)

-Enable view and search for valid documents

-Use key organizational words to effectively search for of the case bases

-Ability to use internal documents and shearing these documents among groups

-Additional estimation of the regularity of the instance that are finished according to all parameters (who was working; how much time each phase took; was there any link between client and performer).

It is obvious that this system will improve the performance of the any business process, and also of any other similar process.

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 4.

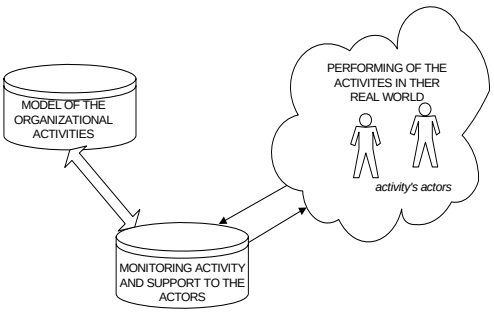

Figure 4: Segment of the software model for activity support

Two separate phases can be observed in the process of creation the intelligent system: build-time and run-time phase. Build-time phase consists of analysis of the business process and formal description of these activities. First step in the build-time phase is analysis of the business process, which includes modelling of the coordination, controlling and regulation aspect of the business process. This phase is start up for formal specification of the intelligent system. The modelling is based on gathered information and result is formal specification of the business process. With formal specification we are getting all relevant parameters for development of intelligent system and its implementation in the real environment, where it will have connection with users and applications. During the performance intelligent system is connected with users, application and database if it exists, but it can also affect formal specification of the business process. Connection and influence of the user to build-time phase is very important. That connection is flexible and it enables dynamical regulation. End users can add, remove or update regulation component during run-time processing.

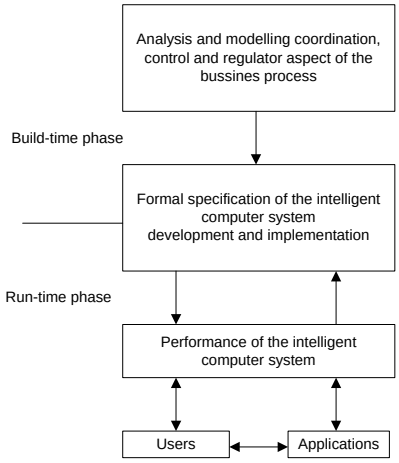

Figure 5. Build-time and run-time phases of the intelligent system

In an actual organizational environment we already have the applications and a corresponding database, as well as the actors carrying out actions. The intelligent system is connected to actors, applications and a database, which is represented as an information perspective in the computer system intended for the process automation (describes business data, documents, electronic forms, files, database where application information is placed).

7 Object View of the Activity

Object technologies re widely used in software engineering and many methods has been developed to support this framework [12].

It is well known that software development starts with gathering and analysis of user requirements.

There are many problems in this phase, and some of them are:

-system developers and end users have knowledge of different areas

-end users even been experts in their area very often cannot express precisely what do they expect from the final product before product has been completed and presented

-formal method is usually not used in this phase

-testing is not included also in this development phase

But one of the main reasons, and it not been consider enough, is that we don't think object oriented from the very beginning. We are also not aware that many activities are normatively regulated and it is necessary to make model of all elements above.

During interviews in order to gather user requirements the end users are aware only of their actions, responsibilities and rights for particular action inside one activity. Developers in that case follow up the same course of action e.g. concentrate on who is doing what. That has consequences that real connection between jobs of particular actions has been overseen. Current organizations' structures in the companies of author's country are established in the way that they are divided in many small organizational parts where actors perform particular actions part of one entire activity. As example we'll consider company that has department for accounting, procurement, inventory, and manufacturing and will analyze process of raw materials procurement for manufacturing.

During analysis in company we have following steps:

Step1: Analysis in accounting department

Invoice that was send by vendor arrives in accounting department for data entry. Accounting department controls vendor's data, account's amount, calculated PDV and other elements that are prescribed by law on the invoice form. After all controls are performed invoice is entered into system and it is processed for payment

Step 2: Analysis in procurement:

According to internal requisition purchase order is formed toward selected vendor. Contractual price and delivery date are negotiated.

Step 3: Analysis in the inventory:

Materials are received from vendor. They are stored in warehouse and information about delivery status is updated in the system. Vendor sends also document called bill of lading that is signed by inventory assistant. Bill of landing is than send to the accounting department.

There are many unresolved issues:

-is inspection of the received items performed correctly and are items according to required specifications

-is the accepted item what has been originally ordered

-is the price the same as it has been negotiated.

-is delivery on time

-is requisitioner notified about reception of the items

Even this partial analysis bring us to the conclusion that this activates are related and that they are normatively regulated activities. It is very important that procurement of item regarding price, quantity and quality was in accordance with regulations and organizational' norms. Moreover, it is of paramount relevance for manufacturing and the sale process in many companies.

Action: issuing purchase order, receivable of materials, account update are performed in different organizational segments and actors assigned on this duties perform what is regulated by existing job classification.

If we take a look into analysis of the case above we can see that it is one activity. We'll call this activity »Procurement process for manufacturing«.

Action has been started in organizational part of procurement (procurement – responsibility) and it has to have full insight in this activity e.g. receiving of materials and invoice, and has to control that everything is performed by rules and contractual arrangements.

In this process objects are listed below:

In the procurement

- Object purchase order

In the finance and accounting:

- Object invoice

In the inventory:

- Object receipt

In this case it cannot be seen that there is some link in the organizational parts for described activity. Improve this scenario with the facts that invoice has to be first evaluated in procurement department. Inventory and procurement has to exchange information about order and receipt.

In this case objects are listed below.

In the procurement:

-Object purchase order

-Object invoice

In the accounting and finance:

-Object invoice

In the inventory:

-Object purchase order

-Object receipt

If we make model of each activity in the isolation we'll get more instances of the same object during the activity flow.

All roles are performed on the same objects in accordance to their rights, but analysis itself and modelling has to be considered as this is one activity.

For activity procurement of materials objects are:

- Object purchase order
- Object invoice
- Object receipt

Actors are:

- Procurement department
- Accounting department
- Inventory department

During the class modelling the type of data for the objects listed above we'll base on the attributes by which they are described. As example for invoice: account number, date of issue, place of issue, amount, tax, items, but also what is very important we'll look into behaviour of the objects e.g. methods. Beside methods that determine behaviour of the object (check account amount), methods will also include methods for: role on the object, responsibilities inside the role. That means it will include elements of normatively regulated activities.

Generally, we can make conclusion that all elements for normatively regulated activities can be mapped in object oriented elements as it is shown in Table 2.

NRA element	Object oriented element
actions	method
roles and actors	method
resources	class, object
document	class, object

Table 2. Mapping of the NRA and object oriented elements

In order to make formal model we can use UML that has all elements to support software development in all of its phases. But, we have to think object oriented in the first phase of software development.

8 Additional Observation

In the previous section we described simplify mapping of the normatively regulated activities in the object model to present one of the possible approaches. In this straightforward example it is easy to observe that it is possible to make bad design of future system just because we did not consider and did not apply object oriented paradigm in the early phase.

Analysis of user requirements is mandatory not only for design of customized applications but also during the implementation of off-the-shelf ERP solutions in the company. Working on the project of implementation of one widely adopted ERP solution in one enterprise company, project group faced many problems during implementation caused by the following reasons:

- Company did not perform reengineering of their business processes before implementing system. As ERP solution itself already has object view to the company, this lack of reengineering resulted in model that does support ERP solution.

- During the phase of gathering users' requirements project manager for ERP system didn't use formal method. Interviews are performed separately without observing enough links between departments and business functions in the early phase of implementation e.g. the phase of analyzing users' requirements. It resulted in the efforts to change ERP system to match to requirements of specific company, instead to present particular suggestions to apply system effective and efficiently. Both of these reasons will be easily eliminate if way of thinking was object oriented

9 Conclusion

In this paper the concept and object view of the normatively regulated activities are described. Normative activities are of paramount importance for organization functionality. These activities can be supported by computer only using intelligent software system. To arrive to that kind of system we have to have adequate analysis of these activities and we also have to perform reengineering of business processes. Many companies require reengineering of their business processes by introduction of new systems. Reengineering will be much more efficient if the object oriented approach will be considered from the very beginning by the people who regulate working procedures. Experience and talent are required to do a good job at detailed design.

In the initial phases of our research we were looking into normatively regulated activities from theory aspect. At the beginning of this activity we were trying to make model using Petri nets as they have all elements to make this model possible. But this approach was not object oriented. After diverting our focus into object design and better understand of object oriented modelling, we noticed that objects are all around us and they are fundamental part of any of our activity, which includes also normatively regulated activates.

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