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Organizational knowledge extraction from business process models

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Ph.D. thesis

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Abstract

In today's dynamic environment all organizations need up-to-date knowledge for their operations that are based on business processes. Complex organizations use Business Process Management (BPM) tools to model and manage these processes. BPM applications tend to model the organizational processes, together with the required information and other resources needed to perform each activity. BPM yields an overall context, but focuses on a high level of process representation.

My research focuses on extracting, organizing and preserving knowledge embedded in organizational processes captured with BPM techniques to enrich organizational knowledge in a systematic and controlled way. The proposed solution is to extract the knowledge from information stored in the process model in order to articulate, externalize and transfer it. The thesis focuses on the BPM aspects of the solution as I strive to investigate it from the information systems perspective.

The novelty of the solution is based on the connection between process model and corporate knowledge, where the process structure will be used for building up the knowledge structure. Common form of managing knowledge within an organization is the ontology, which provides the conceptualization of a certain domain. By using the ontology and combining it with the process models, we connect knowledge management and business process management in a dynamic, systematic and well-controlled solution.

The proposed outcome is a process ontology – domain ontology duplet, where the domain ontology serves as a knowledge repository, and the process ontology holds the multilateral process information incorporating process structure with the viewpoints of organizational stakeholders and IT implementation.

1 Introduction

1.1 Motivation

For twenty years of my life I have been struggling to identify, address and resolve the problems and challenges of different organizations on the field of IT systems supporting business processes. Software development methodologies have traditionally been driven by programming and not organizational concepts, leading to a semantic gap between the software systems and their operational environment. As a contrary, Business Process Modeling emerging from the '90s aligns the business goals and incentives with the IT software design process.

I have started my Ph. D. studies in order to gain insight into the academic achievements addressing this semantic gap and participate in research projects proposing solutions aiming to narrow this gap.

I have considerable experience in capturing business processes of organizations of different nature – both in the academic and in the business domain. In the eBEST project (Török & Leontaridis, 2011) funded by the EU FP7 framework, I was working on the development of a reference architecture for automated workflow software generation based on modeling notation. The focus was given to the extension and mapping of conceptual business models to process ontology models by using a meta-modeling approach, and provide automatic generation of workflow process support applications. The proposed model and the reference architecture served as an implementation pattern for stand-alone workflow management systems or general purpose workflow development frameworks. Partly based on the outcomes of this project, my thesis tries to go one step further, by enhancing process ontologies with the capability to provide annotation for organizational knowledge embedded in domain ontologies.

1.2 Thesis outline

My thesis has six main chapters. The first chapter deals with the aims, background and the significance of the research. I give an overview about the premise of my work, and about the methodology being applied. My main research questions and statements are discussed.

The second and third chapter is about the theoretical background of my work. I provide a literature overview and assessment, including a detailed description about the applied terminologies, methods and approaches discussed in the literature. It is mainly divided to the definitive application areas I plan to combine, business process modeling and semantic technologies, ontologies. I deal with application integration, business modeling and model transformation and with the role of these paradigms in building business driven service oriented environments. Methodologies used for them and implementation issues are also demonstrated. Chapter two is discussing the business process modeling related areas, extended with process modeling standards and languages, while chapter three is about ontologies and their role in semantic interoperability.

In the fourth chapter I deal with the elaboration of the proposed method for knowledge extraction. In chapter four and five I detail some preliminary results of my work, through the basic outline of the modeling steps of the proposed solution and the initial case study. The fifth chapter deals with the presentation of the outcomes of case studies. These later two chapters are going to be completed by the final thesis.

I conclude my thesis with the assessment of the research results, and the future work planned to be accomplished.

1.3 Problem statement and research questions

Enterprises have to operate in a dynamic environment, affected by several external and internal factors. They are acquiring organizational knowledge from numerous sources, whether they know about it or not. In this volatile context of the organizational knowledge creation, it is hard to influence knowledge conversion, maintain a healthy rate of tacit and explicit knowledge as it is discussed in the knowledge conversion theory of Nonaka and Takeuchi (Nonaka & Takeuchi, 1995). One of the main threats from organizational knowledge management aspect is staff movement and mobility. The main challenge is the "wall-to-wall" knowledge articulation in order to provide the organization with up-to-date knowledge. In this way the internal training of employees has to be fully supported. The other dimension of the same problem is supporting the IT systems creation to fit the current requirements of the organization determined by business processes.

Complex organizations use to model and manage their processes with the help of business process management (BPM) tools. These applications help to describe the organizational processes, together with the required information and other resources (amongst other human resources) needed to perform each activity. BPM yields an overall context, but it tends to be static.

Business processes are defined as a sequence of activities. Business processes represent dynamic perspective in enterprises, while the embedded knowledge remains hidden in many cases. From the human resource management view it is required to define unambiguously, who is responsible for the execution of each activity. The RACI matrix (Responsible, Accountable, Consulted, Informed) is used for grouping role types, bridging the organizational model and the process model. Since we need to acquire knowledge belonging to the job roles, in this sense RACI assigns only job role types to the tasks. The RACI is often used for job role discovery, but it lacks the description of the knowledge elements related to tasks and activities. My research area is dedicated to the challenges of knowledge extraction from business processes.

My goal is to analyze the opportunities of knowledge extraction and to develop a solution to extract, organize and preserve knowledge embedded in organizational processes. This knowledge extraction process will enrich organizational knowledge in a systematic and controlled way. The proposed solution will extract the knowledge from information stored in the process model in order to articulate, externalize and transfer it. Since the business process models are used for the execution of processes in a workflow engine, another very important source for gathering useful knowledge are real-time instantiations of the business processes, that gives a view on the dynamic knowledge, usually represented in the form of different business rules. My other research problem is how to organize the extracted knowledge, what are the appropriate ICT solutions, environment for it.

The novelty of my proposed solution is based on the connection between process model and corporate knowledge repository, where the process structure will be used for building up the knowledge structure. Common form of knowledge representation is the ontology. My research focuses on a framework to build ontologies for both process and domain. In the context of this work, I provide a distinction for the two terms:

Process ontology: Identifies all the artifacts that describe a process, regardless of whether it is structured or not . It allows building clearly and unambiguously all process elements, linked with the domain ontologies that specify enterprise concepts, as well as the business rules, roles, outcomes, and all other inter-dependencies.

Domain ontology: The domain ontology provides vocabulary of concepts and their relationships, captures the activities performed on the theories and elementary principles governing that domain. It is not a glossary of terms, it is what defines the company sphere and represents what the company does.

According to these research challenges, my first research question is investigating the relation of processes and organizational elements:

Research question 1: How can we determine the connection between process elements and other organizational phenomena?

To answer this question, I will analyze the main BPM methodologies and their organizational dependencies. Common BPM methodologies provide the methods and tools to identify several dimensions of organizational environment, such as IT infrastructure elements, or organizational stakeholders as human actors closely related to the organization. Every perspective has its procedures and the knowledge behind them. The challenge lies in a systematic and gapless integration of these viewpoints.

The following research question is dealing with my main research issue; discussion of knowledge extraction methods from business processes:

Research question 2: What are the possible approaches of extracting domain specific knowledge embedded in BPM process models?

Answering this question starts with clarifying how can we articulate the hidden knowledge in BPM. I will review theoretical foundations of related fields, like business process management, semantic technology and ontologies.

In my thesis emphasis is given to enrich process models with organizational knowledge, in more strict terms to include knowledge elements in business process models at different levels of granularity. I have to examine what are the preconditions and requirements against processes and how can we organize the extracted knowledge in a most effective and efficient way. The following research question is dealing with the possibilities of the knowledge extraction automation.

Research question 3: Is there any possibility for semi-automatic or automatic solution for knowledge extraction from business process models?

To answer this research question I will overview and analyze the semantic business process management and semantic web services literature, and based on that, I will propose my approach for knowledge extraction. Justification of the ontological approach in knowledge management is proved through the presentation of case studies. I will utilize my research projects experiences, especially which I gained in Prokex (PROKEX, 2013) and eBEST projects (Ternai & Török, Business process modeling and implementation in collaborating environments, 2012).

Research question 4: What is the potential for organizations in having knowledge-enriched process repositories?

From the case studies, I will strive to answer the following questions:

How can a proposed method ease the problem of fluctuation? Can it lead to more targeted training? Is a multi-lateral view on business processes enhances the improvement of processes?

1.4 Research Methodology

In reviewing my thesis research methodology I had to comply with the nature of the research as well as the requirements of the Ph.D. School. In case of IT related theses written under the aegis of accredited Ph.D. schools it is a common occurrence for candidates to define solvable tasks in the form of setting up a series of research related questions and providing answers to them instead of making hypotheses. In contrast to theses aiming to prove hypotheses leaving a problem unsolved is not acceptable, but rather it is taken as a failure.

The Business Informatics Ph.D. School of Budapest Corvinus University has been classified to the IT discipline that belongs to the field of social sciences and as such, applying research methods in a kind of 'hybrid' way can hopefully be considered to be accepted.

1.4.1 Fundamental of social science research

Basically all research works have the goal either to explore new theories by searching for unknown relations or to prove discovered but still unproved theories, thus adding to the general knowledge of the given field. These two aims necessitate a different logical approach: while a research based on validation requires deductive logic, an exploratory research follows inductive logic.

1.4.2 Exploratory research and research based on validation– inductive or deductive logic

The research based on validation approach is suitable for testing assumptions and hypotheses deducted from the accepted theoretical background of the field of research. It uses deductive logic which is applied to test research theories based on hypotheses.

Thus it is clearly visible that making hypotheses is inevitable in a research based on validation. Only after having the hypotheses put down in black and white can the researcher proceed to the observatory part of the research and the evaluation of the hypotheses.

The exploratory approach is a good choice in cases when the field of research is completely or largely unexplored. Exploratory researches are carried out typically with three main goals (Szabó, 2000):

- ensure a better understanding of the topic,
- serve as testing the feasibility of future, more thorough researches,
- develop applicable methods for further researches.

In fields where this approach is appropriate, making testable hypotheses would often be too early and untimely. Moreover the process through which theory development takes place is less strict by its nature (Benbasat, Goldstein, & Mead, 1987; Babbie, 1989). Exploratory research is based on inductive logic which says that theories can be developed by analyzing research data and generalization.

When examining Ph.D. theses of our faculty it must be noted that Klimkó doesn't make any hypotheses in his Ph.D. thesis (Klimkó, 2001), but instead he draws up his research-related expectations. He however emphasizes that it is the inductive approach that makes this possible because his thesis is not of research based on validation nature. "Amongst the questions there are no deductive ones that could be aimed at validating hypotheses. All questions are of inductive nature. That is why my research questions are about "expectations" instead of "hypotheses" (Klimkó, 2001).

My present research is of exploratory nature and follows inductive logic. In my thesis I am going to identify research questions and tasks along with hypotheses and will explain the importance of the questions. Also, by reaching the goals set in the questions, I am also going to give an explanation on the importance of the chosen topic itself.

1.4.3 Qualitative and quantitative research

From a methodological point of view, we can take the qualitative and quantitative approaches commonly used in organization evaluation methods as a basis (Balaton & Dobák, 1991). Quantitative methods include the application of mathematical and statistical means for data processing, so these methods can be used in researches where a lot of measurable data are available.

If we want to explore and understand the deeper relations within a discipline without trying to analyze numerical data sets, it is reasonable to use qualitative methods. These are suitable for research fields where a well-founded knowledge base hasn't been established yet or when the aim is to solve a problem and theory is built based on this solution. In order to avoid the drawbacks of the methods it is recommended to use methodological triangulation (the application of different research methods and perspectives for analyzing the same question)(Balaton & Dobák, 1991). Types of triangulation are:

- simultaneous application of various quantitative procedures
- simultaneous application of various qualitative procedures
- combination of quantitative and qualitative methods

My present research is based on qualitative methods because it follows an exploratory, deductive logic without having access to large, measurable data sets.

1.4.4 Research based on case studies

According to Yin (Yin, 1994) basic research strategies can be based on

- experiments
- questionnaire surveys
- secondary analyses
- historical analyses
- procession of a case study

Yin asserts that it is expedient to use case studies when "…questions of 'how' and 'why' are asked in relation to current events over which the researcher has little control”. Case studies examine phenomena in their natural environment and apply several different data acquisition methods with a small number of examination subjects (Benbasat, Goldstein, & Mead, 1987).

The application of case studies is preferred to other methods when researched concepts and relations can’t be examined in an isolated manner. In such situations it is only the method of case studying that can guarantee the necessary depth for a theory’s evolution. This method has a long tradition in IT literature (Lee, 1989).

The case study approach has many strengths: it provides an overall perspective and enables a more thorough, in-depth understanding. It also helps to reveal such relationships that would remain hidden if a different method was applied (Babbie, 1989)(Galliers, 1992). Bensabat et. al. (Benbasat, Goldstein, & Mead, 1987) make substantial statements in respect to case study based research that, as being idiographic, tries to understand problems in their own context.

Bensabat et. al. summarize main features of the case study based research strategy as follows:

- examines a phenomenon in its natural setting
- employs multiple methods of data acquisition
- gathers information from one or a few entities
- is of exploratory nature
- no experimental control or manipulation is used
- neither dependent nor independent variables are predefined
- results are highly dependent on the researcher’s ability to integrate
- data acquisition methods can change during the research
- the nature of the phenomenon and the reason for it is the question, not the frequency of its occurrence

Case studies may relate to a single or multiple events and there are countless possible levels of analysis in the research. Case studies are usually based on combined data acquisition methods (archives, interviews, questionnaires, observations), in which results can be both qualitative and quantitative.

The case study approach can be applied in order to reach at least three goals (Eisenhardt, 1989):

- with the intention to illustrate (to explain a theory),
- create an applicable theory,
- test a previously worked out theory.

Case studies can also be used to evaluate whether practice corroborates main theoretical concepts. Eisenhardt and Bensabat et. al. provide a detailed guidance to planning a theory development research based on case studies.

In order to avoid any threats while applying this method, five criteria have to be met (Babbie, 1989):

- a relatively neutral aim should be defined
- known data sources should be used
- an adequate time frame should be examined
- known data acquisition methods should be applied
- consistency with the currently accepted knowledge base should be ensured

The main advantage of a case study based research is its flexibility. It enables the interaction between data acquisition and data analysis. This approach has an outstanding validity: instead of defining concepts, case studies provide detailed illustration.

However the case study approach may come with quite a few drawbacks: it rarely provides an accurate description on the state of a large population and the deductions are rather to be considered as suggestions than definitive conclusions. Reliability may also be an issue in a case study based research, just like its inadequacy to generalize the findings. The personal nature of observations and measurements can lead to results that can't be reproduced by others. Secondly it is harder to generalize the in-depth, overall understanding than those results that are based on a strict model and standardized measurements. Thirdly there is a big chance to distort the model (Babbie, 1989). As it is of exploratory nature, my present research uses a case study based approach in validating hypotheses.

2 Business Process Modeling

In this section I provide a detailed literature overview of the BPM and SBPM sphere and ground the decisions I have taken concerning the process modeling standards, languages and the utilized tools.

2.1 Modeling of Business Processes

Nowadays business process modeling is an integral part of many organizations to document and redesign complex organizational processes. One of the most promising tendency in application development today is business process design based software development. Software development methodologies have traditionally been driven by programming and not organizational concepts, leading to a semantic gap between the software system and its operational environment. Business process modeling aligns the business goals and incentives with the IT software design process.

As a forerunner of BPM, in the early 1990s, the idea of Business Process Reengineering (BPR) brought business processes to the center of interest and lifted the subject of design from the supporting IT systems to business processes, to the perspective of business experts. The term is originated from Hammer&Champy's BPR paradigm (Hammer & Champy, What is reengineering?, 1992), (Hammer & Champy, Reengineering the Corporation: A Manifesto fo Business Revolution, 1993).

It has been common sense to first determine business requirements and then to derive IT implementations, to develop software according to ideal processes as determined by business logic. Business processes have to perform well within ever-changing organizational environments. It can be expected that Business Process Management will only come closer to its promises if it allows for a better automation of the two-way translation between the business level and the software systems.

2.1.1 Process lifecycle

In order to obtain a full view of the capabilities of BPM, we have to start out from the overview of the BPM lifecycle. Among the vast number of BPM lifecycle models available (Jeston & Nelis, 2008), we chose to build upon the most concise and probably one of the most popular model of van der Aalst.

According to the proposed basic model, the four elements of the BPM Lifecycle are the following:

Process Design: The organizational processes concerning the subject are identified, top level visualization of the processes are laid down. Several modeling standards and tools are aiding this phase, as we will have a deeper look among them in the following sections.

System Configuration: This phase provides a more thorough overview of the processes, ideally taking into consideration all possible aspects required for the implementation of the underlying IT infrastructure. One very important dimension of the configuration is business-IT alignment, and also the synchronization of roles and responsibilities of the organizational structure concerning the processes. This stage has many obstacles in real-life implementations due to the inhomogeneous nature of the IT and organizational architectures of different enterprises.

Process Enactment: Processes are inaugurated in real life circumstances, and form the IT point of view being deployed into Business Process Management Systems/Suites (BPMS), workflow engines or other software instances. Recently, in a state-of-the-art organization, this deployment holds some extent of automation. The current focus of BPM theory is concerned with raising this level of automation in turning electronically modeled processes into effective IT supporting infrastructure.

Diagnosis: In an ever-changing business environment it is inevitable to have appropriate feedback on the operational environment of the processes. Diagnosis activities range from monitoring, analysis of the effectiveness – or other KPIs – of enacted processes, and also after identifying and analyzing possible failures and bottlenecks, the revision of the process design, making BPM a continuous, cyclic function of the organization. This phase has a wide body of literature within the BPM community, it is supported by many diagnostic standards, but it falls out of the scope of our interest.

2.1.2 Granularity of process models

The term granularity originates from the Latin word granus and refers to the property of being granular and consisting of smaller grains or particles. Zadeh defines this concept as construction, interpretation, and representation of granules, i.e., a clump of objects drawn together by indistinguishably, similarity, proximity, or functionality (Zadeh, 1997). Granularity in process modeling is used to characterize the scale or level of detail in a modeling process. The greater the granularity, the deeper the level of detail. The provided recommendations on process model granularity are not very specific and do not support process modelers in deciding on the appropriate level of detail. As there is currently no sufficiently effective possibility of measuring the granularity of a process model, the decision about the appropriate level of detail is purely based on the subjective assessment of the modelers.(Leopold, Pittke, & Mendling, 2013)

Setting this appropriate level can be thought of as an optimization problem in itself. If a process model is too superficial, it will not contain enough information to draw conclusions, conduct redesign or utilize it in any other ways. A modeling architecture with unnecessarily frittered details or a model with inhomogeneous granularity results confusing process architecture, and consumes unnecessary resources to create, maintain and manage. Throughout my work, the level of granularity in modeling a process is set to grant the ability to attach corresponding concepts like roles or information objects to the model.

2.1.3 Static-dynamic process representation

In the modeling practiced we often refer to these models as “static” models. The term suggests that these submodels remain unchanged during the modeling period, which is far from being realistic, especially since the BPR approach aims to redesign change the internal environment of the organizations, but since every modeling concept captures only a reduced set of the reality, this is something I have to accept as a compromise and also as a limitation for the applicability of my work..

2.2 BPM, SOA, Workflow Management

BPM standards and specifications are based on established BPM theory and are eventually adopted into software and systems. BPM standards and systems are also what Gartner (Hill, Cantara, Deitert, & Kerremans, 2007; Hill, Kerremans, & Bell, Cool Vendors in Business Process Management, 2007; Hill, Sinur, Flint, & Melenovsky, 2006) describes as “BPM-enabling technologies”.

In the industry, there is a growing awareness of the emerging term service-oriented architecture (SOA). BPM is a process-oriented management discipline aided by IT while SOA is an IT architectural paradigm. According to Gartner (Hill, Sinur, Flint, & Melenovsky, 2006), BPM “organizes people for greater agility” while SOA “organizes technology for greater agility”. Processes in SOA (e.g. linked web services) enable the coordination of distributed systems supporting business processes and should not be confused with business processes.

There is also some confusion between the Workflow Management and BPM terms. While often treated synonymously, BPM and workflow are, in fact, two distinct and separate entities. According to one viewpoint, workflow is concerned with the application-specific sequencing of activities via predefined instruction sets, involving either or both automated procedures (software-based) and manual activities (people work)(Csepregi, 2010). BPM is concerned with the definition, execution and management of business processes defined independently of any single application. BPM is a superset of workflow, further differentiated by the ability to coordinate activities across multiple applications with fine grain control.

Other research views BPM as a management discipline with Workflow Management supporting it as a technology (Hill, Pezzini, & Natis, Findings: confusion remains regarding BPM, 2008):

"Business process management (BPM) is a process-oriented management discipline. It is not a technology. Workflow is a flow management technology found in business process management suites (BPMSs) and other product categories."

Another viewpoint from academics is that the features stated in WfM according to Georgakopoulos et al. (Georgakopoulos, Hornick, & Sheth, 1995) is a subset of BPM defined by van der Aalst (Van der Aalst, 2003) with the diagnosis stage of the BPM life cycle as the main difference.

However, in reality, as we have observed, many BPMS are still very much workflow management systems (WfMS) and have not yet matured in the support of the BPM diagnosis, some providers of software tools have updated their products' names from "WfM" to the more rewarding "BPM"(Hill, Kerremans, & Bell, Cool Vendors in Business Process Management, 2007).

2.3 Classification of BPM standards

The most logical way to make sense of the myriad of BPM standards is to categorize them into groups with similar functions and characteristics. For this reason, we propose a cleaner separation of features found in standards addressing the process design and process enactment phase into three clear-cut types of standards:

- Graphical standards. This allows users to express business processes and their possible flows and transitions in a diagrammatic way. Graphical standards are the highest level of expression of business processes.
- Execution standards. It computerizes the deployment and automation of business processes.
- Interchange standards. It facilitates portability of data, e.g. the portability of business process designs in different graphical standards across BPMS; different execution standards across disparate BPMS, and the context-less translation of graphical standards to execution standards and vice versa.

2.3.1 Graphical standards

Graphical standards allow users to express the information flow, decision points and the roles of business processes in a diagrammatic way. Amongst the four categories of standards as mentioned in Section 3.1, graphical standards are currently the most human-readable and easiest to comprehend without prior technical training. Unified Modeling Language activity diagrams – UML AD (Object Management Group – OMG, 2004b), BPMN (OMG, 2004a), event-driven process chains – EPC (Scheer, 1992), role-activity diagrams (RADs) and flow charts are common techniques used to model business processes graphically.

These techniques range from common notations (e.g. flow charts) to standards (e.g. BPMN). And of the standards, UML AD and BPMN are currently the two most expressive, easiest for integration with the interchange and execution level, and possibly the most influential in the near future. For this reason, we will focus more on UML AD and BPMN, followed by a brief description of the other graphical business process modeling techniques.

2.3.2 Execution standards

Execution standards enable business process designs to be deployed in BPMS and their instances executed by the BPMS engine. There are currently two prominent execution standards: BPML and BPEL. Of the two, BPEL is more widely adopted in several prominent software suites (e.g. IBM Websphere, BEA AquaLogic BPM Suite, SAP Netweaver, etc.) even though BPML can better address business process semantics.

2.3.3 Interchange standards

As mentioned earlier, interchange standards are needed to translate graphical standards to execution standards; and to exchange business process models between different BPMS's (Mendling and Neumann, 2005). Some practitioners thought these interchange standards as "the link between business and IT", but we do not agree with this assertion because an interchange standard is a translator from a graphical standard to an execution standard (Koskela and Haajanen). There are currently two prominent interchange standards: Business Process Definition Metamodel (BPDM) by OMG and XML Process Definition Language (XPDL) by the WfMC. A deeper analysis of interchange standards falls into the scope at a later phase of the PROKEX project.

2.4 Process modeling standards and languages

In this section we provide a short assessment of the major modeling languages which has been taken into account during the model selection of the PROKEX project.

2.4.1 Petri nets

Petri nets are the oldest phenomenon of modeling techniques among the ones analyzed in the project. Petri nets can be regarded in many ways as the ancestor of all subsequent modeling procedures.

The Petri nets consist of places and transitions, connected by directed arcs. The directed arcs describe which places are pre- and/or postconditions for which transitions, while there is no direct connection within the sets of places or within the sets of transitions.

At the level of places an arbitrary number of *tokens* can be deposited, which are passed on to the next place, if the condition of the transitions are satisfied at every arc leading to a transition. The following diagram depicts a simple Petri net with tokens.

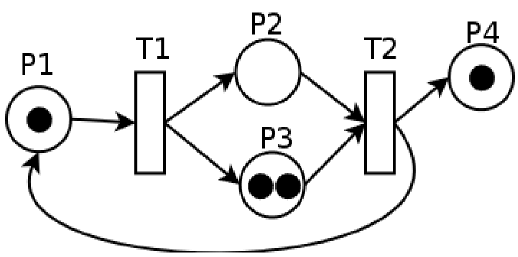


Figure 1: Simple Petri net

Petri nets are capable of the modeling of the activities of processes, but are inadequate for the comprehensible representation of complex processes involving numerous roles and responsibilities.

The main areas of the application of Petri nets are software design, workflow management, data analytics, concurrent programming and program diagnostics.

2.4.2 UML

UML (Unified Modeling Language) is a standard for object modeling which was based on the spreading methods of object oriented analysis and planning in the 80s and 90s. This tool is a normalized modeling language which is used very often in highly software oriented systems' planning for specifying models, visualization and documentation (Raffai, 2001). With implication to business related areas the main usage of UML are organizational modeling, process analysis, configuration and business process reengineering (BPR).

The most popular type of UML is the Activity Diagram (AD) which is a graphical tool for representing the business and operational workflows of the processes with sequences, conditions and parallelism. With this process flow diagram UML is much more applicable for business process analysis. Similarly to BPMN (Business Process Modeling Notation) AD uses the swim-lane structure in which actors of the given process are grouped into different lanes – and maybe even into different pools if they are logically separated (Oro & Ruffolo, 2012). In the flowchart we can use the following basic components and notations: initial and final node (filled circle with or without border), activity (rounded rectangle), flow (arrow), fork and join (black bar) and decision and merge points (diamond). In the example below which shows the process of withdrawal from ATM we can see the usage of the mentioned elements (Lin, 2008).

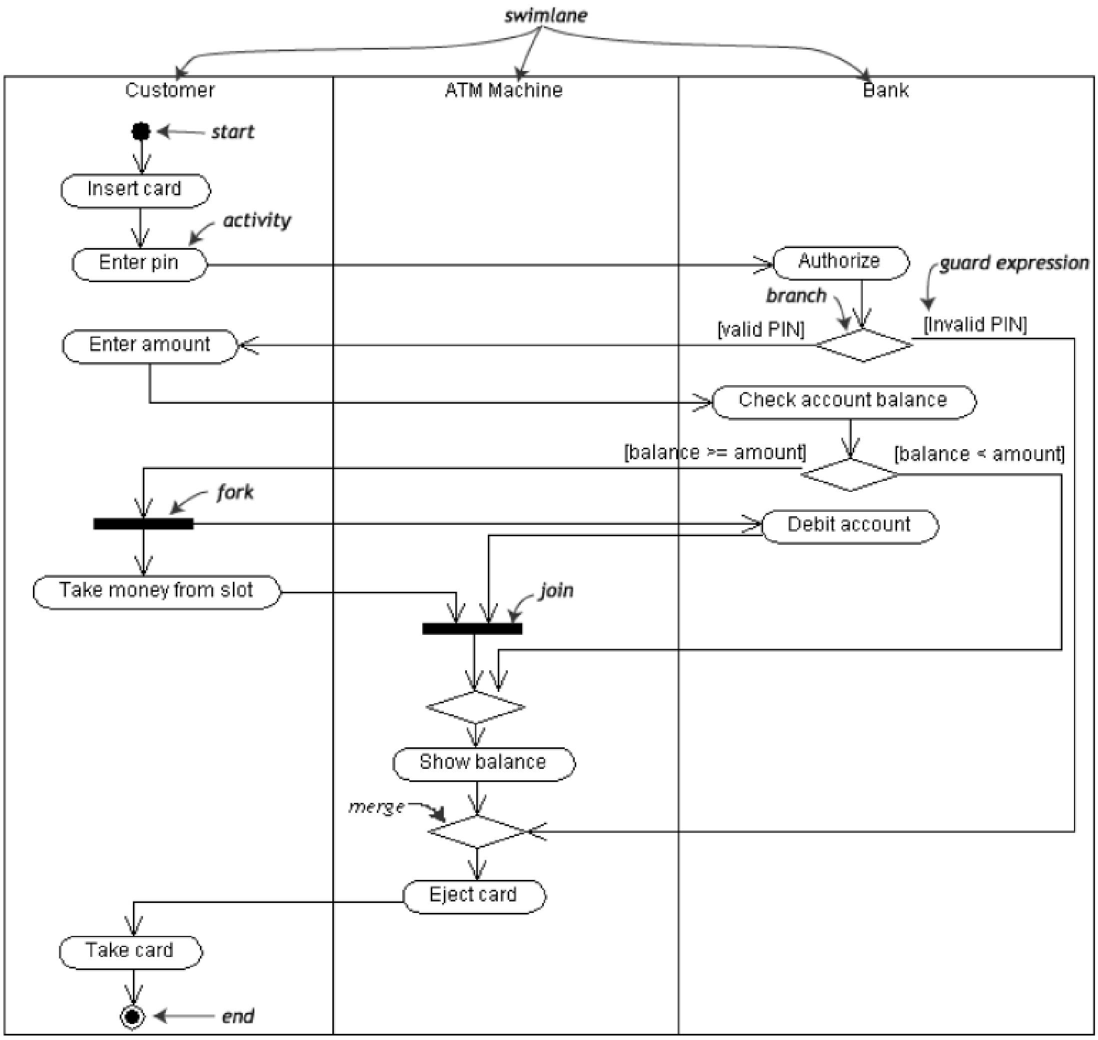


Figure 2: Sample model of ATM withdrawal (UML) (Lin, 2008)

In the figure we can differentiate three lanes for the three actors (customer, ATM machine and the Bank's backend system). The process is started by the customer who interacts directly with the machine and then after the backend system authorizes the user the next step is selecting the desired amount. If anything fails during the validation of the stated conditions the machine breaks the process by ejecting the card. Otherwise the customer receives the money from the machine before it ejects the card.

Apparently by using UML AD we get a simple, transparent and standardized process representational model which can be used for simple process analysis and even for software development as well.

2.4.3 BPMN

The public debut of the 1.0 version of BPMN (Business Process Modeling Notation) modeling language took place in 2004, while 2.0 has been available since 2011. The language is very similar to the aforementioned UML AD and EPC, regular elements and components of these models can be found in BPMN too. According to the Object Management Group (OMG), maintainer of BPMN, this modeling language provides companies with the capability of recording and evaluating external and internal business processes. The Business Process Diagram (BPD) as it is called, helps companies manage their processes in a general, standardized way (OMG, 2005). Comparing BPMN to other modeling languages, its main advantage is that it is more transparent and easier to understand which make it very popular amongst business analytics (OMG, 2005).

Below we show an example for BPMN BPD which represents the process of a patient going to see the doctor.

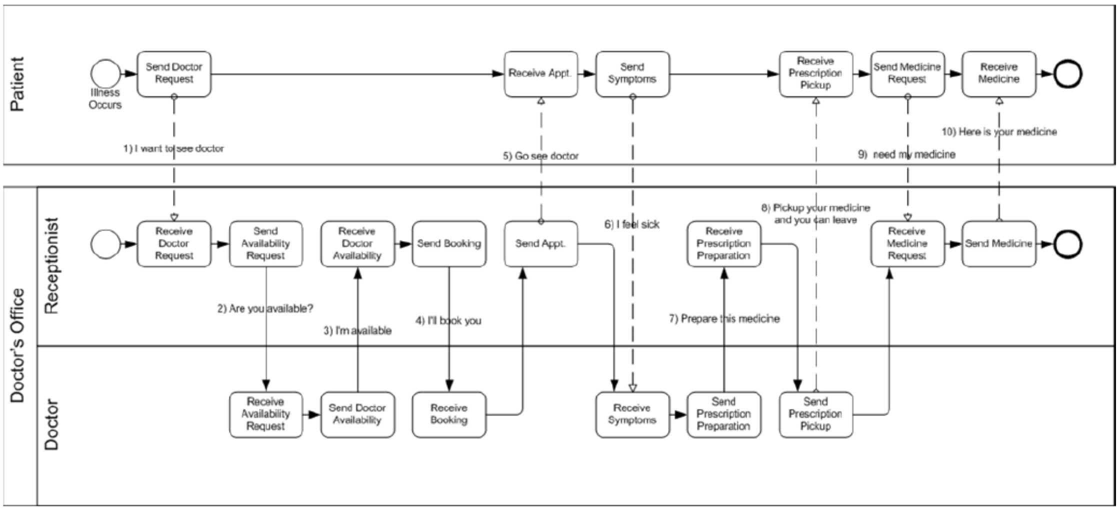


Figure 3: Sample BPMN Business Process Diagram

As it was listed above in the section about UML we can see almost the same components and nodes in a very similar implementation in the BPD. The main differences between the two figures are the axis of the model and the number of pools we use. Here we define a separate pool with a single lane for the patient and another one for the doctor's office with two lanes inside one for the receptionist and one for the doctor. The main reason for this grouping is that these actors do not belong to the same logical collection. In multi-pool model we must use another flow type for interaction between pools which is the message (dashed arrow). Although we do not see any decision points in this model it is not necessarily less complex than the one for UML AD because for instance there are more activities and in this process we can find some minor parallel tasks as well.

2.4.4 Agent based workflow model

Ming-Piao Tsai and Tung-Jung Hsieh presented an agent based workflow model and its application for the development of cooperative and concurrent product design (Tsai & Hsieh, 2006). Concurrent engineering (CE) has emerged as a key point in enhancing the competitiveness of a product development. CE is a business strategy which replaces the traditional product development process with one in which tasks are done in parallel and there is an early consideration for every aspect of a product's development process. Product design is involved in complicated interaction among multidisciplinary design teams in a distributed, heterogeneous and dynamic environment, including communication, cooperation, coordination and negotiation (Shen, Nome, & Barthes, 2000). Design tasks and activities are interrelated workflow process, so team members must collaborate and corresponding computerized platform must interact at some tasks of executing a design process. To serve these needs Collaborative Product Development (CPD) was introduced as an integration tool and it has become a popular approach among manufacturing companies. Ming-Piao Tsai and Tung-Jung Hsieh adopted the WARP approach (Workflow Automation through Agent-Based Reflective Processes, WARP) (Blake, 2000) to build the agent based workflow model for the integration of CE and CPD. This workflow model consists of three levels:

- a global level to enable product designers to define and create a product development process,
- a concurrent operational level to support product development in parallel,
- a cooperative environment platform module for the implementation of concurrent design process.

The WARP approach defines a set of object oriented representations in UML. WARP is a semi-automated approach to provide information for the user (workflow designer) about reflective 3rd party components through the process of introspection. A reflective language has a base language and a meta-language describing that base language, which offers a possibility for a designer to learn about a component without having the actual source code during the process of introspection. The overall workflow architecture for the integration of the CE and CPD technology is shown here:

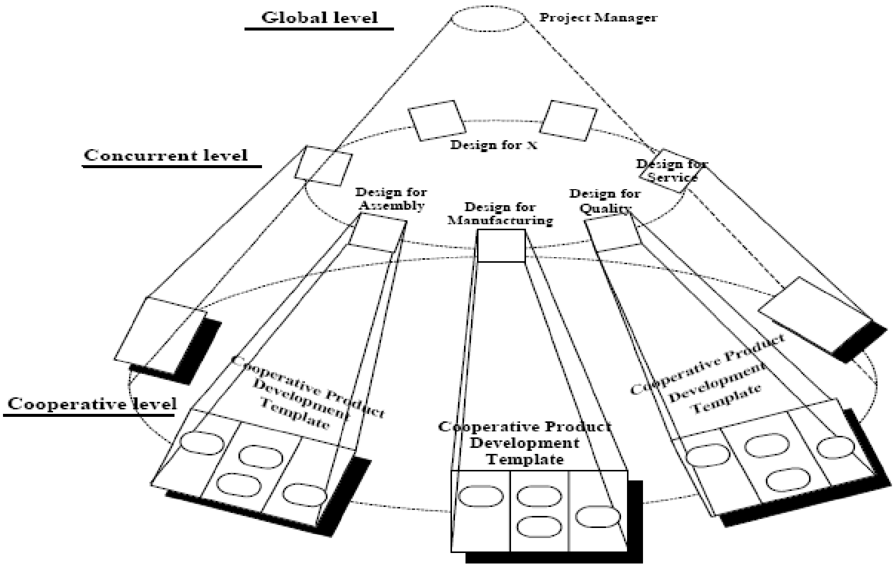


Figure 4: The overall workflow architecture for the integration of concurrent engineering and cooperative product development (Tsai & Hsieh, 2006)

The architecture is divided into three levels including global level, concurrent level and cooperative level. At the global level, the workflow designer can pre-define or modify the product design process from the user interface. In concurrent level, many product development issues, like design for assembly, design for manufacturing, design for cost, design for quality (DFX issues), etc. is done, which often are of great concern and decision in CE. The implementation of CE begins by creating an organizational environment that facilitates communication, collaboration and discussion not just between individuals, but also between separate organizations and other stakeholders. These needs are supported by the CPD environment, which is implemented for each DFX issues in third cooperative level. The WARP architecture (Figure 5) consists of software agents that can be configured to control the workflow operation of distributed services. Agent is a software object in this context that imitates the role of a competent personal assistant to perform a specific task on behalf of a user intelligently or not, independently or with little guidance.

WARP architecture is divided into two layers; these are the automated configuration layer and the application coordination layer. Initially, workflow designer can design the product design process from the user interface. The Global Manager agent and Site agents are automatically configured into the application coordination layer so that the Role Manager Agent (RMA) and the Workflow Manager Agent (WMA) is configured out according to the dependency relationships between the workflow of the services.

One of the most significant advantages of separation is that CPD template can be defined for specific remote services on the Web but independent of specific projects.

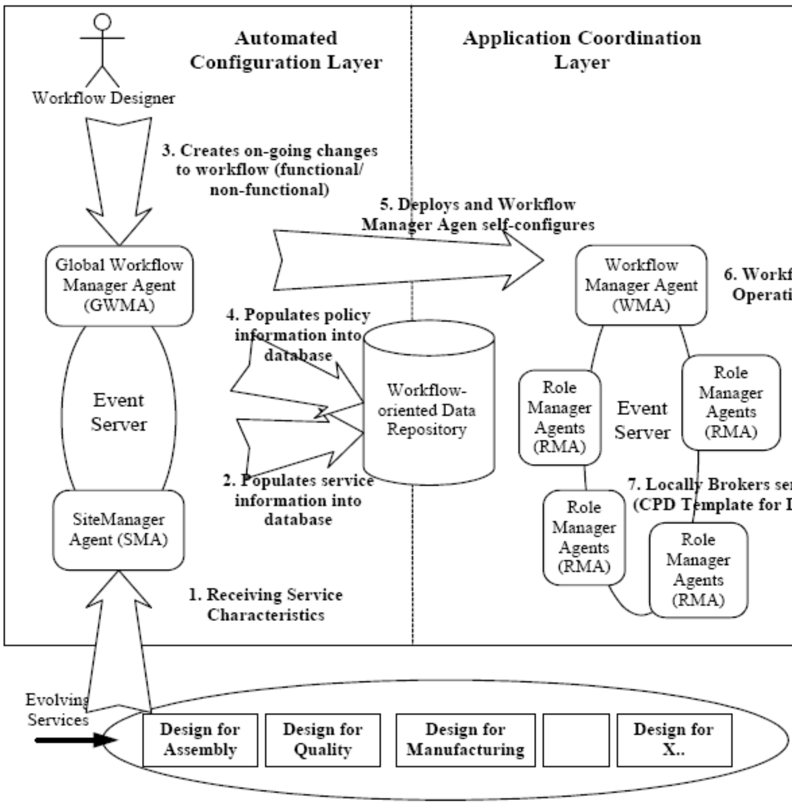


Figure 5: WARP architecture and configuring process (Tsai & Hsieh, 2006)

Design patterns (Figure 6) enable the reuse of proven design expertise. The purpose of a pattern is to capture this design expertise in a form that people can use effectively. The CPD template is a layered architecture pattern composed of three modules including: a scheduler, a register and a forum. The scheduler is responsible for creating the workflow sequence of specific service (e. g. one of the DFX issues) when the initial message is received by the Role Manager Agent, and a message then be mailed to the relative conferee. The register is a registration mechanism by which conferee register and un-register themselves to the forum state table in the information log. The forum is a discussion platform on which the relative conferees can focus on the issues of the specific service and talk to each other.

The special characteristics of the above discussed agent based workflow model is, that WARP approach was adopted and integrated the concept of agents into workflow management.

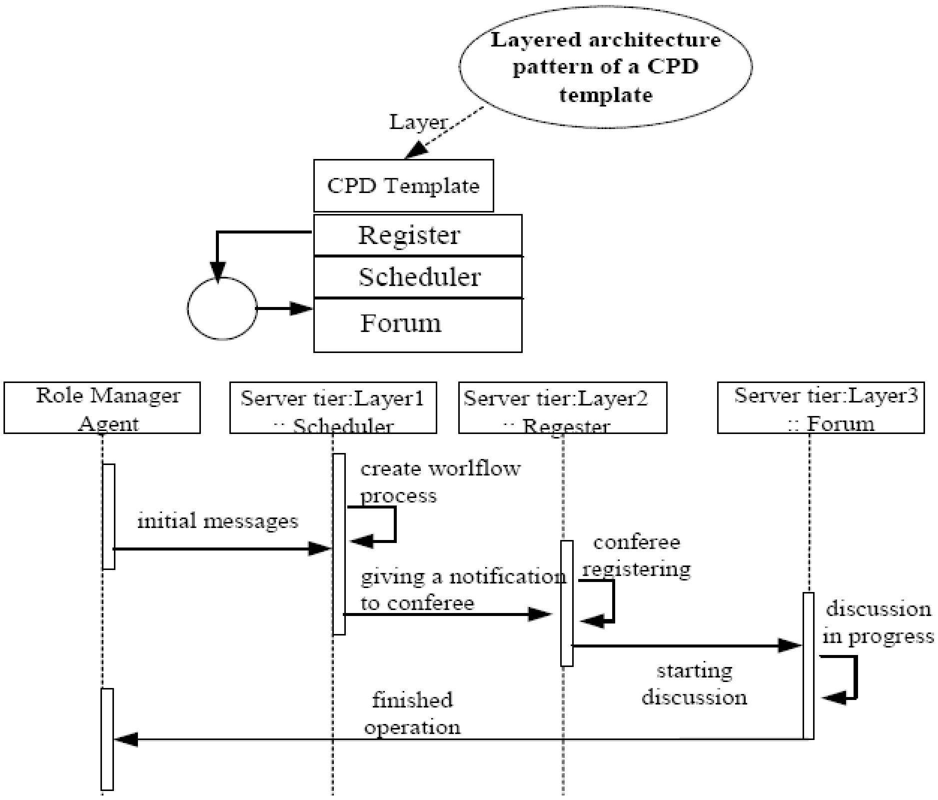


Figure 6: The design pattern framework for CPD template (Tsai & Hsieh, 2006)

2.4.5 EPC

The Event-driven Process Chain (EPC) model enables the creation of consistent descriptions and visualizations as well as content- and time-related dependencies for all open corporate tasks. Connections between tasks are based on events that trigger the task and the events the fulfillment of the task itself triggers. Basically there are two types of this model: the "slim" EPC includes only time-related and logical process aspects while the "extended" Event-driven Process Chain (eEPC) model integrates static connections amongst functions, data elements and the product, service and organizational views too.

EPC was developed in the early 1990's by the Institute for Information Systems (Iwi) of Saarland University, Germany. It is an integral part of ARIS and SAP R/3 systems (Ryan K.L., Stephen S.G., & Eng Wah, 2009).

The main strength of EPC lies in its simplicity which made it popular amongst business analysts, even though it's not a well-defined system from a semantic or syntactic point of view (Lin, 2008).

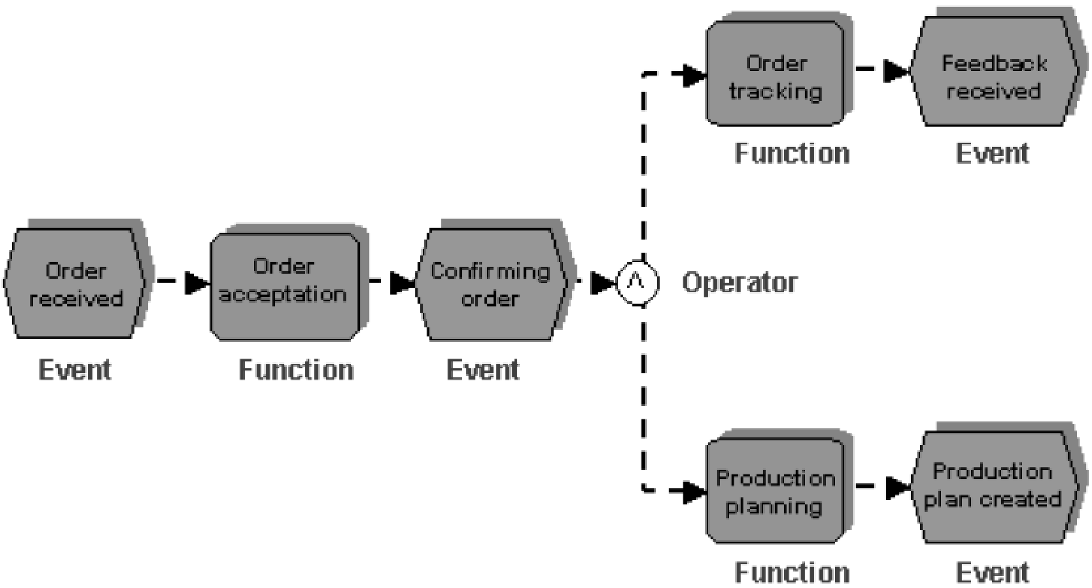


Figure 7: Sample ordering process in EPC (Lin, 2008)

As it appears on (Figure 7) events and functions are interlaced one after the other. In case of eEPC input, output, references, responsibilities etc. can be added.

The sample depicts an ordering process. A new order is received, then it gets accepted and confirmed. After that order tracking (followed by feedback reception) takes place parallel to production planning (followed by the creation of a production plan).

It is also a huge advantage in this model that we can easily interlace processes in a way that the last step of a process is an event that triggers another process.

3 Ontologies

This section provides an overview about the theoretical background of ontologies, including development methods and languages as well. I will discuss the role of ontologies in semantic business process management, emphasizing the opportunity to embed process structure information in ontologies.

Ontologies are state-of-the-art constructs to represent rich and complex knowledge about things, their properties, groups of things, and relations between things. The use of web-based ontologies and their contribution to business innovation has received a lot of attention in the past years (Cardoso, Hepp, & Mytras, 2007). Ontologies provide the means to freely describe different aspects of a business domain, basically provide the semantics and they can describe both the semantics of the modeling language constructs as well as the semantics of model instances (Murzek & Kramler, 2006). With web-based semantic schema such as the Web Ontology Language (OWL) (McGuinness & van Harmelen, 2004), the creation and the use of specific models can be improved, furthermore the implicit semantics being contained in the models can be partly articulated and used for processing. Apart from the representation of business domains, ontologies are utilized in many other practical areas of software development from 3D construct definition to software localization and internationalization. The generation, processing and visualization of ontologies are supported by an extensive set of tools and frameworks. In the classification of ontologies, I will rely on Andrea Kő's work conducted at our faculty (Kő & Tapucu, 2010).

Concept of ontology is used in many different senses and sometimes in a contradictory way. The word has a Greek origin – it was originally composed of the words being + discipline. It became popular as philosophical tendency, where ontology is a nature and organization of being. In information technology the concept is used in a different way. The following definition is the most cited one in the literature:

“An ontology is an explicit specification of a conceptual model (conceptualization)” (Gruber, 1993).

This definition emphasizes the explicit specification, which make ontologies proper solutions for machine processing. One of the main goals of using ontology is to give a formal description of a specific domain, a task or an application. For that reason the use of ontological approach has been popular in the development of knowledge-based systems. Schreiber and his colleagues definition is based on the ontology building process in KACTUS project (Schreiber, Wielinga, & Jansweijer, 1995):

“Ontology provides the means for describing explicitly the conceptualization behind the knowledge represented in a knowledge base.”

Another approach for ontology building is to reuse parts of large ontologies (Swartout, Patil, Knight, & Russ, 1996):

“An ontology is a hierarchically structured set of terms, for describing a domain that can be used as a skeletal foundation for a knowledge base. In this way the same ontology can be used for creating several knowledge bases, which can share the same taxonomy”.

Another aspect, which is important during the discussion of ontologies is the shared specification:

“Ontology is the term used to refer to the shared understanding of some domain of interest”(Uschold & Grüninger, Ontologies: Principles, methods and applications, 1996).

Shared understanding has a key role from knowledge management view, because it can enhance knowledge transfer and sharing in the companies. These two features (shared understanding and explicit specification) are combined in the following definition:

“An ontology is a formal explicit specification of a shared conceptualization”(Uschold & Grüninger, Ontologies and semantics for seamless connectivity, 2004.).

The conceptual model or the conceptualization is a kind of ideology in the wider sense; it reflects the mind of the specific domain. The ontology may appear in different forms but it has to contain the terms, terminology and semantics of the domain. It always is the appearance of collective specific domain interpretations that helps communication between the parties concerned. This common base enables the correct and successful information exchange that provides possibilities for reusability, public use and operation.

There are diverse, known classifications of ontologies. Guárico distinguished the following categories (Guarino, 1995.):

- **Top-level ontology**: it describes general notions that are domain; task and application independent like e.g. the space, time etc. It supports the combination and integration of the ontologies. One example is the ontology developed by (Sowa, 2000).
- **Domain ontology**: it contains the description of the vocabulary associated to a generic domain, according to specializing top-level ontology. Such a specific domain is e.g. the medicine, the geology, the farming, the finances that are treated irrespectively of tasks and problems, which can be correlated with the domain.
- **Task ontology**: it comprises the description of an activity or a task, according to the specification of the top-level ontology. Its subject is the problem solving.
- **Application ontology**: the most special ontology that corresponds to a specialization of the domain ontology or the task ontology for any concrete applications.

As we will discuss it later, my aim is to enhance this classification with the concept of **Process ontologies**, where ontology holds the structural information of processes with multi-dimensional met information partly to ground the channeling of knowledge embedded in domain ontologies.

According to the categorization discussed-above, the most important dimensions used for the characterization of ontologies are the following:

- Formality: the degree of formality that is used to formulate the terminology catalogue and the definitions of words,

- Goal: for what purpose the user wants want to use the ontology;
- Domain: the nature of specific domain that is written in the ontology.

Categories of formality:

- Non-formal: explained in informal way and formulated in natural language;
- Structured informal: it is written in structured and constrained form of natural language, what increases the intelligibility and decreases the ambiguity (e.g. the text variant of the ‘Enterprise Ontology’);
- Semi-formal: description in an specification language (e.g. the Ontolingua version of the ‘Enterprise Ontology’);
- Rigorously formal, strict: determined in terms of formal semantics, theorems and proofs of such properties as consistency and completeness of theory (e.g. TOVE).

In my work I try to limit myself to the use of semi-formal or formal categories, since automatic or semi-automatic processing of the ontologies, in other words, the ability for applying machine reasoning is directly proportional to the level of formality.

Viewing ontologies from another angle, they serve as application dependent “intermediary languages” for describing a business domain. Based on the above, we can distinguish the next three categories of ontologies application:

- Communication: between humans - informal, unambiguous ontology can be used for these purposes.
- Cooperation: between systems - it means translation among different tools, paradigms, languages and software instruments. In this case the ontology is the basis of the data change.
- System design and analysis - the ontology can support the analysis and design of software systems with submitting a conceptual description.

Concluding this effort of categorization, I cannot exclude the justification for selecting ontologies as a medium of managing structured knowledge. The most advantageous properties of ontologies are:

- Reusability: the ontology is the root of the formal description and coding of the most important entities, attributes, process and its internal relations. This formal description provides (maybe through automated translation procedure) the reusability and the common or shared use inside the given software.
- Knowledge acquisition: speed and reliability of knowledge acquisition can be accelerated, if ontology can be used for analysis or knowledge base creation.
- Reliability: automatic verification of consistency can be assured by the formal description.
- Specification: ontology enables the analysis of requirements and the determination of information systems specification.
- Standardization: top-level ontologies can be used well in different situations. New types of task and application ontologies can be derived from these top-level models with specialization.

There are several basic rules related to the design of the ontologies, but all include the determination of

1) ontology development methodology,
2) ontology language and
3) ontology development environment (tool).

3.1 Ontology development methodologies

This section summarizes the most popular methodologies and provides criteria to compare and assess them. The ontology development has to be a repetitive, iterative process, because the users have to reach a consensus about it. The literature describes several types of methodology that aim expressly in the planning of ontology (Jones, Bench-Capon, & Visser, 1998). The most often cited methodologies are the following:

- CommonKADS (Schreiber, Akkermans, Anjewierden, de Hoog, Shadbolt, & Van de Veld, 1998)

- TOVE (Fox & Grüninger, 1998)
- Uschold and King methodology(Uschold, King, Moralee, & Zorgios, 1998).
- On-To-Knowledge (Fensel, van Harmelen, & Davies, 2003)
- Methontology (Fernández-López, Gomez-Perez, & Juristo, 1997)
- Sensus (Ontoweb, 2002).

3.1.1 CommonKADS

The fundamental design principles of CommonKADS were the modular design, the redesign and the reuse (Schreiber, Akkermans, Anjewierden, de Hoog, Shadbolt, & Van de Veld, 1998). The discipline of modular design can be derived from the discipline of reuse, that's why the ontology designers generally accept it. On the basis the principle to reuse ontology can be constructed from a library of the existing ontologies. This requires mapping between the ontologies. Two types of mapping are distinguished for translating the vocabularies of ontologies:

1) the semantics of expressions of the mapped ontology does not change
2) the semantics of the mapped ontology changes after being interpreted by another ontology.

The selection of relevant ontologies is facilitated by an indexing schema that provides three dimensions for characterizing an interpreting the context of the use of ontology: task-type, problem-solving methods and domain-type. The base of the methodology is a set of models that consists of six model types (Schreiber, Wielinga, & Jansweijer, 1995).

- Organizational model: it contains a description of the organizational environment.
- Task model: the task is seen as a relevant subset of the business processes. The task model globally analyses the entire task, the inputs, the outputs, the resources, the conditions and the requirements of execution.
- Agent model: it represents the agents who perform processes described in the Task model.

- Communication model: it describes the communication, the information exchange, and the interaction between the agents.
- Knowledge model: it consists of an explicit, detailed description of the type and the structure of the knowledge used in the course of execution.
- Design model: the above models determine a kind of requirement specification for the knowledge-based systems. Based on these requirements the design model defines a technical system specification.

CommonKADS has its own conceptual language, CML (Conceptual Modeling Language). CML is a semi-formal language (including the determination of ontology) for the specification of CommonKADS knowledge models. It contains textual description and graphic representation.

3.1.2 TOVE

TOVE ontology development methodology has been constructed within the frameworks of the Toronto Virtual Enterprise research project (Ninger & Fox, 1994). The TOVE methodology proposes the following layers of ontology development:

- motivating scenarios: these scenarios are considered the staring points to reveal a set of problems within an organization. They often appear in the form of story problems.
- informal competency questions: the requirements are based on the motivating scenarios.
- terminology specification: the formal description of the attributes, objects and relations of an ontology (often in the form of first order predicate calculus).
- formal competency questions: the formally defined terminology is used to formalize the requirements of the ontology.
- axiom specification: the axioms determine the terms and constrains on their interpretation (are often given in first-order logic)

- completeness theorems: an evaluation period determines the conditions that provide the solutions for the competency questions of the ontology that will be complete.

3.1.3 Uschold and King methodology

Uschold, King, Moralee and Zorgios have developed an enterprise ontology that can be a framework of the organizational modeling (Uschold, King, Moralee, & Zorgios, 1998). They gave formal and informal description of the ontology, and discussed motivations of the ontology development. Based on their study, the primary goal of an ontology development is to improve business planning, to enhance flexibility, to have more efficient communication and integration and to adapt to the changing business environment. The primary purpose of the enterprise modeling is to offer an enterprise-wide view of an organization that serves as a basis for decision-makings. It views the organization not in traditional way but from the viewpoint of such fields in which the organization operates. Ontolingua was applied as ontology language in Uschold and his colleagues work.

3.1.4 On-To-Knowledge

On-To-Knowledge methodology applies an integrated approach that is built on knowledge management experiences and practical knowledge, and put them in a wider organizational perspective (Fensel, van Harmelen, & Davies, 2003). Main phases of ontology development are the following:

1. Requirements analyses

This phase is about the determination of requirements against ontology, which include the following tasks:

- Identification the domain and the goal for the ontology (based on mainly the users input)

- Determination of design guidelines

  In this phase shaping and construction principles of ontology are detailed (it is affected by the type of the ontology, the implementation tool, method for knowledge acquisition).

  Contains estimation of the complexity of the ontology (how many concepts will be include); estimation is based on the knowledge item analysis
- Allocation of knowledge resources

  Reusability of existing ontologies and knowledge models are investigated; relevant legislation and documentation is analyzed; clarification of knowledge elicitation and acquisition is determined
- Listing of users and usage scenarios

  Potential users identify the way of usage and determine the applications supported by the ontology

2. Terminology specification

Formal description of objects, their attributes and relations.

3. Formalization

Formal description of the ontology, used one of the ontology modeling language (e.g. OWL).

4. Evaluation

In this phase the following aspects have to be examined:

- The ontology satisfies the requirements specification?
- The ontology was built according to the specification?
- The prototype satisfies the desired functionality.

5. maintenance and further improvement

This is mainly an organizational process. Strict regulation is needed for maintenance of ontology (modification, deletion, update etc.) and version control. Roles related to maintenance have to be assigned.

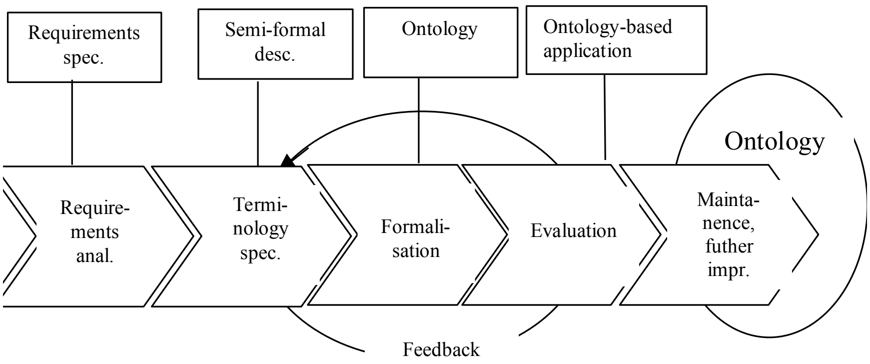


Figure 8: Ontology development process according to the On-To-Knowledge methodology, (Fensel, van Harmelen, & Davies, 2003)

3.1.5 Methontology

Methontology is another popular approach in ontology development (Fernández-López, Gomez-Perez, & Juristo, 1997). It was created in the Artificial Intelligence Lab of the Technical University of Madrid (UPM), for building ontologies either from scratch, reusing other ontologies as they are, or by a process of reengineering them. Stages of the methodology are the following (they are considered as the phases of the ontology life cycle):

- **specification**: This stage is the preparation for the ontology development. Its purpose is to determine the degree of formality, the set of intended users, the scope of the ontology and to formulate the goal of the ontology. The product of this phase is a specification document in a natural language.
- **knowledge acquisition**: This activity can be achieved in line with the specification, using any type of knowledge source and processing, gathering methods, but the methodology emphasizes the importance of the expert interviews and analyses of texts.
- **conceptualization**: It describes the domain terms as concepts, individual instances, verbs relations or properties and it represents them by an informal representation.

- **integration**: In order to support the reuse of the ontologies it can be a good idea to examine the possibility of using definitions from other ontologies.
- **implementation**: In this period the ontology is formally represented in a language e.g. in Ontolingua.
- **evaluation**: This is an emphasized stage of Methontology. Its procedures are based on the techniques used in the verification and validation of the knowledge-based systems. It gives guidelines for revealing incompleteness, inconsistencies and redundancies.
- **documentation**: collecting documents resulting from other activities.

3.1.6 Sensus

Sensus is an ontology for use in natural language processing and was developed at the ISI (Information Sciences Institute) natural language group to provide a broad-based conceptual structure for developing machine translators. Sensus has more than 50,000 concepts organized in a hierarchy, according to their level of abstraction. It includes terms with both a high and a medium level of abstraction.

According to the approach, during the development of an ontology in a particular domain, the following steps are taken (Fernández-López M. , Overview Of Methodologies For Building Ontologies, 1999):

1) A series of terms are taken as seed.
2) These seed terms are linked by hand to Sensus.
3) All the concepts in the path from the seed terms to the root of Sensus are included.
4) Terms that could be relevant within the domain and have not yet appeared are added.
5) Finally, for those nodes that have a large number of paths through them, the entire subtree under the node is sometimes added.

Fernández-López et al. offered the following criteria to compare and assess ontology development methodologies (Fernández-López, Gómez-Pérez, & Rojas, Ontology's crossed life cycles, 2000):

- Inheritance from Knowledge Engineering
- Detail of the methodology
- Recommendations for knowledge formalization.
- Strategy for building ontologies
- Application-dependency
- Strategy for identifying concepts
- Recommended life cycle
- Recommended techniques
- How widespread is the set of ontologies that have been developed using the methodology
- What systems have been built using these ontologies

Additional aspects are the possibility of collaborative and distributive construction, that is, to what extent the methodologies permit different groups at different sites to work together to build ontologies (Fernández-López, Gómez-Pérez, & Rojas, Ontology's crossed life cycles, 2000).

3.2 Ontology languages

In the context of my research, process models as process knowledge resources can be disseminated through the Web. The Web can be viewed as a large distributed repository for the process models. However, distributed models are originally from different autonomous systems and stored in various schemas. Technologies facilitating interoperability of heterogeneous models such as ontology and semantic annotation, are required when organizing the knowledge in such a repository.

The Semantic Web domain has given us ontology language standards such as RDF and OWL to support the semantic interpretation. The knowledge representation of process models needs to be transformed into those Semantic Web standards.

I am not planning to undertake a thorough presentation of current standards, just to give a short overview of some of the characteristics of the languages I am planning to build upon.

3.2.1 RDF, RDFS

RDF (Resource Description Framework) is a way to define a triple 'subject', 'predicate', 'value' or 'subject', 'predicate', 'object' to describe a single fact. Generally URI's are used for the subject and predicate. The object is either another URI or a literal such as a number or string. Literals can have a type (which is also a URI), and they can also have a language.

RDFS (RDF Schema) defines some classes which represent the concept of subjects, objects, predicates etc. This means that we can initiate statements about classes of thing, and types of relationship.

3.2.2 OWL

The OWL Web Ontology Language (McGuinness & van Harmelen, 2004) is designed for use by applications that need to process the content of information instead of just presenting information to humans. OWL facilitates greater machine interpretability of Web content than that supported by XML, RDF, and RDF Schema (RDFS) by providing additional vocabulary along with a formal semantics.

Building upon RDF and RDF-S, OWL provides more machine-interpretable semantics by defining additional vocabulary along with formal semantics. OWL builds on Description Logics which is a restriction of First Order Logic. OWL provides three increasingly expressive sublanguages: OWL Lite, OWL DL (Description Logics), and OWL Full. Each of these sublanguages is an extension of its simpler predecessor. Compared to the other two sublanguages, OWL DL is often chosen as the ontology modeling language because of its capacity of fair semantics expressiveness and inference. Most available OWL reasoners support OWL DL.

An OWL ontology usually consists of classes, properties, instances of classes, and relationships between these instances. Instances of classes in OWL are called individuals. OWL classes are described through "class descriptions", which can be combined into "class axioms". With class axioms, OWL Lite can represent generalization (rdfs:subClassOf), equality (owl:equivalentClass). Besides, OWL DL can specify classes as logical combinations of other classes (owl:intersectionOf, owl:unionOf, owl:complementOf), or as enumerations of specified objects (owl:oneOf) or as distinction of two classes (owl:disjointWith).

OWL distinguishes between two main categories of properties — object properties (owl:ObjectProperty) to link individuals to individuals and datatype properties (owl:DatatypeProperty) to link individuals to data values. Properties can be specified through domains (rdfs:domain) and ranges (rdfs:range). More property axioms are supported by OWL are sub-property (rdfs:subPropertyOf), equivalent property (owl:equivalentProperty), inverse property (owl:inverseOf), functional property (owl:FunctionalProperty), transitive property (owl:TransitiveProperty), symmetric property (owl:SymmetricProperty) and etc. An arbitrary number (zero or more) of values for a property is represented by cardinality constraints (owl:maxCardinality, owl:minCardinality, and owl:cardinality). Value constraints (owl:allValuesFrom, owl:someValueFrom and owl:hasValue) specify the quantifier restriction of a property.

OWL individuals are specified through the class axiom rdf:subClassOf. The identity of individuals can be stated by referring to the same individual (owl:sameAs), or referring to different individuals (owl:differentFrom), or listing all different individuals (owl:AllDifferent).

3.2.3 OWL-S

OWL-S is an ontology of services that provides users and agents with the possibility to discover, invoke, compose, and monitor Web resources offering particular services and having particular properties (Martin, Burstein, Hobbs, & Lassila, 2004). The motivations of the applications of OWL-S are automatic Web services discovery, automatic Web services invocation and automatic Web service composition and interoperation.

Three essential types of knowledge about a service can be described with OWL-S:

- advertising information for prospective clients by ServiceProfile,
- process model by ServiceModel, and
- transport protocols by ServiceGrounding.

A process represented by the ServiceModel is a specification of the ways that a client may interact with a service. The process ontology is a set of concepts and relationships which are used to represent a ServiceModel.

In the process ontology of OWL-S, the operational/functional perspective is represented through process classes, parameter classes, their subclasses, and their relations. Distinguished subclasses of process — atomic process, simple process and composite process depict the structural perspective. A set of control constructs connecting processes support the control perspective. The organizational perspective is included by specifying the class participant in a process. The data transaction perspective is implicitly represented through the effect (the class result) of a process. The resources perspective is not specified in the process ontology although it might be inferred by linking the parameters to a resource class which is defined separately from the process ontology.

3.2.4 Comparison of Ontology Languages

Corcho and her colleagues compared ontology languages (Corcho, Fernández-López, & Gómez-Pérez, 2003), results are summarized in Figure 9. That table doesn't contain OWL, because it wasn't a matured language in that time. I extend their conclusion with OWL-related information. The symbol + means in the table, that the feature is supported by the language, the symbol - means that the feature is not supported by the language, and the symbol ± means that the feature is not directly supported by the language but it can be represented using a workaround. Concepts, organized in taxonomies, binary relations and instances are the only components that can be represented in all of the presented languages, additionally in OWL. Functions can be defined in Ontolingua, LOOM, OCML, OIL, DAML+OIL and OWL. Formal axioms can be defined in Ontolingua, LOOM, OCML, OWL and FLogic. Finally, rules can be defined in LOOM and OCML and OWL too.

	Onto-lingua	OCML	LOOM	FLogic	XOL	SHOE	RDF(S)	OIL	DAML
Concepts									
General issues									
Metaclasses	+	+	+	+	+	−	+	−	−
Partitions	+	±	+	±	−	−	−	+	+
Documentation	+	+	+	±	+	+	+	+	+
Attributes									
Template (instance attributes)	+	+	+	+	+	+	+	+	+
Own (class attributes)	+	+	+	+	+	−	−	+	+
Local scope	+	+	+	+	+	+	+	+	+
Global scope	±	±	+	−	+	−	+	+	+
Facets									
Default slot value	−	+	+	+	+	−	−	−	−
Type constraint	+	+	+	+	+	+	+	+	+
Cardinality constraints	+	+	+	±	+	−	−	+	+
Slot documentation	+	+	+	−	+	+	+	+	+
Taxonomies									
Subclass of	+	+	+	+	+	+	+	+	+
Exhaustive subclass partitions	+	±	+	±	−	−	−	+	+
Disjoint decompositions	+	±	+	±	−	−	−	+	+
Not subclass of	±	−	±	−	−	−	−	+	+
Relations and functions									
n-ary relations/functions	+	+	+	±	±	+	±	±	±
Type constraints	+	+	+	+	+	+	+	+	+
Integrity constraints	+	+	+	+	−	−	−	−	−
Operational definitions	−	+	+	+	−	−	−	−	−
Axioms									
First order logic	+	+	+	+	−	±	−	±	±
Second order logic	+	−	−	−	−	−	−	−	−
Named axioms	+	+	−	−	−	−	−	−	−
Embedded axioms	+	+	+	−	−	−	−	−	−
Instances									
Instances of concepts	+	+	+	+	+	+	+	+	+
Facts	+	+	+	+	+	+	+	+	+
Claims	−	−	−	−	−	+	±	±	±

Figure 9: Table Comparison of Ontology Languages

3.3 Ontologies in Semantic Interoperability

3.3.1 Semantic Business Process Management

The main challenge in Business Process Management is the continuous, two-way translation between the business requirements view on the process space and the actual process space, constituted by the IT systems and resources. Semantic Business Process Management (SBPM) is a new approach of increasing the level of automation in the translation between these two levels, and is currently driven by major players from the BPM and Semantic Web Services domain. (Ternai & Török, 2011)

Business Process Management is the approach of managing the execution of IT supported business operations from the managerial process view. BPM should provide a uniform representation of a process at a semantic level, which would be accessible to intelligent queries or for compliance checks (Weber, 1997). It is expected, that the BPM notation should cover every aspect of the characterized processes available at the managerial level.

Semantic process management was created with the purpose to overcome the obstacles of standard BPM techniques, and also to incorporate its principles with semantic technologies, primary with the ontology-based development. Hepp at. al, along with Koschmider and Oberweis identified the challenge in traditional process management, that it only contributes models for the business experts and managerial level, completely lacking or only marginally addressing technical details of implementation. This way process models are inadequate for automatic machine processing, working implementations are only possible after further supplementary transformation (Hepp, Leymann, Domingue, Wahler, & Fensel, 2005; Koschmider & Oberweis, 2008). The main focus of semantic process management is consequently the narrowing of the gap between the business and IT views of organizational phenomenon with the utilization of semantic technologies such as ontologies, reasoning mechanisms and semantic webservices. Hepp et al. did not demonstrate concrete applications, only introduced a theoretical framework.

There is a considerable advance in the past decade in the domain of SBPM, many experimental projects have been concluded successfully. The unambiguous and rapid alignment between process models and IT solutions is targeted by the SUPER project, one of the most extensive R+D project under the FP7 initiative of the European Union (Semantics Utilised for Process Management within and between Enterprises) (Belecheanu, és mtsai., 2007). Another result of this effort is the development of the Web Service Modeling Ontology (WSMO) (Fensel, és mtsai., 2006), as well as the Semantic Business Process Execution Language (SBPEL).

Several approaches have been discussed to enhance both the act of creating conceptual models as well as the execution of the models by using semantic schema in the area of business process management (Hepp, Leymann, Domingue, Wahler, & Fensel, 2005). The paradigm of current SBPM research is to provide as much compatibility to existing tools and standards as possible. This means, that processes behind of a business model should be represented in terms of SBPM environment, and it should be possible to create executable processes configured within an SBPM environment.

During the phases of development and implementation, conceptual models are used to support the requirements engineering process. Furthermore, conceptual models facilitate tasks such as the exploration, negotiation, documentation, and validation of requirements. This allows exploring and correcting possible errors at an early stage (Wand & Weber, 2002). Conceptual modeling captures the semantics of an application through the use of a formal notation, but the descriptions resulting from conceptual modeling are intended to be used by humans and not machines. The conceptual foundations of these approaches show several similarities, but the actual realizations on various technical platforms are not discussed in detail. The realization of the alignment of conceptual models and semantic schema on a technical level needs to be elaborated in details. Our approach tries to provide a feasible implementation pattern based on the extension of process ontologies to resolve this issue.

3.3.2 Process ontology

Ontologies, as general but formalized representation can also be used for describing the concepts of a business process. We attempt to undertake this task and provide an extension for the standard ontology definition in the form of an annotation scheme to enable ontologies to cover all the major aspects of business process definition. From now on, we refer to ontologies as process ontologies (Török & Leontaridis, 2011).

According to our current knowledge, process ontologies have no precise definition in academic literature. Some refer to it simply as a conceptual description framework of processes. (Herborn & Wimmer, 2006). In this interpretation process ontologies are abstract and general. Contrary, task ontologies determine a smaller subset of the process space, the sequence of activities in a given process (Benjamins, Nunes de Barros, & Valente, 1996).

In our approach, a formal process ontology is a domain ontology built upon the knowledge domain of processes. Ontology definition is the key element in turning process models into working software, providing a visual and textual representation of the processes, data, information, resources, collaborations and other measurements. We are primarily interested in the automatic generation of workflow systems based on BPM defined ontologies, while preserving the capability of discussion with non-technical users. The core paradigm of our approach is to represent the business incentives extended with all the implementation details of processes using ontology languages and to employ machine reasoning for the automated or at least semi-automated translation. We discuss how to establish the links between model elements and ontology concepts in order to realize reusability. Automatic generation of workflow processes allows us to redeploy processes in a flexible manner whenever business requirements change. This method also permits interoperability between different implementation frameworks supporting the process ontology annotation scheme.

3.4 Modeling environment conclusion

The business process models I capture in the case study of the thesis is being realized using the BOC ADONIS modeling platform (ADONIS Process Portal, 2013). I have selected this modeling platform because of its popularity in modeling practice, however it is very likely to be principally transferable to other semi-formal modeling languages.

Main application area of ADONIS is Business Process Management. The modeling platform is a business meta-modeling tool with components such as modeling, analysis, simulation, evaluation, process costing, documentation, staff management, and import-export. Its main feature is its method independence. ADONIS is a graph-structured Business Process Management application. The integral model element is the activity.

From the modeling standard point of view, ADONIS incorporates the Event-driven Process Chain (EPC) model described in 2.4.5.

The process models are principally transferable to other semi-formal modeling languages, it is capable to manage both RDF and OWL schemas.

ADONIS also supports the RACI model for identifying roles within the processes and associate them with the process activities.

My choice as the basic ontology editor is Protégé from Stanford (Stanford, 2013). Protégé is an open-source ontology editor and framework for building intelligent systems. It supports both RDF and OWL languages. I use it for both visualization and manual editing purposes.

4 Knowledge extended process modeling

The current chapter describes the proposed solution for capturing every aspect of a business process, extended with the identification and mapping of the knowledge items. The modeling procedure set forth in this section is applied in the case study of the thesis.

4.1 Initial modeling of processes

The basis of my multi-lateral approach is general control-flow oriented business process models. The process modeling starts with the close observation of an existing, real-life process at the given organization. The first step is to conduct interviews with all of the stakeholders of the process to be captured at the company, assess already existing process documentation, document the process development meetings and materials prepared during the actual project. A thorough inspection of the underlying IT infrastructure is also necessary.

The ever-recurring problem of capturing processes is the level of granularity. Setting this appropriate level can be thought of as an optimization problem in itself. If a process model is too superficial, it will not contain enough information to draw conclusions, conduct redesign or utilize it in any other ways. A modeling architecture with unnecessarily frittered details or a model with inhomogeneous granularity results in a confusing process architecture, and consumes unnecessary resources to create, maintain and manage. Ternai et al. collects the parameters have to be set in order to use a process model as a base of semantic transformations (Ternai, Szabó, & Varga, Ontology-based compliance checking on higher education processes, 2013), I abide myself to the guidelines in this work. The level of granularity in modeling a process is set to grant the ability to attach corresponding concepts like roles or information objects to the model.

At this point, the process structure, and meta-information for the IT and organizational viewpoints are recorded, all relevant information resources are elaborated, but organizational knowledge is unstructured, hard to identify and has various, heterogeneous sources.

4.2 Complementary modeling layers

After finalizing the basic process flow, the specific activities within the process model have to be aligned with roles and responsibilities. We capture a view of the inner stakeholders of the organization. We start by collecting all the roles that are related to the given process, and gradually examine, which roles have any relation with a given activity. This task is carried out on the theoretical ground of the RACI responsibility matrix. We determine, which are the explicit roles being played by which stakeholder at the level of a given activity. More precisely, we define according to the RACI, which role is Responsible for the performing of the activity, which role is Accountable for it, which are the roles needed to be Consulted during the execution of the activity, and who to be Informed about the advance, obstacles, completion or other information related to the given activity.

This knowledge is the basis of the proposed outcome, namely to be able to present the knowledge items required by a person in a given role, or in a broader perspective, in a given position.

There are two additional modeling dimensions that play an important part in enriching process information:

Many organizations have a well-structured IT infrastructure map, and in a higher-level process model, IT architecture elements are assigned to the process model at activity level. Modeling tools incorporate sub-models of the company's IT infrastructure. In this sub-model we define the major systems, tools or resources, which are going to play an active role in our processes, and associate these elements at the activity level of the process model.

Documents are also essential artifacts of business processes, different documents serving different roles are being created, transferred, and utilized as a source of knowledge and information. These documents have to be taken into account throughout the complete BPM lifecycle, and this way also incorporated to the process models.

4.3 Mapping of knowledge elements

As a last step of capturing the inspected processes, an overall semantic annotation is necessary to identify and connect knowledge elements of the processes at activity level. In other words, we supplement the models with every available, explicit knowledge items at activity level.

This action is carried out in three steps:

- Domain experts and practitioners provide direct, structured knowledge items at the level of activities;
- As a second layer, an accurate, thorough description of the activity is recorded which can be treated as unstructured information. The information contained in underlying, non-structured form most undergo a semantic transformation to identify the knowledge elements or concept groups.;
- The third layer relies on related documentation: guidelines, official procedures, best-practices, related legislation, etc. Acquiring knowledge element information is the most challenging in this case, the process can be aided with text-mining techniques.

Identified knowledge items can already exist in domain ontologies, in this case the mapping can be automated. In many fields of business areas general ontologies are available. If this is the case, it allows a more thorough concept building, and also results in more standardized outcomes adaptable as generalized solutions or industry level best practices. If there is no available pre-existing domain knowledge repository, the domain ontology specific to the examined organizational conduct is created. In both cases the domain ontology will hold all the knowledge item nodes that appear in processes.

As we shall see in the 6 Ontology for Insurance Domain section, nodes of the domain ontology hold the knowledge item description, which are represented by the classes of the domain ontology. In our institute's domain ontology structure, the classes Basic

Concept and Knowledge area are used, depending on the nature of the knowledge items general or particular nature respectively.

In case a pre-existing domain ontology is available, it must be imported to the modeling environments knowledge base. Concerning the modeling implementation of the semantic annotation, the first level knowledge items can be directly placed in Adonis EPC process models as information objects.

The level of granularity set forth in our initial process models needs to be preserved. It has to remain unchanged, since this granularity applies to all other modeling dimensions as well. As a heuristic rule, we can say that the semantic annotation must not alter the initial process structure, except in cases where the alteration derives from structural and not annotational grounds.

4.4 Multilateral process views – process coupling via semantic transformations

The resulting complex process models contain interconnected, multilateral information on the following areas of the recorded processes:

- process structure, process hierarchy
- organizational structure, roles and responsibilities at activity level
- mapped explicit knowledge
- IT architecture
- document structure

In order to make use of this holistic process-space, we need to apply semantic transformations to the models. The goal is to provide a machine-readable representation for further utilization in the form of ontologies.

Since the complex process models hold both process knowledge and domain knowledge, we have to conduct these transformations respectively.

Process ontology instances can be created automatically by XSLT transition. The process model hierarchy is represented in OWL format, and the additional structure of interconnected elements can also be transferred following a semantic annotation scheme. As far as my literature research extended, I have found no industry standards expressing the full requirements of such a process structure annotation, but an ad-hoc processing of such a markup is possible (Gábor, Kő, Szabó, Ternai, & Varga, 2013).

The creation of domain ontology also holds several challenges. The above described first level structured knowledge can be easily transformed into OWL ontologies, but the underlying levels need further elaboration. We are striving to provide automatic ways to create ontology knowledge elements or concept groups by means of applying text-mining techniques, but some extent of domain expert knowledge seems to be inevitable for transforming unstructured knowledge from the recorded processes. The PROKEX project intends to develop a reference architecture satisfying some aspects of automatic processing based on the multilateral process knowledge extraction of my thesis.

5 Research questions discussion

I have been conducting process modeling at different organizations both as the manager of my company Netpositive, and as a research partner of the PROKEX project. The following is a case study of the knowledge extraction method at a Hungarian insurance company. The CIG Pannónia Life Insurance Company has been our client for many years, we provide BPR, BPM services, as well as application development, IT consulting and operation services. CIG is heir in spirit to the First Hungarian General Insurance Company (Első Magyar Általános Biztosító Társaság) founded in 1857. In those days, as well as nowadays, Hungary lacked an insurance company run by Hungarian management, focusing on the Hungarian market and supported and privately financed by recognized and credible Hungarian personalities. CIG is a young, emerging player in the Hungarian insurance market, the company launched its sales activities in 2008 with its own network, independent insurance brokers, a tied-network of insurance brokers and brokerage firms.

5.1 Initial process modeling

The theoretical basis of the modeling activities is grounded on the described method in section 4.1. Modeling is accomplished with BOC Adonis BPM Suite.

Although the solution is theoretically language independent, and the final implementation is going to take place in domestic environment, duplicate models were created for English and Hungarian versions. English version was necessary to conduct experiment text-mining pilot projects for knowledge extraction.

In order to highlight the modeling process, some of the sub-models required for the EPC process model is displayed, especially concentrating on the aligning of roles with the activities.

In our current activities, we are recording more than 200 complex processes at CIG, the following excerpt I work with throughout the case study summarizes the processes related to managing insurance agents. I chose this segment of the overall process map because it holds no company specific features, it can be generally adopted and applied to any companies operating on the fields of the insurance market, though the statements might be limited by the Hungarian regulation.

For the sake of terminological clarification and helping to understand the process models, I would like to introduce the following terms and definitions:

- Insurance mediator: according to the Hungarian legislation, a person or a legal entity acting on behalf of an insurance company to provision, maintain and supervise insurance contracts between the contractors and the insurance company. A legitimate insurance mediator must be registered by a state board before legally selling insurance policies to customers.
- Captive agent: a captive agent is an insurance mediator of a sole insurance company. Simply put, the agent is licensed to sell only the products of the given company. The insurance company is obligated to register the agent at the registry maintained by state authorities, in the Hungarian case the registry is held by the Hungarian National Bank. The insurance company is liable for all the activities of a captive agent.
- Independent agent: Independent insurance agents typically represent a number of insurance companies, and sell the products that most appropriately meet the needs of their clients. Independent agents must register themselves (and their affiliates) at the official registry, and also they hold the liability for their activity instead of the insurance company. Their expertise allows them to advise their clients about appropriate amounts of insurance and insurance coverages for their particular needs. Often, independent insurance agents will work with insurance intermediaries, which obtains quotes from multiple insurance providers and passes them off to the independent agent. Working with an insurance intermediary service allows the independent agent to review many quotes and offer their clients the best policy options available.

According to the above definitions, insurance mediator is the union of captive and independent agents.

On the following pages I quickly introduce the initial process models I have captured. The detailed process models are attached to the thesis in Appendix I.

It is important to notice that at this phase of process modeling the emphasis is put on understanding clearly how the process looks like in its present condition in the organization. The outcomes of the interviews are many times ambiguous, roles are incorporated in the textual representation of process description, there is seemingly little or no reference to IT architecture elements, but knowledge objects can already be traced. Apart from these obstacles, there is usually enough information available, to define the activities, dependencies of the process structure and to construct the process model. (Please note that although defining optimal processes and process improvement is an elementary goal of process modeling, in my work I concentrate only on process structure, and identifying the linkage between knowledge element, thus putting aside questions of process optimization).

5.1.1 Sample process model I: Introduction of a captive agent into the network of the insurance company

The first process I demonstrate is the process where the proposed captive agent enrolls the company. The process starts if the agent is already selected and is willing to be accepted into the network of the insurance company.

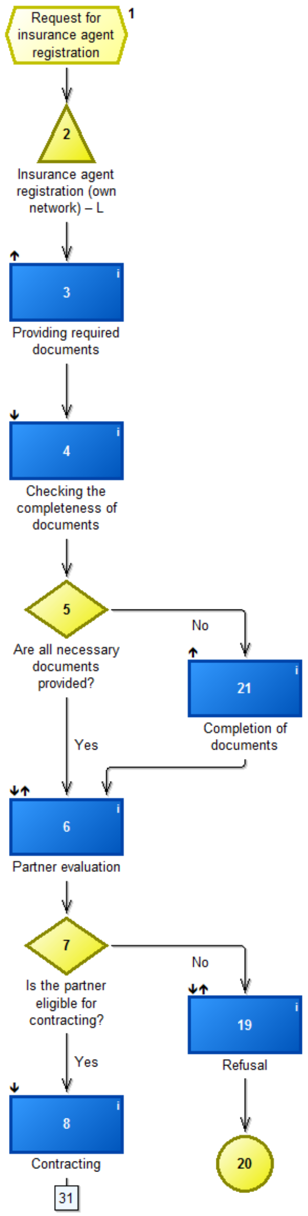
A brief literal summary of the process that was captured at interviews is the following:

> *The sales support manager collects all required documents. The network administration group checks whether all necessary documents are provided. If any document is missing, they contact the insurance agent and ask for the completion of documents. The risk management director carries out a preliminary partner evaluation in order to check whether the representative is acceptable to the network. Evaluation results are passed over to network administration. The process continues only if the results are positive.*
>
> *During partner evaluation the insurance company decides whether the partner's commission calculation would be based on the realized premium or its stock. This decision is based on the expectable volume of realized insurance contracts. Partner evaluation is carried out by the support department in cooperation with the risk management director. The partner's legal status*

(bankruptcy or liquidation proceedings, public financial data) is verified with a PartnerControl program. It is also checked whether the partner previously had a contract with the insurance company, whether it has debts to be paid etc. Refusal is quite rare (1-2 occasions/year).

The captive agent is than to be registered at the Hungarian National Bank. After receiving the required documents it is carried out by the sales support manager in an online application.

The process structure is depicted below:



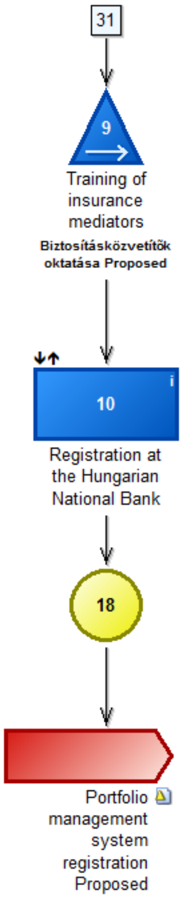


Figure 10: Initial process model sample - Introduction of a captive agent.

5.1.2 Sample process model II: Introduction of an independent agent into the network of the insurance company

This process defines the registration of the independent agents or the respective companies acting as independent agents for the insurance company. Contrary to the captive agents' case where contracts are standardized, the emphasis is put on negotiating a particular contract with the broker company.

A brief literal summary of the process that was captured at interviews is the following:

> *The insurance company carries out negotiations with the partner about the details of the contract. The insurance company has contract templates*

approved by the legal department, relationship managers have to choose from them.

However, differences may occur in the content of the commission charts as these can be customized. Also, if the partner is big enough, terms and conditions of the contract may be altered with the approval of the legal department.

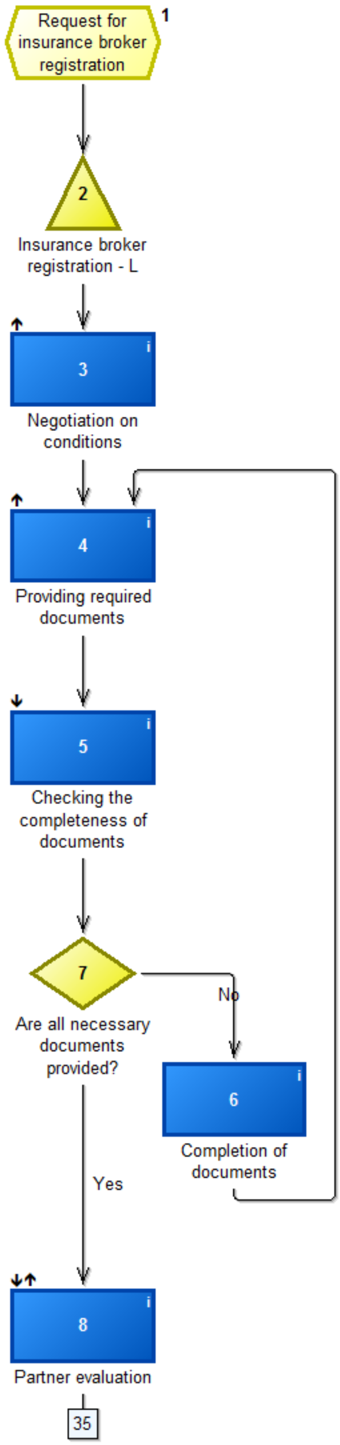
The insurance agent sends the insurance company the required documents via their network. The agent passes his documents over to his manager who in turn passes them over to his manager and so on. This way documents finally arrive to the administration department. The network administration group checks whether all necessary documents are provided. If any document is missing, they contact the insurance agent and ask for the completion of documents. Partner evaluation is carried out by the support department in cooperation with the risk management director. The director of alternative sales channels is responsible for the content of the contract. Terms and conditions are worked out and finalized, but the signing of the contract can take place only after the partner evaluation process has been completed. If the company decides that the partner is not eligible to be accepted, the contact person informs the insurance agent about the refusal and its reasons.

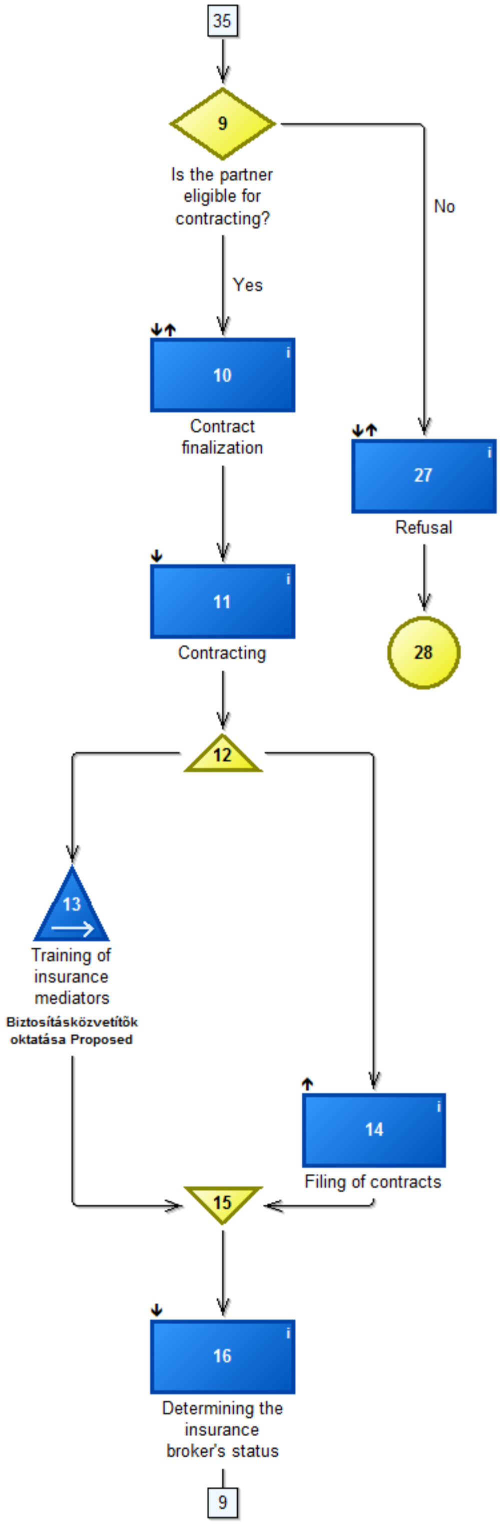
The contract is signed by the insurance broker and the director of alternative sales channels. Both the contract and the commission chart is printed and signed on paper.

The returned contract is filed, first in a printed format. After that the contract and its commission appendix are uploaded to the portfolio management system and the SharePoint folder of confidential documents in order to make them easily accessible.

The independent insurance broker or its affiliate agents has to receive training on products he wants to sell, but as with all other liabilities, it is the task of the independent broker to apply for. He also needs to get all necessary informative *brochures and handouts. Training courses are conducted by relationship managers.*

The process structure is depicted below:




35
9
Is the partner eligible for contracting?
No
Yes
10
Contract finalization
27
Refusal
11
Contracting
28
12
13
Training of insurance mediators
Biztosításközvetítők oktatása Proposed
14
Filing of contracts
15
16
Determining the insurance broker's status
9

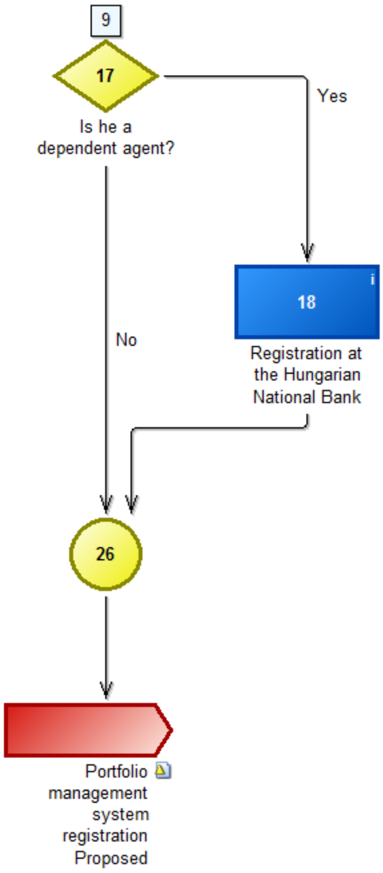


Figure 11: Initial process model sample - Introduction of an independent agent.

5.1.3 Sample process model III: Portfolio management system registration

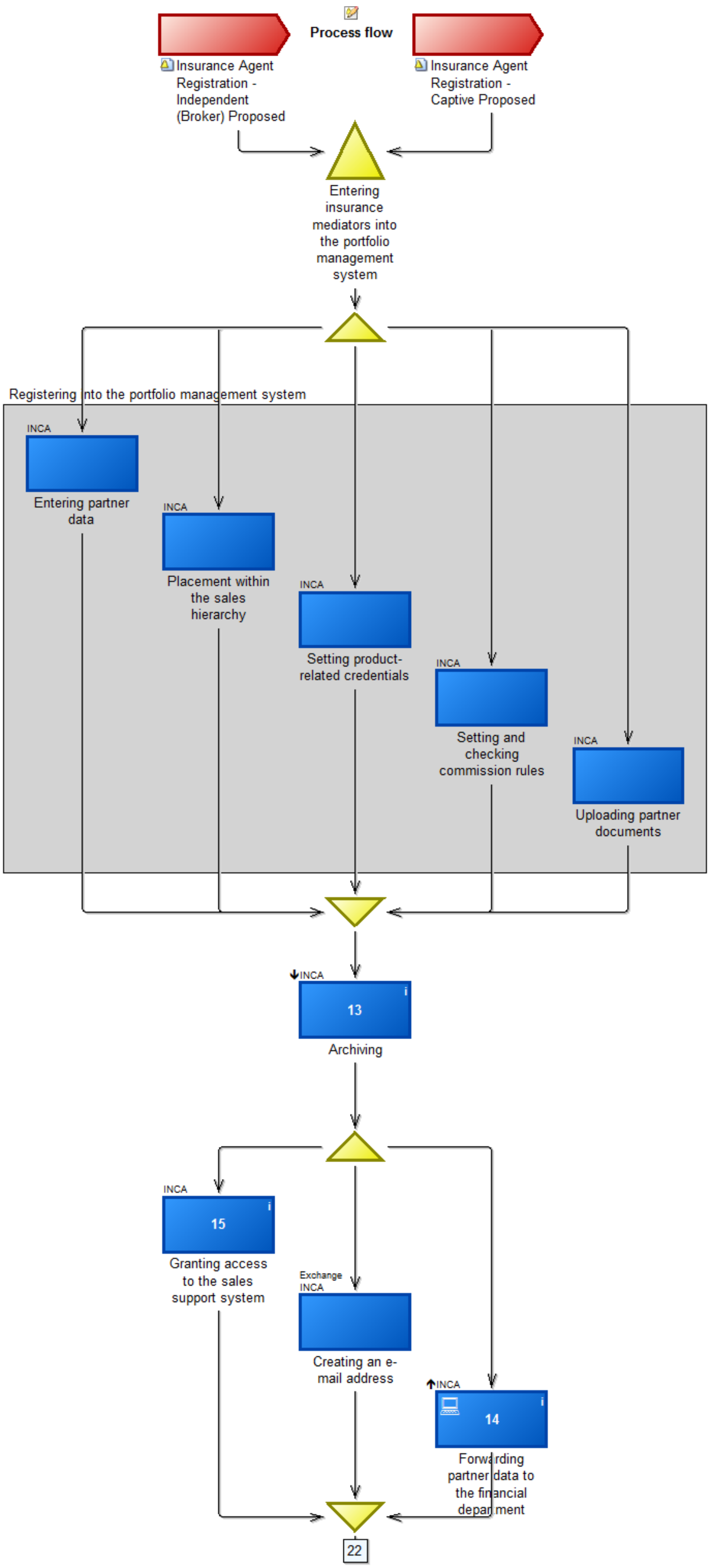
This process identifies the required activities within the organization in order to prepare and provide the operational conditions that enable the agent to pursue his duties and act on behalf of the insurance company.

A brief literal summary of the process that was captured at interviews is the following:

> *The relationship manager enters the insurance mediator's party- and partner-level basic data. According to their predetermined role insurance mediators are placed within the tree structure representing the sales channel. Mediators can take more than one place within the hierarchy. The agent acquires credentials to products he is authorized to sell and manage. Access to a*

product is granted only if the mediator has attended the related training course and successfully passed the final examination, or if the authorization was agreed on in the contract. Derived commissions are calculated on the basis of commission rules which determine that in case of a given commission type what commission rate is applicable for the given insurance mediator.

All documents provided by the insurance mediator during the registration process have to be archived, paper-based versions are to be stored in a folder. The insurance mediator has to receive credentials to the sales support system. Having the sales support administrator's approval, the mediator has to be notified an all actions and credentials.



Process flow
Insurance Agent Registration - Independent (Broker) Proposed
Insurance Agent Registration - Captive Proposed
Entering insurance mediators into the portfolio management system
Registering into the portfolio management system
INCA
Entering partner data
INCA
Placement within the sales hierarchy
INCA
Setting product-related credentials
INCA
Setting and checking commission rules
INCA
Uploading partner documents
INCA
13
Archiving
INCA
15
Granting access to the sales support system
Exchange
INCA
Creating an e-mail address
INCA
14
Forwarding partner data to the financial department
22

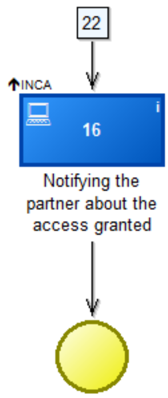


Figure 12: : Initial process model sample - Portfolio management system registry

5.1.4 Sample process model IV: Training of insurance mediators

Since insurances - especially in the field of life insurances - require considerable expertise, it is inevitable that agents must undergo a training for all products that the agent is going to offer to its clients. Complex insurance contracts together with the general and special conditions can reach up to 150 pages, and for many products there is no possibility for a customer to directly assemble an insurance offer. The relating legislation also obligates the agents to take part in product-level trainings of the insurance company's products.

A linear process is envisioned, since the level of granularity does not require to elaborate in greater detail what happens e.g. if the agent fails an exam, and apart from that it has a very rare occurrence that an agent is unable to complete the training process.

A brief literal summary of the process that was captured at interviews is the following:

> *Training may be necessary when a new mediator is contracted, a new product (version) is launched or if an existing partner intends to sell a product that he hasn't been licensed before. Insurance mediators have to participate in training courses for each product. Training courses are ended with a final examination which the mediators have to pass successfully. In the case of captive agents it is the sales support administrator's task to hand in requests for product related training courses. Independent brokers can hand in requests themselves for the training of their own insurance mediators. In accordance*

with the requests the sales support department organizes the trainings. They arrange for a suitable place, invite the tutors, and they discuss all details with the participants. Training costs are paid by the insurance company. After every detail is agreed on, training takes place and available printed materials are handed out. Insurance mediators prepare for their final examination and indicate when they are ready. At an appointed date and time the insurance agent takes part in an examination conducted by a representative of the training department. The examination is a written test taken in an examination room. If the agent successfully passes the examination, the training department notifies the network administration group.

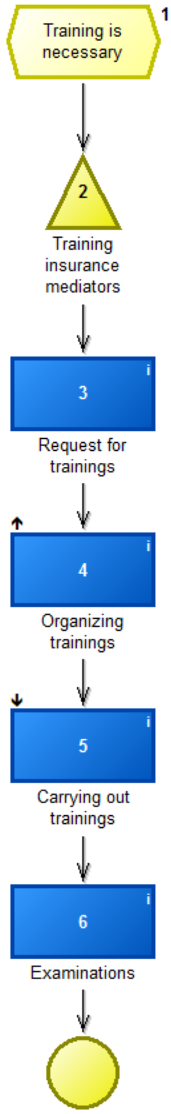


Figure 13: : Initial process model sample - Training of insurance mediators

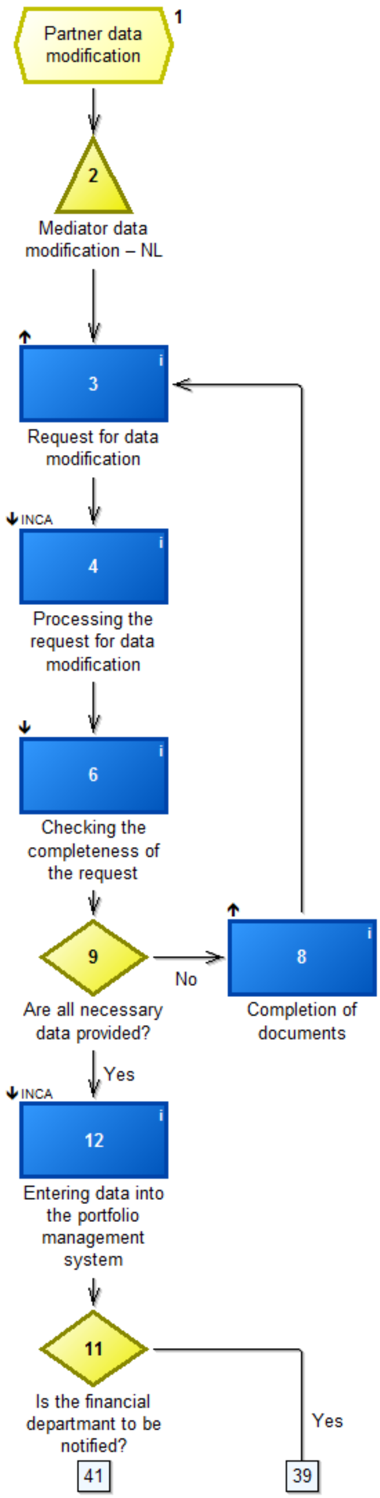
5.1.5 Sample process model V: Insurance agent status modification

The following process is a very simple example of settling partner portfolio management issues.

A brief literal summary of the process that was captured at interviews is the following:

> *The partner notifies the sales support administrator in an electronic format about his request for administrating the changes and the modification of related data in the registries of the insurance company.*

The sales support administrator decides whether it's a party- or partner-level data modification and whether it affects product-related credentials or commission management. If necessary, coordinates with the sales support manager. The sales support administrator checks whether required conditions for the data modification are met, all necessary data are provided, and if understating documents are presented, and processes the request. Modifications have to be accomplished in the portfolio management system. Along the actual modification, all documents provided by the partner are scanned and attached. The sales support administrator informs the financial department about the modifications in details with all related documents attached, and also informs the agent about the accomplished changes.



Partner data modification
1
2
Mediator data modification – NL
3
Request for data modification
INCA
4
Processing the request for data modification
6
Checking the completeness of the request
9
Are all necessary data provided?
No
8
Completion of documents
Yes
INCA
12
Entering data into the portfolio management system
11
Is the financial departmant to be notified?
Yes
41
39

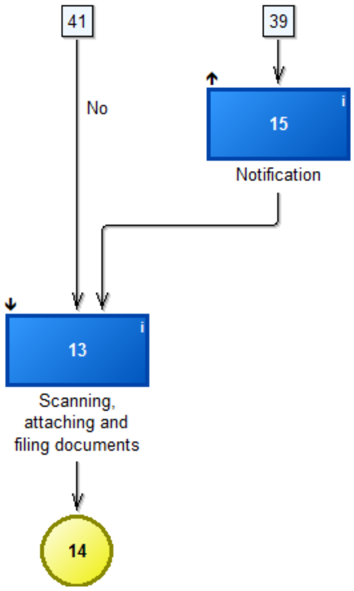


Figure 14: : Initial process model sample - Insurance agent status modification

5.1.6 Sample process model VI: Debt Management of insurance agents

In the daily operation of the agent network of an insurance company, both positive and negative signed commission instances arise. A typical example for a negative commission is when the insurance contract ends prematurely, so a given ratio of the initial sales commission is being deducted from the agent. This way it is relatively common, that agents hold a negative balance towards the insurance company. The debt management process faces this challenge.

A brief literal summary of the process that was captured at interviews is the following:

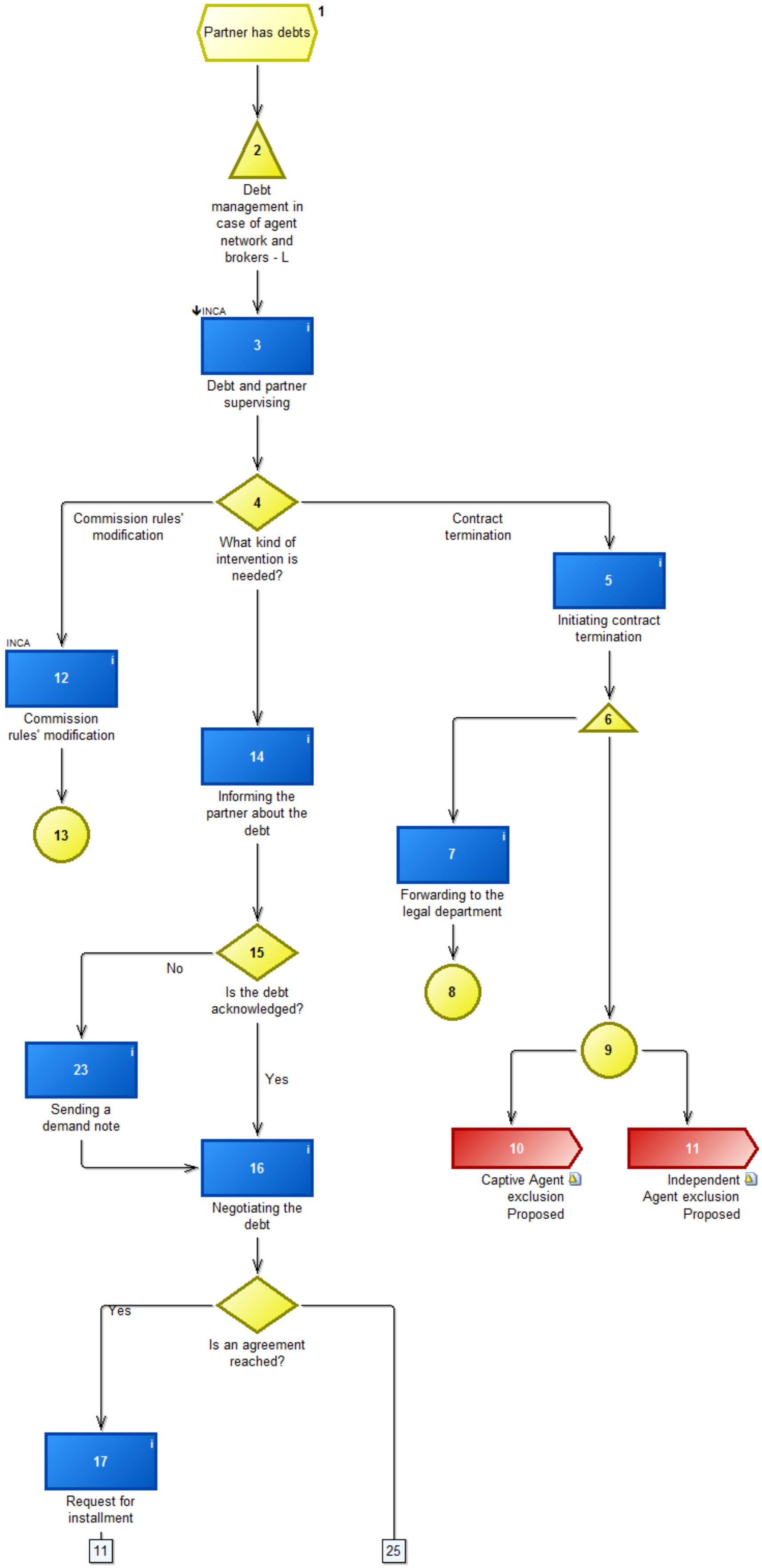
> *The insurance company identifies from regular reports that the agent has a negative balance, he is in debt towards the company. The portfolio management system generates a report on the insurance mediator's debts. The head of the sales support department decides what kind of intervention is needed - if any.*
>
> *Depending on debt amount it has to be decided whether the partner's commission rules are to be modified or the contract is to be terminated.*

Smaller amounts of debts can be solved by the modification of commission rules or by suspending commission payments.

The sales support administrator informs the insurance mediator about the existing debt and asks for an acknowledgement. If the partner doesn't acknowledge the debt, the legal department makes a demand note. Debt amount calculated is discussed, the parties negotiate contentious items. If the debt is covered by a payment, the necessary commission administration is undertaken, and the process ends.

The insurance mediator in debt may ask for an installment. The request is considered by the legal department. It is the legal department's task to prepare installment-related documents. The sales support department cooperates in the preparation by providing documents and lists concerning the debt.

If there is no resolution among the parties, the contract is terminated and process is concluded by the legal department, typically by filing a lawsuit.



1
Partner has debts
2
Debt management in case of agent network and brokers - L
INCA
3
Debt and partner supervising
4
What kind of intervention is needed?
Commission rules' modification
Contract termination
INCA
12
Commission rules' modification
13
5
Initiating contract termination
6
14
Informing the partner about the debt
7
Forwarding to the legal department
8
15
Is the debt acknowledged?
No
Yes
23
Sending a demand note
16
Negotiating the debt
9
10
Captive Agent exclusion Proposed
11
Independent Agent exclusion Proposed
Is an agreement reached?
Yes
17
Request for installment
11
25

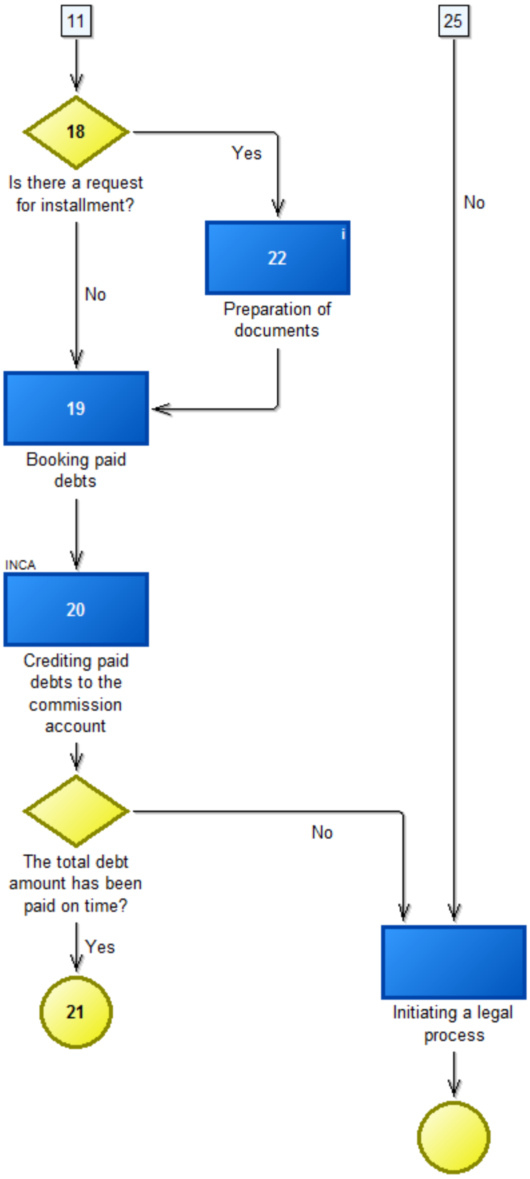


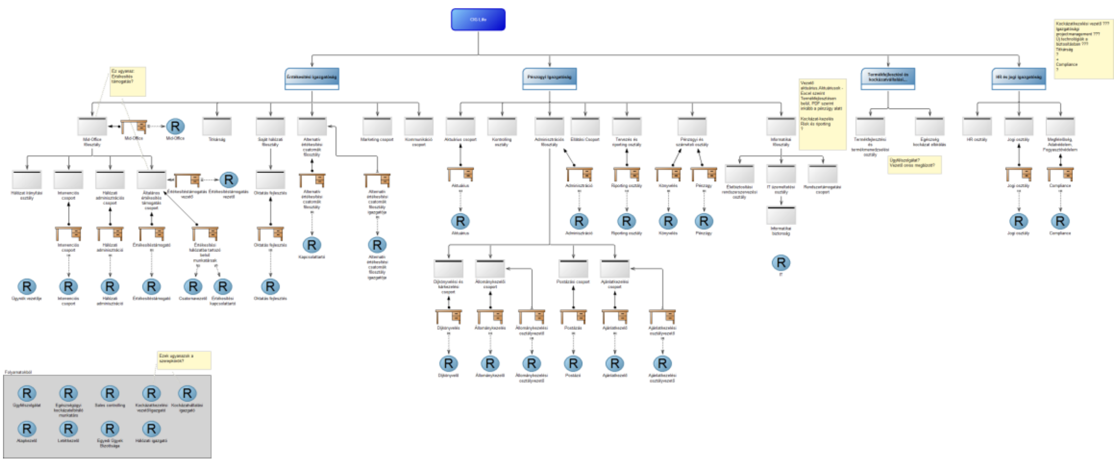
Figure 15: : Initial process model sample - Debt Management of insurance agents

5.2 Stakeholders of the processes

With the aid of the RACI responsibility matrix, we can determine, which are the explicit roles being played by which stakeholder at the level of a given activity. More precisely, we define according to the RACI, which role is Responsible for the performing of the activity, which role is Accountable for it, which are the roles needed to be Consulted during the execution of the activity, and who to be Informed about the advance, obstacles, completion or other information related to the given activity.

This knowledge is the basis of the PROKEX project’s proposed outcome, namingly to be able to present the knowledge items required by a person in a given role, or in a broader perspective, in a given position.

The specific activities within the process model have to be aligned with roles and responsibilities set forth in the company's organizational structure. This task is carried out on the theoretical ground of the RACI matrix. First of all, we had to identify the roles utilized in the process, this is depicted in the following figure:

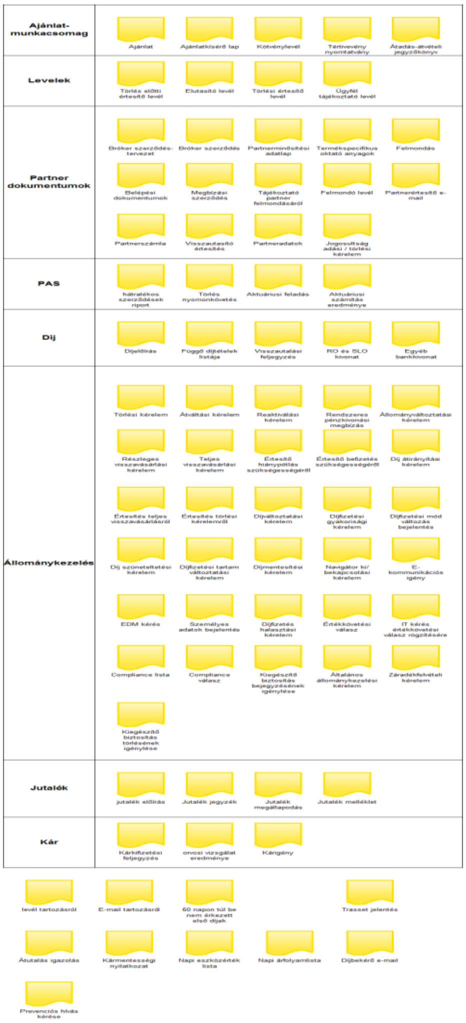


16. Figure: Organizational structure model

5.3 Document model

Documents are essential artifacts of business processes, different documents serving different roles are being created, transferred, and utilized as a source of knowledge and information. These documents have to be taken into account throughout the complete BPM lifecycle.

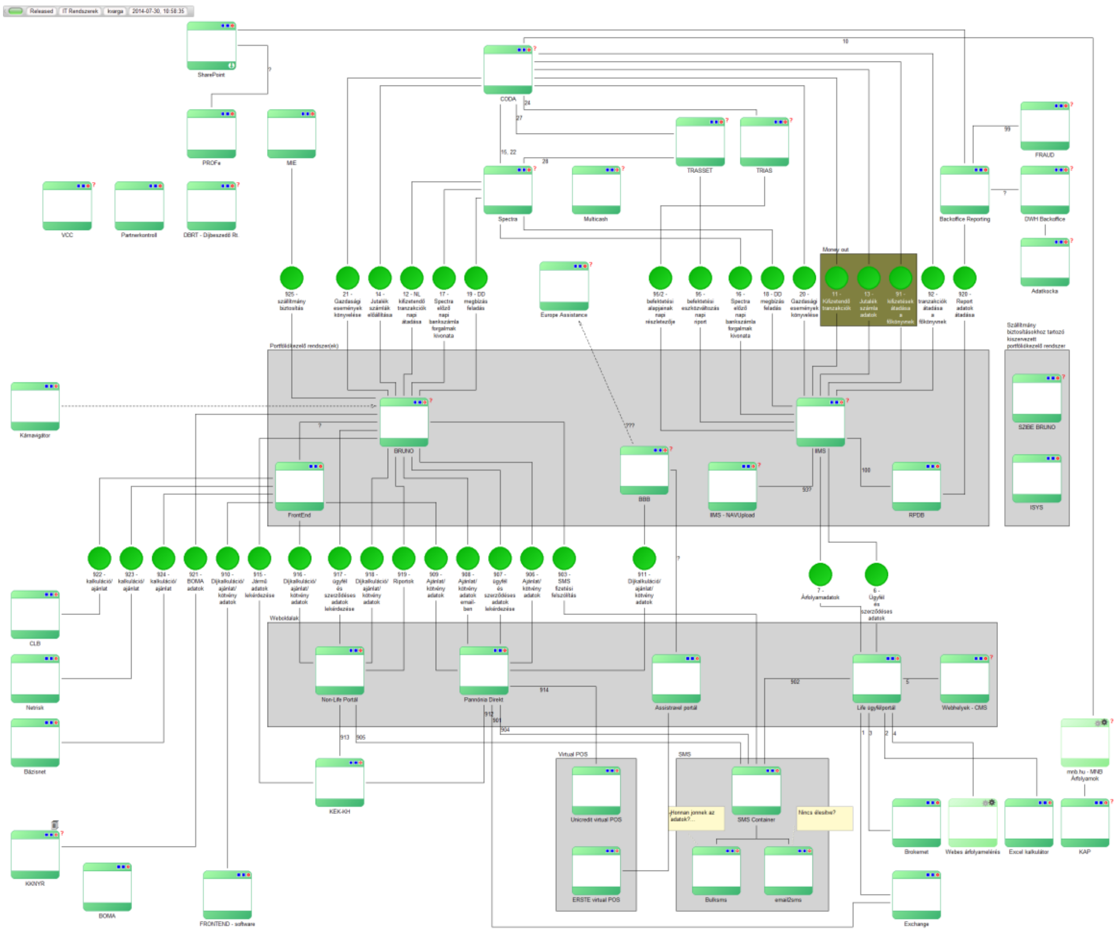
Documents concerning the case study processes are depicted below. Documents are assigned to the specific activities associated with stakeholder roles and responsibilities. The status of the documents (input, output) is also defined. In the final implementation output documents serve as a crucial source for knowledge extraction as a placeholder for knowledge items. As an example, the “independent agent contracting template” will serve as a knowledge extraction base for insurance product developers in setting the workflow procedures of the environment during the process enactment.



17. Figure Document model sample

5.4 IT architecture model

The last underlying sub-model of the complex process model is the IT infrastructure model (18. Figure Sample IT infrastructure model). In this model we define the major systems, tools or resources, which are going to play an active role in our processes. Such systems are the portfolio management systems, workflow management systems, systems aiding the sales activities (e.g. direct marketing infrastructure, client portals, broker channel sales tools). Technological supporting systems (e.g. systems providing authentication and authorization, document management systems) are only considered, if the orchestration of the process activities creates an alteration in their states, or decisions are being made based on their states at the level of modeling granularity.



18. Figure Sample IT infrastructure model

The greater grey aggregation contains the main modules of the portfolio management system, which is responsible for the storage and administration of all major entities of an insurance company: products, insurance contracts (policies), outer stakeholders (parties), accounts, fees, transactions, commissions etc.

These items of IT infrastructure are also interconnected to the complex process model at activity level.

5.5 Mapping of knowledge elements

Following the guidelines proposed in section 4.3 Mapping of knowledge elements, the process models are extended with knowledge level information. Concerning the current case study, several ontologies existed for the insurance domain. Among them I have used Object Management Group's current proposal (Jenkins, Molnar, Wallman, & Ford, 2013).

Since modeling takes place in a software framework, first I had to import the pre-existing domain ontology. Since no API or assisted solution existed for the Adonis modeling framework, but we have direct access to our implementation's Adonis server database, I simply imported the nodes to the database as Adonis information objects.

All pre-existing knowledge elements are this way available for modeling, like the following "commission" item:

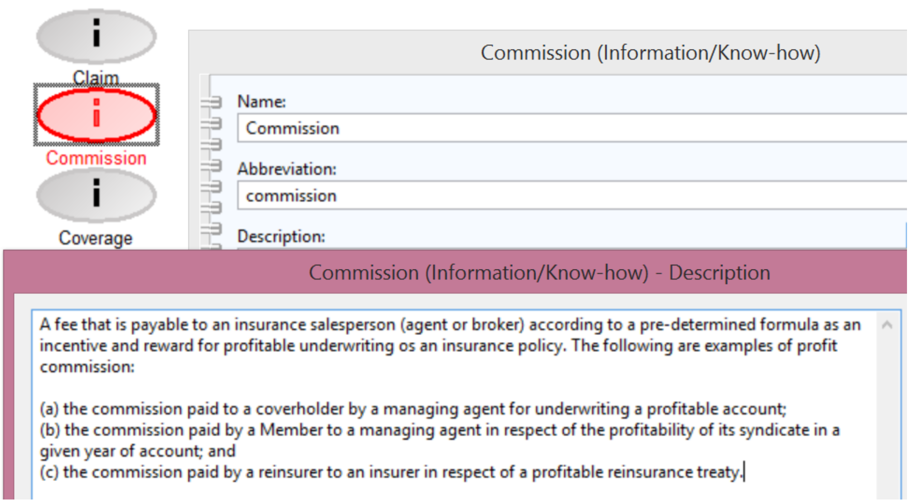


Figure 19: "Commission" knowledge item from domain ontology

Many other concepts derived from the process modeling itself, these knowledge element instances were recorded parallel with the elaboration of the processes.

Mapping of a concept can now be accomplished within the modeling framework:

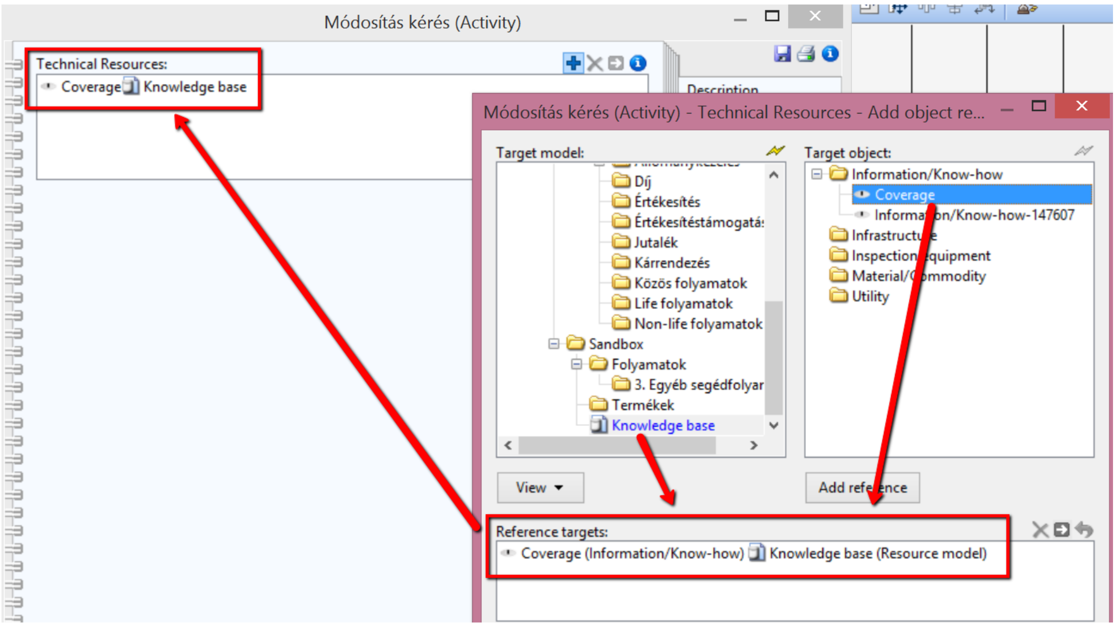


Figure 20: Mapping of a knowledge item and an activity as an information object

6 Ontology for Insurance Domain

This section gives an overview about insurance domain ontology elaborated for the case study. First I present the general meta structure of the ontology used in our institute, afterwards I detail the extended and customised version of it.

6.1 The Meta Structure of the Insurance Ontology

Insurance ontology follows the meta structure of Studio ontology. Studio is an ontology driven learning environment, developed by Corvinno company(Corvinno, 2008). The main goal of the Studio system is to provide support in exploring missing knowledge areas of candidates, e.g. students or employees in the frames of an electronic learning environment in order to help them to complement their knowledge deficiencies. Studio is widely used in higher education in business informatics education and employees training in various companies. The next figure provides an overview about the meta structure of the ontology.

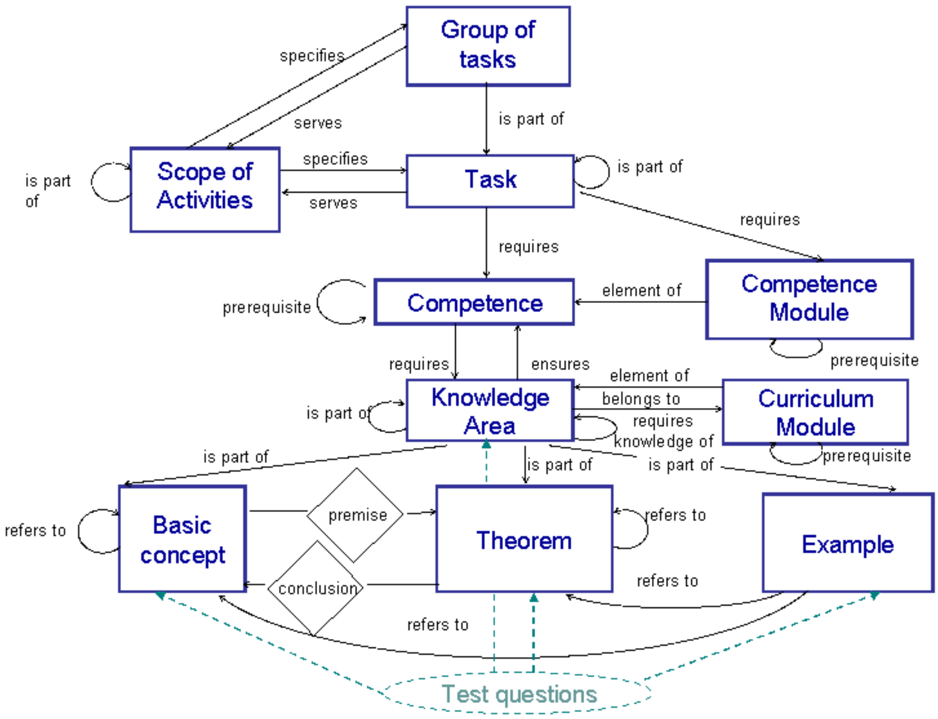


Figure 21: Ontology meta structure (Vas, 2007)

The detailed description of the ontology meta structure is available in the Studio white paper (Corvinno, 2008). From insurance domain aspect, the most important classes are “Knowledge Area” and “Basic Concept”.

“Knowledge Area” is the central part of the ontology, representing major parts of a given domain. Each “Knowledge Area” may have several Sub-Knowledge-Areas through the “is part of” relation. Not only internal relations, but relations connecting different knowledge areas are also important. This is described by the “is part of” relation. At the same time another relation is used to describe knowledge requirements of certain knowledge area, namely the “requires knowledge of” relation.

Knowledge elements depict the internal structure of knowledge areas and they have the following major types: “Basic concepts”, “Theorems” and “Examples” (Vas, 2007). In order to precisely define the internal structure of knowledge areas relations that represent the connection between different knowledge elements also must be described.

The model of Studio Ontology is depicted by (Figure 21) above using the following notation:

- Rectangles sign classes.
- Arrows depict 0-N relations (so a competence may have several prerequisites, scope of activities may specify more tasks at the same time and it is also possible that a competence those not have any prerequisites).

Object properties are shown in the figure below and detailed in (Corvinno, 2008) and (Vas, 2007).

6.2 The Structure of the Insurance Ontology

According to the above discussed meta structure, the main classes were customized and extended with insurance related objects. Domain-specific knowledge was collected through interviews with insurance experts and some key documents of the field were processed(Dionne, 2000),(MABISZ, 2014),(The Receivable Management Services Corporation, 2014). Studio ontology can be exported to owl/xml format, which I utilized for the insurance ontology description. The figures below were prepared in Protégé environment from the owl version of the insurance ontology.

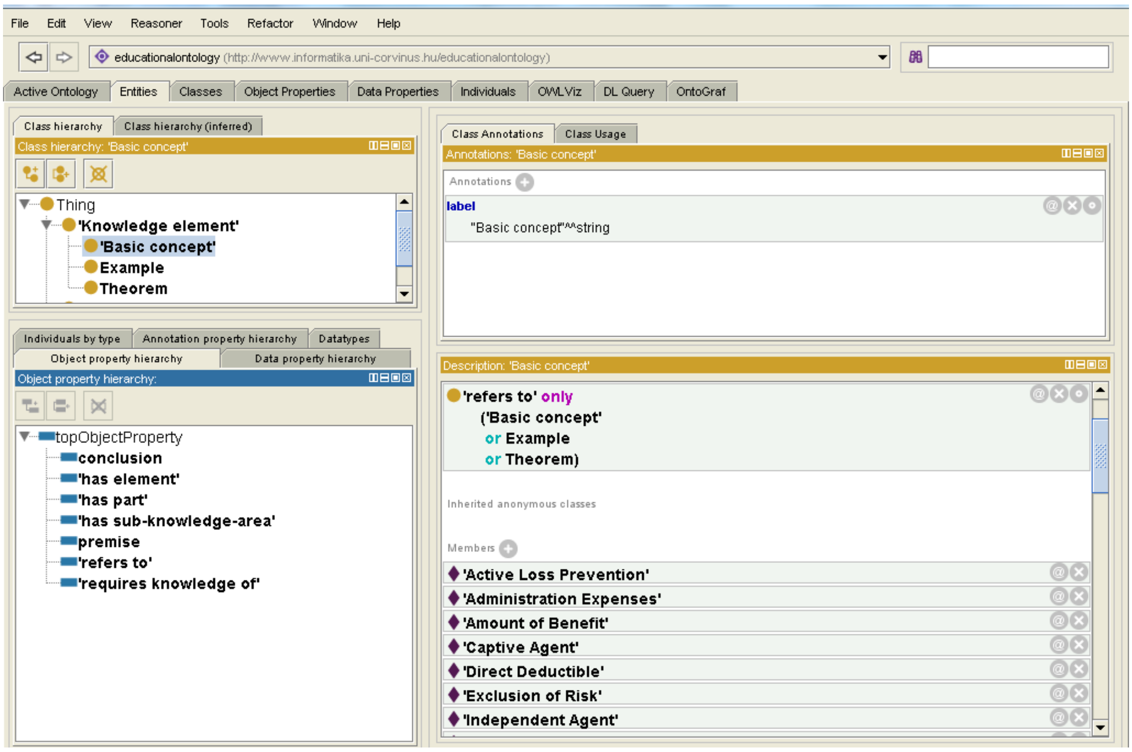


Figure 22: Insurance ontology in Protege

The detailed xml output is available in the appendix. Main subclasses of knowledge area class can be seen in the next figure.

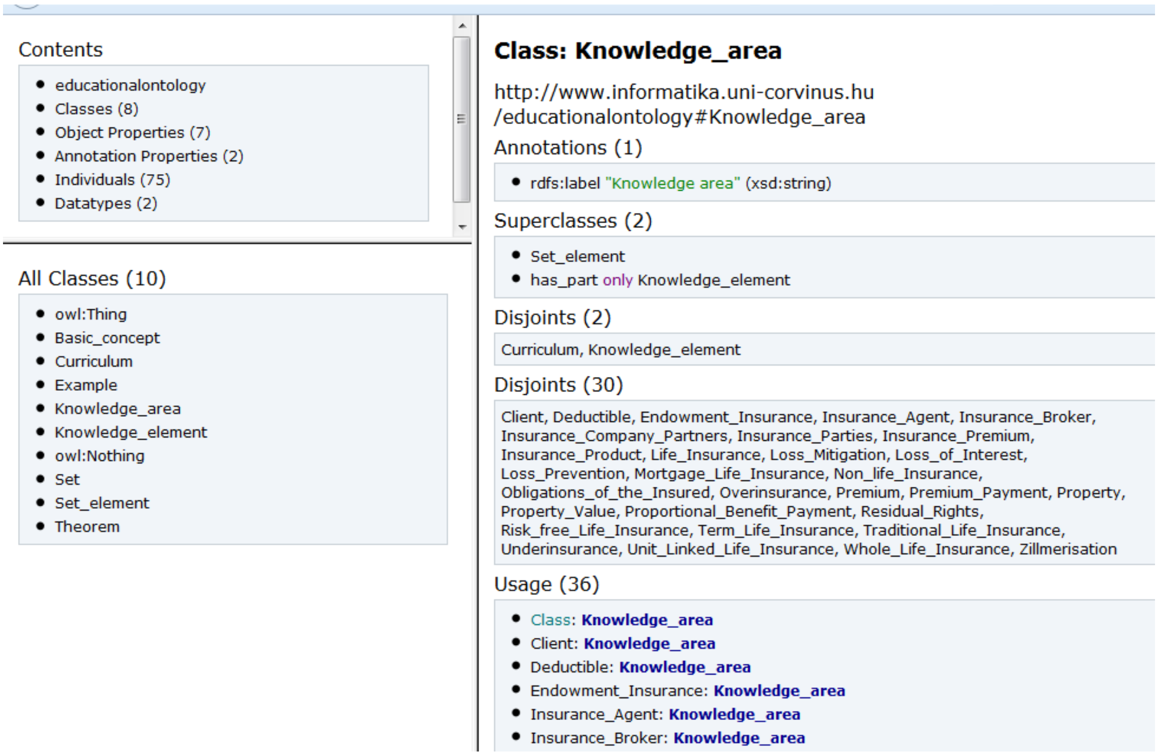


Figure 23: Instances of knowledge area in Insurance Ontology (html export)

Knowledge areas of insurance ontology are presented by OntoGraf in Protege in the following figure:

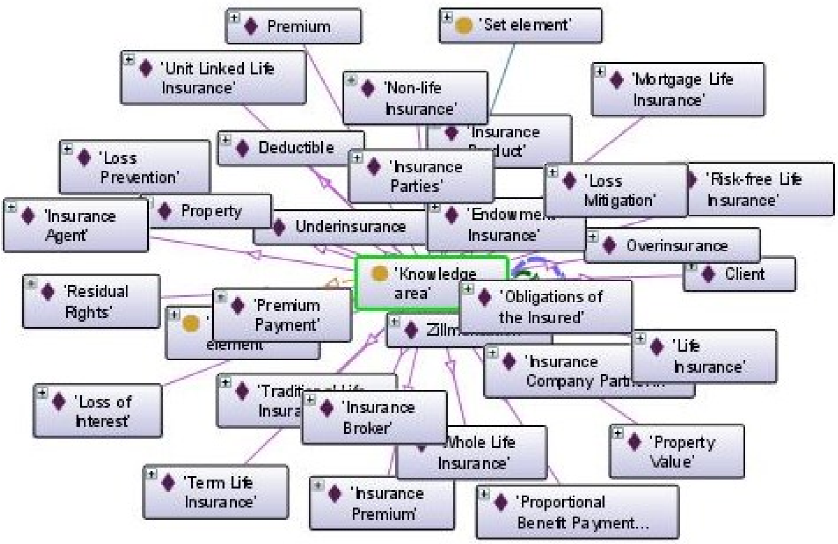


Figure 24: Instances of knowledge area in Insurance Ontology by OntoGraf

Main subclasses of basic concepts class can be seen in the following figure. There are 43 concepts in the ontology.

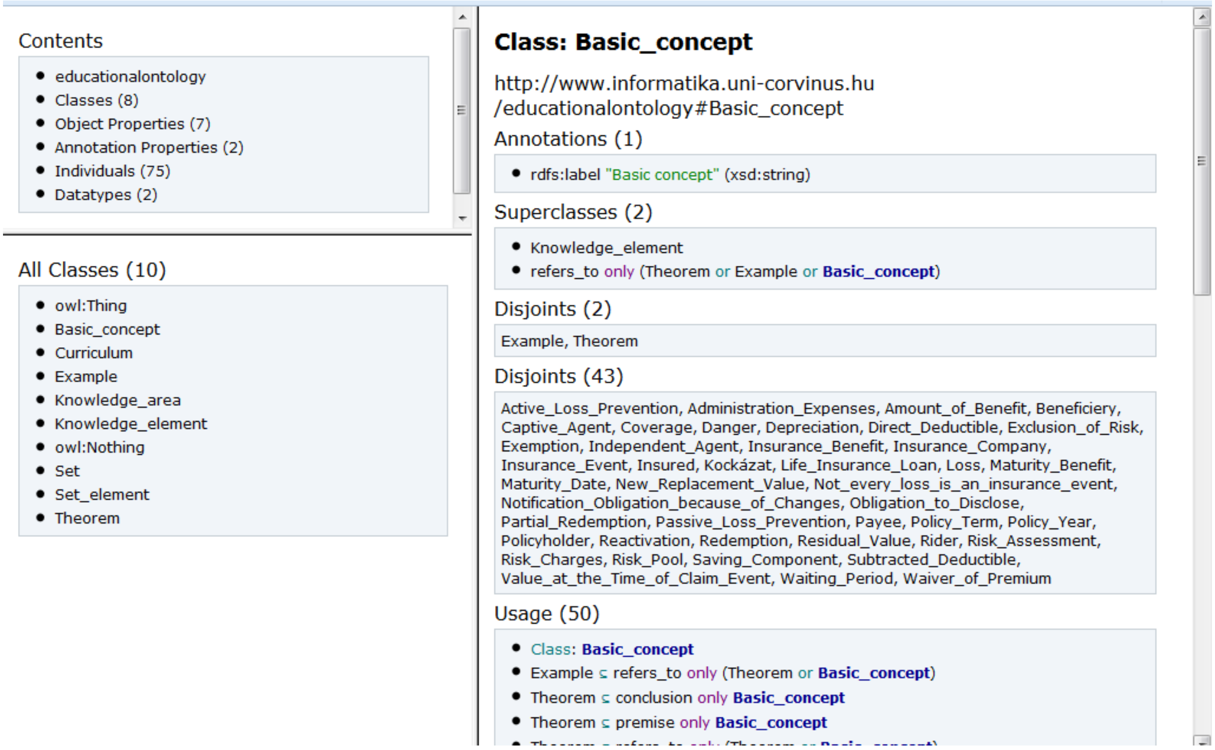


Figure 25: Main instances of "Basic concept" class in Insurance Ontology (html export)

Basic concepts of the field are shown in the next figure.

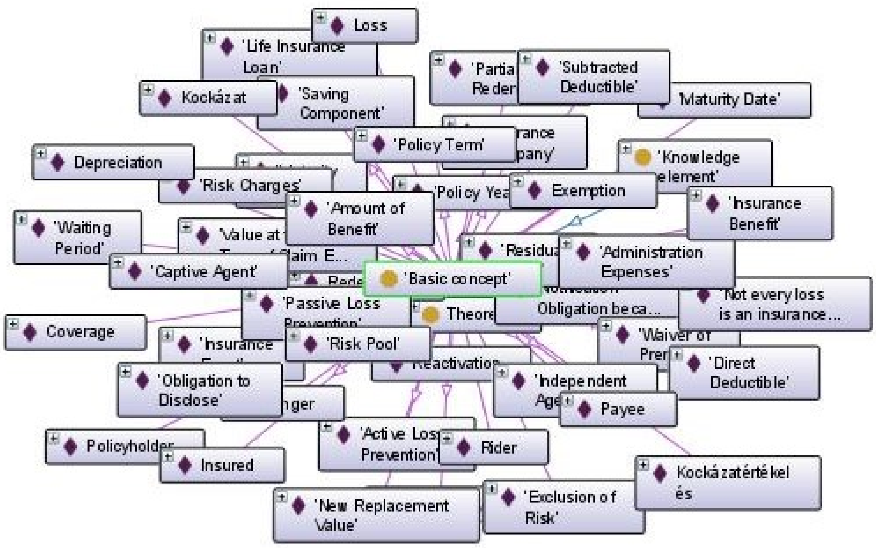


Figure 26: Main instances of "Basic concept" class in Insurance Ontology by OntoGraf

7 Conclusions and Future Work

My research area is dedicated to the challenges of knowledge extraction from business processes. I analyzed the opportunities of knowledge extraction based on the literature, my research background and practical experiences. I am proposing a solution to extract, organize and preserve knowledge embedded in organizational processes to enrich the organizational knowledge base in a systematic and controlled way. My other research problem is how to organize the extracted knowledge, what are the appropriate ICT solutions, environment for it. I reviewed theoretical foundations of related fields, like business process management, semantic technology, semantic business process management and ontologies. Ontologies play a key role in semantic business process management, because they provide the structure for organizational knowledge. Therefore I discussed their background detailed in the literature review section.

I have identified the requirements in the business process modeling level to be able to use a complex process model as a base of creating the links between the process models and the domain ontology.

The novelty of the solution is based on the connection between process model and corporate knowledge, where the process structure will be extended with the annotation for knowledge structure. The resulting process and domain ontology duplet enables a higher level of automation for IT implementation and a wider range of possibilities for machine-reasoning.

The research outcome is going to be tested in a reference architecture, where the main goal is to create a supporting infrastructure capable to conduct multi-lateral searches especially for the purpose to support employees to easily acquire their job role specific knowledge, but there are wider areas for application.

The resulting knowledge repository holds multilateral information specifically for the viewpoints of organizational stakeholders and IT systems. The proposed solution support employees to easily acquire their job role specific knowledge, support IT departments to efficiently answer the challenge of changes to be applied at different processes, and knowledge engineers to have a better insight into the organizations' knowledge environment.

8 Case study process model documentation

Process documentation of referenced complex process models generated from Adonis Business Process Toolkit.

Table of contents

Debt Management of Insurance Agents Proposed

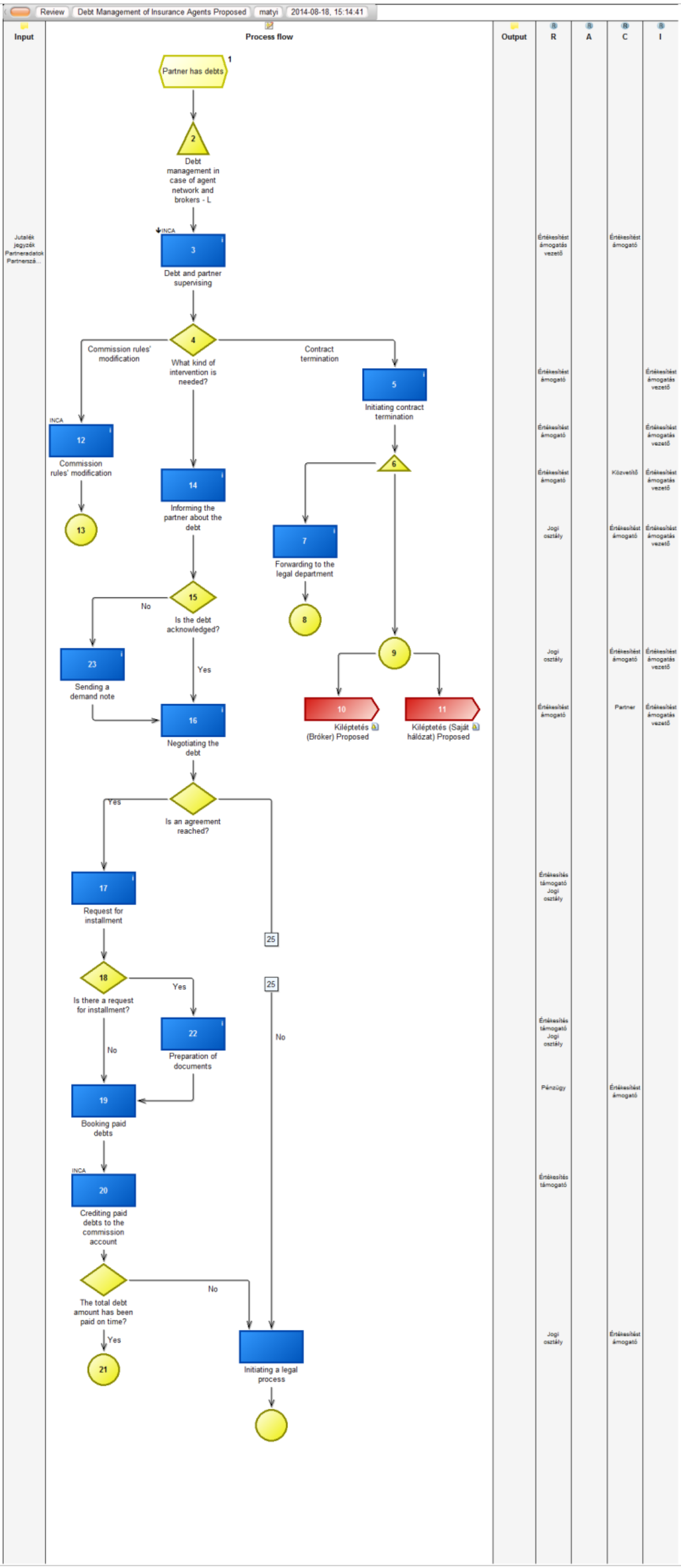
(Business process model)

Description	
Description	In the daily operation of the agent network of an insurance company, both positive and negative signed commission instances arise. A typical example for a negative commission is when the insurance contract ends prematurely, so a given ratio of the initial sales commission is being deducted from the agent. This way it is relatively common, that agents hold a negative balance towards the insurance company. The debt management process faces this challenge.
Comment	
User attributes	
Model type	Current model
Model state	Review
System attributes	
Author	Török Mátyás
Creation date	2014-08-12, 16:37
Last user	Török Mátyás
Date last changed	2014-08-18, 15:14:41

Model content

1. Partner has debts (Trigger)
2. Debt management in case of agent network and brokers - L (Process start)
3. Debt and partner supervising (Activity)
4. What kind of intervention is needed? (Decision)
5. Initiating contract termination (Activity)
6. Parallelity-76905 (Parallelity)
7. Forwarding to the legal department (Activity)
8. End-76899 (End)
9. End-76902 (End)
10. Cross-reference-76879 (Cross-reference)
11. Cross-reference-84877 (Cross-reference)
12. Commission rules' modification (Activity)
13. End-76913 (End)
14. Informing the partner about the debt (Activity)
15. Is the debt acknowledged? (Decision)
16. Negotiating the debt (Activity)
17. Request for installment (Activity)
18. Is there a request for installment? (Decision)
19. Booking paid debts (Activity)
20. Crediting paid debts to the commission account (Activity)
21. End-93763 (End)
22. Preparation of documents (Activity)
23. Sending a demand note (Activity)

End-150881 (End)
Initiating a legal process (Activity)
Is an agreement reached? (Decision)
The total debt amount has been paid on time? (Decision)


Review
Debt Management of Insurance Agents Proposed
matyi
2014-08-18, 15:14:41
Input
Process flow
Output
R
A
C
I
Partner has debts
Debt management in case of agent network and brokers - L
INCA
Debt and partner supervising
Commission rules' modification
What kind of intervention is needed?
Contract termination
Initiating contract termination
INCA
Commission rules' modification
Informing the partner about the debt
Forwarding to the legal department
No
Is the debt acknowledged?
Yes
Sending a demand note
Negotiating the debt
Kiléptetés (Bróker) Proposed
Kiléptetés (Saját hálózat) Proposed
Yes
Is an agreement reached?
Request for installment
Is there a request for installment?
Yes
Preparation of documents
No
No
Booking paid debts
INCA
Crediting paid debts to the commission account
The total debt amount has been paid on time?
No
Yes
Initiating a legal process

1. Partner has debts
Trigger

Changes	
Identification of changes	No change

2. Debt management in case of agent network and brokers - L
Process start

Description	
Key process	No declaration
Changes	
Identification of changes	No change

3. Debt and partner supervising
Activity

Description	
Description	The portfolio management system generates a riport on the insurance mediator's debts. The head of the sales support department decides what kind of intervention is needed if any. Depending on debt amount it has to be decided whether the partner's commission rules are to be modified or the contract is to be terminated.
Responsibilities (RACI)	
Responsible for execution	• Sales support manager
Cooperation/participation	• Sales support personnel
Input/Output	
Input	• Jutalék jegyzék • Partner data • Partnerszámla
Systems	
Referenced IT system elements	• Insurance Corebusiness Administration System (INCA)
Changes	
Identification of changes	No change

4. What kind of intervention is needed?
Decision

Changes	
Identification of changes	No change

Relation "Subsequent" to "5. Initiating contract termination" (Activity)

Description	
Denomination	Contract termination

Relation "Subsequent" to "12. Commission rules' modification" (Activity)

Description	
Denomination	Commission rules' modification

5. Initiating contract termination

Activity

Description	
Description	In case of significant debts the termination of the partner contract has to be initiated.
Responsibilities (RACI)	
Responsible for execution	• Sales support personnel
To inform	• Sales support manager
Changes	
Identification of changes	No change

6. Parallelity-76905

Parallelity

Description	
Type	AND
Changes	
Identification of changes	No change

7. Forwarding to the legal department

Activity

Description	
Description	Contract termination is effectuated by the legal department.
Responsibilities (RACI)	
Responsible for execution	• Lawyer / Legal administrative personnel
Cooperation/participation	• Sales support personnel
To inform	• Sales support manager
Changes	
Identification of changes	No change

8. End-76899

End

Description	
Type	local
Changes	
Identification of changes	No change

9. End-76902

End

Description	
Type	local
Changes	
Identification of changes	No change

10. Cross-reference-76879

Cross-reference

Description	
Cross-reference	• Kiléptetés (Broker) Proposed
Type of Cross-reference	Outgoing Cross-reference
Changes	
Identification of changes	No change

11. Cross-reference-84877
Cross-reference

Description	
Cross-reference	• Kiléptetés (Saját hálózat) Proposed
Type of Cross-reference	Outgoing Cross-reference
Changes	
Identification of changes	No change

12. Commission rules' modification
Activity

Description	
Description	Smaller amounts of debts can be solved by the modification of commission rules or by suspending commission payments.
Responsibilities (RACI)	
Responsible for execution	• Sales support personnel
To inform	• Sales support manager
Systems	
Referenced IT system elements	• Insurance Corebusiness Administration System (INCA)
Changes	
Identification of changes	No change

13. End-76913
End

Description	
Type	local
Changes	
Identification of changes	No change

14. Informing the partner about the debt
Activity

Description	
Description	The sales support administrator informs the insurance mediator about the existing debt and asks for an acknowledgement.
Responsibilities (RACI)	
Responsible for execution	• Sales support personnel
Cooperation/participation	• Insurance mediator

To inform	• Sales support manager
Changes	
Identification of changes	No change

15. Is the debt acknowledged?

Decision

Changes	
Identification of changes	No change

Relation "Subsequent" to "16. Negotiating the debt" (Activity)

Description	
Denomination	Yes

16. Negotiating the debt

Activity

Description	
Description	Debt amount calculated at the 5th process step is discussed, the parties negotiate contentious items.
Comment	KA 12
Responsibilities (RACI)	
Responsible for execution	• Sales support personnel
Cooperation/participation	• Partner
To inform	• Sales support manager
Changes	
Identification of changes	No change

17. Request for installment

Activity

Description	
Description	The insurance mediator in debt may ask for an installment. The request is considered by the legal department.
Comment	KA 13
Responsibilities (RACI)	
Responsible for execution	• Sales support • Lawyer / Legal administrative personnel
Changes	
Identification of changes	No change

18. Is there a request for installment?

Decision

Changes	
Identification of changes	No change

Relation "Subsequent" to "22. Preparation of documents" (Activity)

Description

Denomination	Yes

19. Booking paid debts

Activity

Description	
Comment	#14298-3
Responsibilities (RACI)	
Responsible for execution	• Finance
Cooperation/participation	• Sales support personnel
Changes	
Identification of changes	No change

20. Crediting paid debts to the commission account

Activity

Description	
Comment	#14298-3 #14298-19
Responsibilities (RACI)	
Responsible for execution	• Sales support
Systems	
Referenced IT system elements	• Insurance Corebusiness Administration System (INCA)
Changes	
Identification of changes	No change

21. End-93763

End

Description	
Type	local
Changes	
Identification of changes	No change

22. Preparation of documents

Activity

Description	
Description	It is the legal department's task to prepare installment-related documents. The sales support department cooperates in the preparation by providing documents and lists concerning the debt.
Responsibilities (RACI)	
Responsible for execution	• Sales support • Lawyer / Legal administrative personnel
Changes	
Identification of changes	No change

23. Sending a demand note

Activity

Description	
Description	If the partner doesn't acknowledge the debt, the legal department makes a demand note.
Responsibilities (RACI)	
Responsible for execution	• Lawyer / Legal administrative personnel
Cooperation/participation	• Sales support personnel
To inform	• Sales support manager
Changes	
Identification of changes	No change

End-150881
End

Description	
Type	local
Changes	
Identification of changes	No change

Initiating a legal process
Activity

Description	
Description	From this point the process is conducted by the legal department, typically by filing a lawsuit.
Responsibilities (RACI)	
Responsible for execution	• Lawyer / Legal administrative personnel
Cooperation/participation	• Sales support personnel
Changes	
Identification of changes	No change

Is an agreement reached?
Decision

Changes	
Identification of changes	No change

Relation "Subsequent" to "17. Request for installment" (Activity)

Description	
Denomination	Yes

The total debt amount has been paid on time?
Decision

Changes	
Identification of changes	No change

Relation "Subsequent" to "21. End-93763" (End)

Description	
Denomination	Yes

Insurance Agent Registration (Broker) Proposed

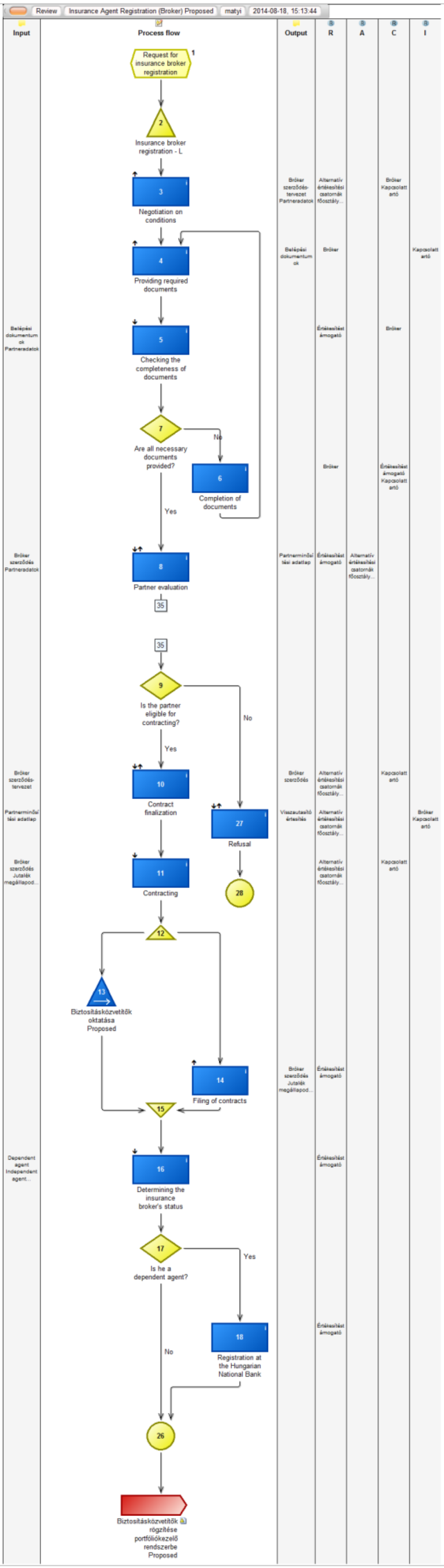
(Business process model)

Description	
Description	This process defines the registration of the insurance mediators organized into the insurance company's independent mediator (broker) network. The insurance mediation contract is being elaborated by the sales support and signed by the director of alternative sales channels. Every broker contract may determine specific rules and terms, especially concerning the commission rates.
User attributes	
Model type	Current model
Model state	Review
System attributes	
Author	Török Mátyás
Creation date	2014-07-14, 16:34
Last user	Török Mátyás
Date last changed	2014-08-18, 15:13:44

Model content

1. Request for insurance broker registration (Trigger)
2. Insurance broker registration - L (Process start)
3. Negotiation on conditions (Activity)
4. Providing required documents (Activity)
5. Checking the completeness of documents (Activity)
6. Completion of documents (Activity)
7. Are all necessary documents provided? (Decision)
8. Partner evaluation (Activity)
9. Is the partner eligible for contracting? (Decision)
10. Contract finalization (Activity)
11. Contracting (Activity)
12. Parallelity-76869 (Parallelity)
13. Training (Subprocess)
14. Filing of contracts (Activity)
15. Merging-76873 (Merging)
16. Determining the insurance broker’s status (Activity)
17. Is he a dependent agent? (Decision)
18. Registration at the Hungarian National Bank (Activity)
26. End-70855 (End)
27. Refusal (Activity)
28. End-76846 (End)

Cross-reference-150873 (Cross-reference)


Review
Insurance Agent Registration (Broker) Proposed
2014-08-18, 15:13:44
Input
Process flow
Output
R
A
C
I
Request for insurance broker registration
Insurance broker registration - L
Negotiation on conditions
Providing required documents
Checking the completeness of documents
Are all necessary documents provided?
No
Completion of documents
Yes
Partner evaluation
Is the partner eligible for contracting?
No
Yes
Contract finalization
Refusal
Contracting
Biztosításközvetítők oktatása Proposed
Filing of contracts
Determining the insurance broker's status
Is he a dependent agent?
Yes
No
Registration at the Hungarian National Bank
Biztosításközvetítők rögzítése portfóliókezelő rendszerbe Proposed

1. Request for insurance broker registration

Trigger

Changes	
Identification of changes	No change

2. Insurance broker registration - L

Process start

Description	
Key process	No declaration
Changes	
Identification of changes	No change

3. Negotiation on conditions

Activity

Description	
Description	The insurance company carries out negotiations with the partner about the details of the contract. The insurance company has contract templates approved by the legal department, relationship managers have to choose from them. However, differences may occur in the content of the commission charts as these can be customized. Also, if the partner is big enough, terms and conditions of the contract may be altered with the approval of the legal department.
Responsibilities (RACI)	
Responsible for execution	• Director of Alternative Sales Channels • Leading sales support personnel
Cooperation/participation	• Broker • Sales support administrator
Input/Output	
Output	• Broker contract proposal • Partner data
Changes	
Identification of changes	No change

4. Providing required documents

Activity

Description	
Description	The insurance agent sends the insurance company the required documents via their network. The agent passes his documents over to his manager who in turn passes them over to his manager and so on. This way documents finally arrive to the administration department. The following documents are required to be provided: - contract of services - certificate of good conduct - copy of the register - specimen signature - undertaking by the guarantor - mentor data sheet

	- copies of personal documents
Responsibilities (RACI)	
Responsible for execution	• Broker
To inform	• Sales support administrator
Input/Output	
Output	• Registration documents
Changes	
Identification of changes	No change

5. Checking the completeness of documents

Activity

Description	
Description	The network administration group checks whether all necessary documents are provided. If any document is missing, they contact the insurance agent and ask for the completion of documents.
Responsibilities (RACI)	
Responsible for execution	• Sales support personnel
Cooperation/participation	• Broker
Input/Output	
Input	• Registration documents • Partner data
Changes	
Identification of changes	No change

6. Completion of documents

Activity

Description	
Description	The insurance broker collects all missing documents and sends them to the insurance company.
Responsibilities (RACI)	
Responsible for execution	• Broker
Cooperation/participation	• Sales support personnel • Sales support administrator
Changes	
Identification of changes	No change

7. Are all necessary documents provided?

Decision

Changes	
Identification of changes	No change

Relation "Subsequent" to "8. Partner evaluation" (Activity)

Description	
Denomination	Yes

8. Partner evaluation

Activity

Description	
Description	Partner evaluation is carried out by the support department in cooperation with the risk management director. The partner's legal status (bankruptcy or liquidation proceedings, public financial data) is verified with a PartnerControl program. It is also checked whether the partner previously had a contract with the insurance company, whether it has debts to be paid etc. Refusal is quite rare (1-2 occasions/year).
Responsibilities (RACI)	
Responsible for execution	• Sales support personnel
Accountable for approving results	• Director of Alternative Sales Channels • Leading sales support personnel
Input/Output	
Input	• Broker contract • Partner data
Output	• Partner rating datasheet
Changes	
Identification of changes	No change

9. Is the partner eligible for contracting?

Decision

Changes	
Identification of changes	No change

Relation "Subsequent" to "10. Contract finalization" (Activity)

Description	
Denomination	Yes

10. Contract finalization

Activity

Description	
Description	The director of alternative sales channels is responsible for the content of the contract. Terms and conditions are worked out and finalized, but the signing of the contract can take place only after the partner evaluation process has been completed.
Responsibilities (RACI)	
Responsible for execution	• Director of Alternative Sales Channels
Cooperation/participation	• Sales support administrator
Input/Output	
Input	• Broker contract proposal
Output	• Broker contract
Changes	
Identification of changes	No change

11. Contracting

Activity

Description	
Description	The contract is signed by the insurance broker and the director of alternative sales channels. Both the contract and the commission chart is printed and signed on paper.
Responsibilities (RACI)	
Responsible for execution	• Director of Alternative Sales Channels
Cooperation/participation	• Sales support administrator
Input/Output	
Input	• Broker contract • Commission agreement • Commission supplement • Partner rating datasheet
Changes	
Identification of changes	No change

12. Parallelity-76869

Parallelity

Description	
Type	AND
Changes	
Identification of changes	No change

13. Training

Subprocess

Description	
Referenced subprocess	• Training of insurance mediators Proposed
Description	The insurance broker has to receive training on products he wants to sell. He also needs to get all necessary informative brochures and handouts. Training courses are conducted by relationship managers. Examination is compulsory only for dependent agents.
Changes	
Identification of changes	No change

14. Filing of contracts

Activity

Description	
Description	The returned contract is filed, first in a printed format. After that the contract and its commission appendix are uploaded to the portfolio management system and the SharePoint folder of confidential documents in order to make them easily accessible.
Responsibilities (RACI)	
Responsible for execution	• Sales support personnel

Input/Output	
Output	• Broker contract • Commission agreement • Commission supplement • Partner rating datasheet
Changes	
Identification of changes	No change

15. Merging-76873

Merging

Description	
Type	AND
Changes	
Identification of changes	No change

16. Determining the insurance broker’s status

Activity

Description	
Description	Following a business decision made by the insurance company it can happen that a dependent agent gets into the independent brokers’ channel.
Responsibilities (RACI)	
Responsible for execution	• Sales support personnel
Input/Output	
Input	• Dependent agent • Independent agent • Partner data
Resources	
Technical Resources	• Independent agent
Changes	
Identification of changes	No change

17. Is he a dependent agent?

Decision

Changes	
Identification of changes	No change

Relation “Subsequent” to “18. Registration at the Hungarian National Bank” (Activity)

Description	
Denomination	Yes

18. Registration at the Hungarian National Bank

Activity

Description	
Description	If the insurance broker is a dependent agent, he must be registered at the Hungarian National Bank. It is carried out manually by the relationship manager in an online application.

Responsibilities (RACI)	
Responsible for execution	• Sales support personnel
Changes	
Identification of changes	No change

26. End-70855

End

Description	
Type	local
Changes	
Identification of changes	No change

27. Refusal

Activity

Description	
Description	The contact person informs the insurance agent about the refusal and its reasons.
Responsibilities (RACI)	
Responsible for execution	• Director of Alternative Sales Channels
To inform	• Broker • Sales support administrator
Input/Output	
Input	• Partner rating datasheet
Output	• Visszautasító értesítés
Changes	
Identification of changes	No change

28. End-76846

End

Description	
Type	local
Changes	
Identification of changes	No change

Cross-reference-150873

Cross-reference

Description	
Cross-reference	• BiztosításInsurance mediatork rögzítése portfóliókezelõ rendszerbe Proposed
Type of Cross-reference	Outgoing Cross-reference
Changes	
Identification of changes	No change

Insurance Agent Registration (Own network) Proposed

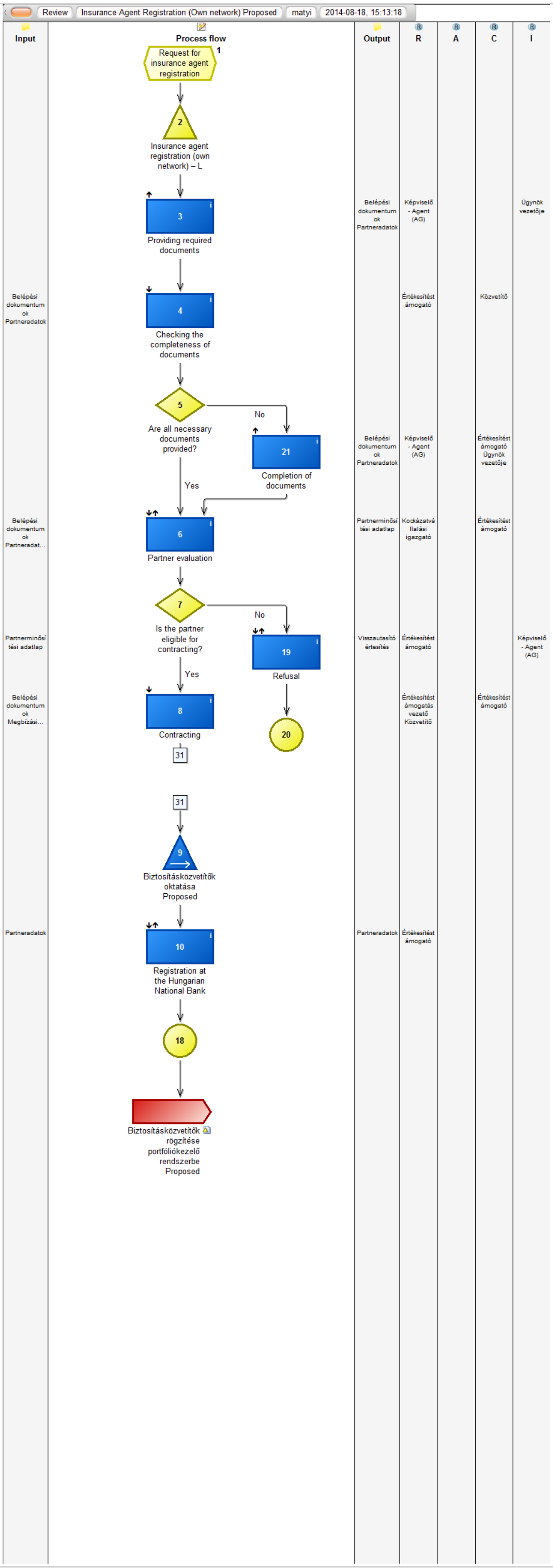
(Business process model)

Description	
Description	A biztosító ügynöki hálózatába való beléptetés folyamata. Jelenleg az ügyféltörzs-kezelés kivételével portfóliókezelo rendszeren kívüli, magasabb fokú integráció javasolt.
Comment	
User attributes	
Model type	Current model
Model state	Review
System attributes	
Author	Török Mátyás
Creation date	2014-08-12, 16:35
Last user	Török Mátyás
Date last changed	2014-08-18, 15:13:18

Model content

1. Request for insurance agent registration (Trigger)
2. Insurance agent registration (own network) – L (Process start)
3. Providing required documents (Activity)
4. Checking the completeness of documents (Activity)
5. Are all necessary documents provided? (Decision)
6. Partner evaluation (Activity)
7. Is the partner eligible for contracting? (Decision)
8. Contracting (Activity)
9. Subprocess-134508 (Subprocess)
10. Registration at the Hungarian National Bank (Activity)
18. End-70116 (End)
19. Refusal (Activity)
20. End-70097 (End)
21. Completion of documents (Activity)

Cross-reference-150731 (Cross-reference)



Review
Insurance Agent Registration (Own network) Proposed
matyi
2014-08-18, 15:13:18
Input
Process flow
Output
R
A
C
I
Request for insurance agent registration
1
2
Insurance agent registration (own network) – L
3
Providing required documents
Belépési dokumentum ok Partneradatok
Képviselő - Agent (AG)
Ügynök vezetője
Belépési dokumentum ok Partneradatok
4
Checking the completeness of documents
Értékesítést ámogató
Közvetítő
5
Are all necessary documents provided?
No
21
Completion of documents
Belépési dokumentum ok Partneradatok
Képviselő - Agent (AG)
Értékesítést ámogató Ügynök vezetője
Yes
Belépési dokumentum ok Partneradat...
6
Partner evaluation
Partnerminősí tési adatlap
Kockázatvá llalási igazgató
Értékesítést ámogató
7
Is the partner eligible for contracting?
No
Partnerminősí tési adatlap
19
Refusal
Visszautasító értesítés
Értékesítést ámogató
Képviselő - Agent (AG)
Yes
Belépési dokumentum ok Megbízási...
8
Contracting
Értékesítést ámogatás vezető Közvetítő
Értékesítést ámogató
20
31
31
9
Biztosításközvetítők oktatása Proposed
Partneradatok
10
Registration at the Hungarian National Bank
Partneradatok
Értékesítést ámogató
18
Biztosításközvetítők rögzítése portfóliókezelő rendszerbe Proposed

1. Request for insurance agent registration

Trigger

Changes	
Identification of changes	No change

2. Insurance agent registration (own network) – L

Process start

Description	
Key process	No declaration
Changes	
Identification of changes	No change

3. Providing required documents

Activity

Description	
Description	The sales support manager collects all required documents. The following documents are to be provided: - contract of services - certificate of good conduct - copy of the register - specimen signature - undertaking by the guarantor - mentor data sheet - copies of personal documents
Responsibilities (RACI)	
Responsible for execution	• Képviselõ - Agent (AG)
To inform	• Ügynök vezetõje
Input/Output	
Output	• Registration documents • Partner data
Changes	
Identification of changes	No change

4. Checking the completeness of documents

Activity

Description	
Description	The network administration group checks whether all necessary documents are provided. If any document is missing, they contact the insurance agent and ask for the completion of documents.
Responsibilities (RACI)	
Responsible for execution	• Sales support personnel
Cooperation/participation	• Insurance mediator
Input/Output	
Input	• Registration documents • Partner data
Changes	

Identification of changes	No change

5. Are all necessary documents provided?

Decision

Changes	
Identification of changes	No change

Relation “Subsequent” to “6. Partner evaluation” (Activity)

Description	
Denomination	Yes

6. Partner evaluation

Activity

Description	
Description	The risk management director carries out a preliminary partner evaluation in order to check whether the representative is acceptable to the network. Evaluation results are passed over to network administration. The process continues only if the results are positive. During partner evaluation the insurance company decides whether the partner’s commission calculation would be based on the realized premium or its stock. Partner evaluation is carried out by the support department in cooperation with the risk management director. The partner’s legal status (bankruptcy or liquidation proceedings, public financial data) is verified with a PartnerControl program. It is also checked whether the partner previously had a contract with the insurance company, whether it has debts to be paid etc. Refusal is quite rare (1-2 occasions/year).
Responsibilities (RACI)	
Responsible for execution	• Kockázatvállalási igazgató
Cooperation/participation	• Sales support personnel
Input/Output	
Input	• Registration documents • Partner data • Partner rating datasheet
Output	• Partner rating datasheet
Changes	
Identification of changes	No change

7. Is the partner eligible for contracting?

Decision

Changes	
Identification of changes	No change

Relation “Subsequent” to “8. Contracting” (Activity)

Description	
Denomination	Yes

8. Contracting
Activity

Description	
Description	Contractual terms and conditions are negotiated. Decision is made on what products the insurance mediator will sell. In case of dependent insurance mediators applicable commission rules are also determined. The contract is signed by the insurance mediator and the director of alternative sales channels. Both the contract and the commission chart is printed and signed on paper.
Responsibilities (RACI)	
Responsible for execution	• Sales support manager • Insurance mediator
Cooperation/participation	• Sales support personnel
Input/Output	
Input	• Registration documents • Megbízási contract • Partner data • Partner rating datasheet
Changes	
Identification of changes	No change

9. Subprocess-134508
Subprocess

Description	
Referenced subprocess	• Training of insurance mediators Proposed
Changes	
Identification of changes	No change

10. Registration at the Hungarian National Bank
Activity

Description	
Description	The dependent agent is to be registered at the Hungarian National Bank. After receiving the required documents it is carried out by the sales support manager in an online application.
Responsibilities (RACI)	
Responsible for execution	• Sales support personnel
Input/Output	
Input	• Partner data
Output	• Partner data
Changes	
Identification of changes	No change

18. End-70116
End

Description

Type	local
Changes	
Identification of changes	No change

19. Refusal

Activity

Description	
Description	The contact person informs the insurance agent about the refusal and its reasons.
Responsibilities (RACI)	
Responsible for execution	• Sales support personnel
To inform	• Képviselõ - Agent (AG)
Input/Output	
Input	• Partner rating datasheet
Output	• Visszautasító értesítés
Changes	
Identification of changes	No change

20. End-70097

End

Description	
Type	local
Changes	
Identification of changes	No change

21. Completion of documents

Activity

Description	
Description	The insurance agent collects all missing documents and sends them to the insurance company.
Responsibilities (RACI)	
Responsible for execution	• Képviselõ - Agent (AG)
Cooperation/participation	• Sales support personnel • Ügynök vezetõje
Input/Output	
Output	• Registration documents • Partner data
Changes	
Identification of changes	No change

Cross-reference-150731

Cross-reference

Description	
Cross-reference	• BiztosításInsurance mediatork rögzítése portfóliókezelõ rendszerbe Proposed

Type of Cross-reference	Outgoing Cross-reference
Changes	
Identification of changes	No change

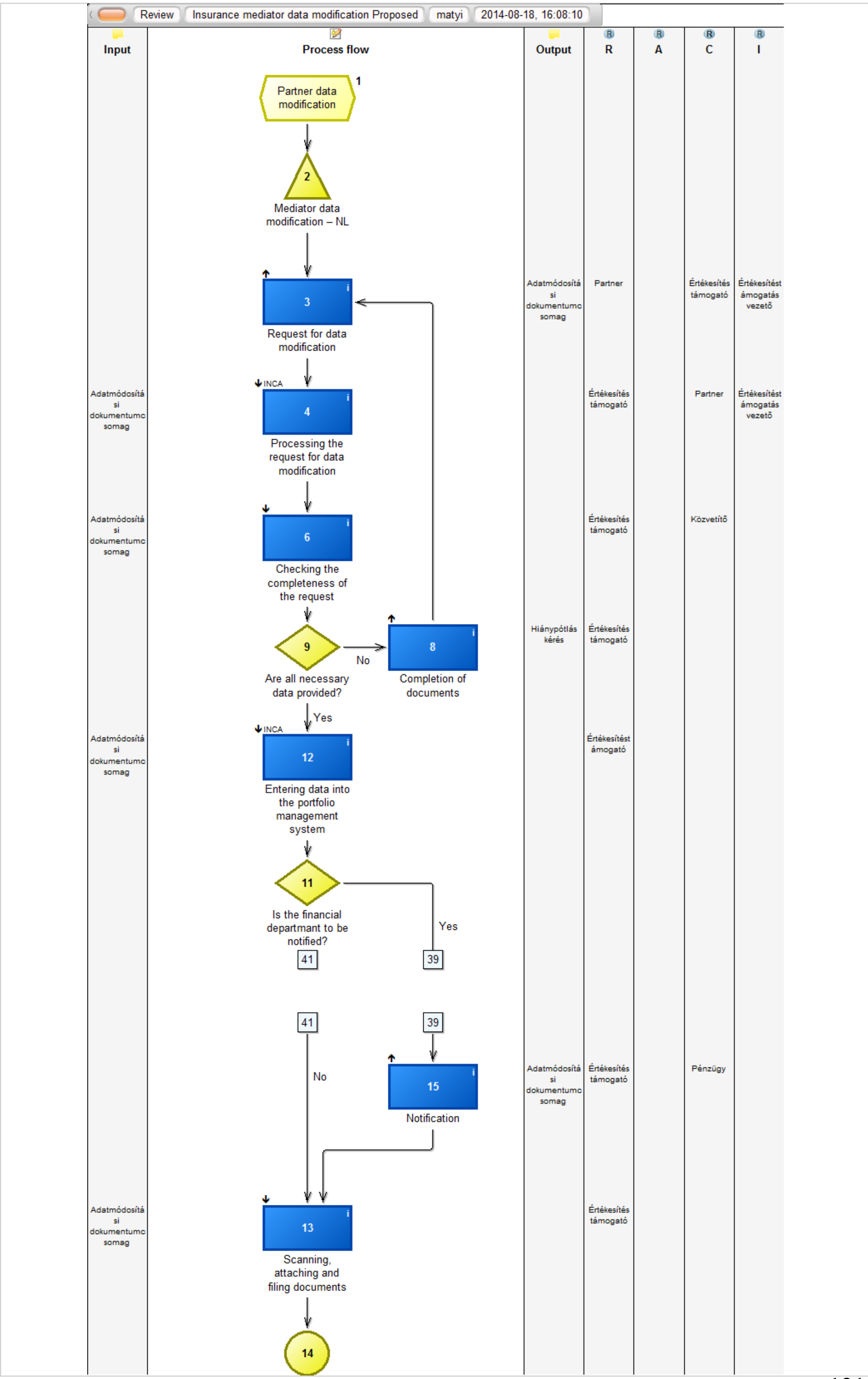
Insurance agent status modification Proposed

(Business process model)

Description	
Description	Managing and administrating the records of registry of insurance agents upon changes indicated by the agents.
Comment	
User attributes	
Model type	Current model
Model state	Review
System attributes	
Author	Török Mátyás
Creation date	2014-08-12, 16:36
Last user	Török Mátyás
Date last changed	2014-08-18, 16:08:10

Model content

1. Partner data modification (Trigger)
2. Mediator data modification – NL (Process start)
3. Request for data modification (Activity)
4. Processing the request for data modification (Activity)
6. Checking the completeness of the request (Activity)
8. Completion of documents (Activity)
9. Are all necessary data provided? (Decision)
11. Is the financial departmant to be notified? (Decision)
12. Entering data into the portfolio management system (Activity)
13. Scanning, attaching and filing documents (Activity)
14. End-93681 (End)
15. Notification (Activity)



Review
Insurance mediator data modification Proposed
matyi
2014-08-18, 16:08:10
Input
Process flow
Output
R
A
C
I
Partner data modification
1
2
Mediator data modification – NL
3
Request for data modification
Adatmódosítási dokumentumcsomag
Partner
Értékesítés támogató
Értékesítést ámogatás vezető
INCA
4
Processing the request for data modification
Adatmódosítási dokumentumcsomag
Értékesítés támogató
Partner
Értékesítést ámogatás vezető
6
Checking the completeness of the request
Adatmódosítási dokumentumcsomag
Értékesítés támogató
Közvetítő
9
Are all necessary data provided?
No
8
Completion of documents
Hiánypótlás kérés
Értékesítés támogató
Yes
INCA
12
Entering data into the portfolio management system
Adatmódosítási dokumentumcsomag
Értékesítést ámogató
11
Is the financial department to be notified?
Yes
41
39
41
39
No
15
Notification
Adatmódosítási dokumentumcsomag
Értékesítés támogató
Pénzügy
13
Scanning, attaching and filing documents
Adatmódosítási dokumentumcsomag
Értékesítés támogató
14

1. Partner data modification

Trigger

Changes	
Identification of changes	No change

2. Mediator data modification – NL

Process start

Description	
Description	Mediator data modification in the system. Sending portal link.
Key process	No declaration
Changes	
Identification of changes	No change

3. Request for data modification

Activity

Description	
Description	The partner notifies the sales support administrator in an electronic format about his request for data modification.
Responsibilities (RACI)	
Responsible for execution	• Partner
Cooperation/participation	• Sales support
To inform	• Sales support manager
Input/Output	
Output	• Adatmódosítási dokumentumcsomag
Changes	
Identification of changes	No change

4. Processing the request for data modification

Activity

Description	
Description	Processing the received request. The sales support administrator decides whether it's a party- or partner-level data modification and whether it affects product-related credentials or commission management. If necessary he discusses the case with his sales support manager.
Responsibilities (RACI)	
Responsible for execution	• Sales support
Cooperation/participation	• Partner
To inform	• Sales support manager
Input/Output	
Input	• Adatmódosítási dokumentumcsomag
Systems	
Referenced IT system elements	• Insurance Corebusiness Administration System (INCA)

Changes	
Identification of changes	No change

6. Checking the completeness of the request

Activity

Description	
Description	The sales support administrator checks whether required conditions for the data modification are met, all necessary data are provided or something is missing.
Responsibilities (RACI)	
Responsible for execution	• Sales support
Cooperation/participation	• Insurance mediator
Input/Output	
Input	• Adatmódosítási dokumentumcsomag
Changes	
Identification of changes	No change

8. Completion of documents

Activity

Description	
Description	If company name, company seat etc. are to be modified, the insurance company asks for a copy of the register. If the bank account number is to be modified, the related bank account contract has to be provided.
Responsibilities (RACI)	
Responsible for execution	• Sales support
Input/Output	
Output	• Hiánypótlás kérés
Changes	
Identification of changes	No change

9. Are all necessary data provided?

Decision

Changes	
Identification of changes	No change

Relation “Subsequent” to “12. Entering data into the portfolio management system” (Activity)

Description	
Denomination	Yes

11. Is the financial departmant to be notified?

Decision

Changes	
Identification of changes	No change

Relation “Subsequent” to “15. Notification” (Activity)

Description	
Denomination	Yes

12. Entering data into the portfolio management system

Activity

Description	
Description	Data modifications have to be entered into the portfolio management system. Along the data themselves all documents provided by the partner are scanned and attached. Data to be modified: - company seat address - postal address - bank account number - company name
Responsibilities (RACI)	
Responsible for execution	• Sales support personnel
Input/Output	
Input	• Adatmódosítási dokumentumcsomag
Systems	
Referenced IT system elements	• Insurance Corebusiness Administration System (INCA)
Changes	
Identification of changes	No change

13. Scanning, attaching and filing documents

Activity

Description	
Description	All finalized and undersigned partner documents are scanned, then attached into the portfolio management sytem and finally the original copies are filed. Filed documents are stored in folders.
Comment	KA 20 #14298-3
Responsibilities (RACI)	
Responsible for execution	• Sales support
Input/Output	
Input	• Adatmódosítási dokumentumcsomag
Changes	
Identification of changes	No change

14. End-93681

End

Description	
Type	local
Changes	
Identification of changes	No change

15. Notification

Activity

Description	
Description	The sales support administrator sends an e-mail to the financial department about the modifications in details with all related documents attached.
Responsibilities (RACI)	
Responsible for execution	• Sales support
Cooperation/participation	• Finance
Input/Output	
Output	• Adatmódosítási dokumentumcsomag
Changes	
Identification of changes	No change

Portfolio management system registration Proposed

(Business process model)

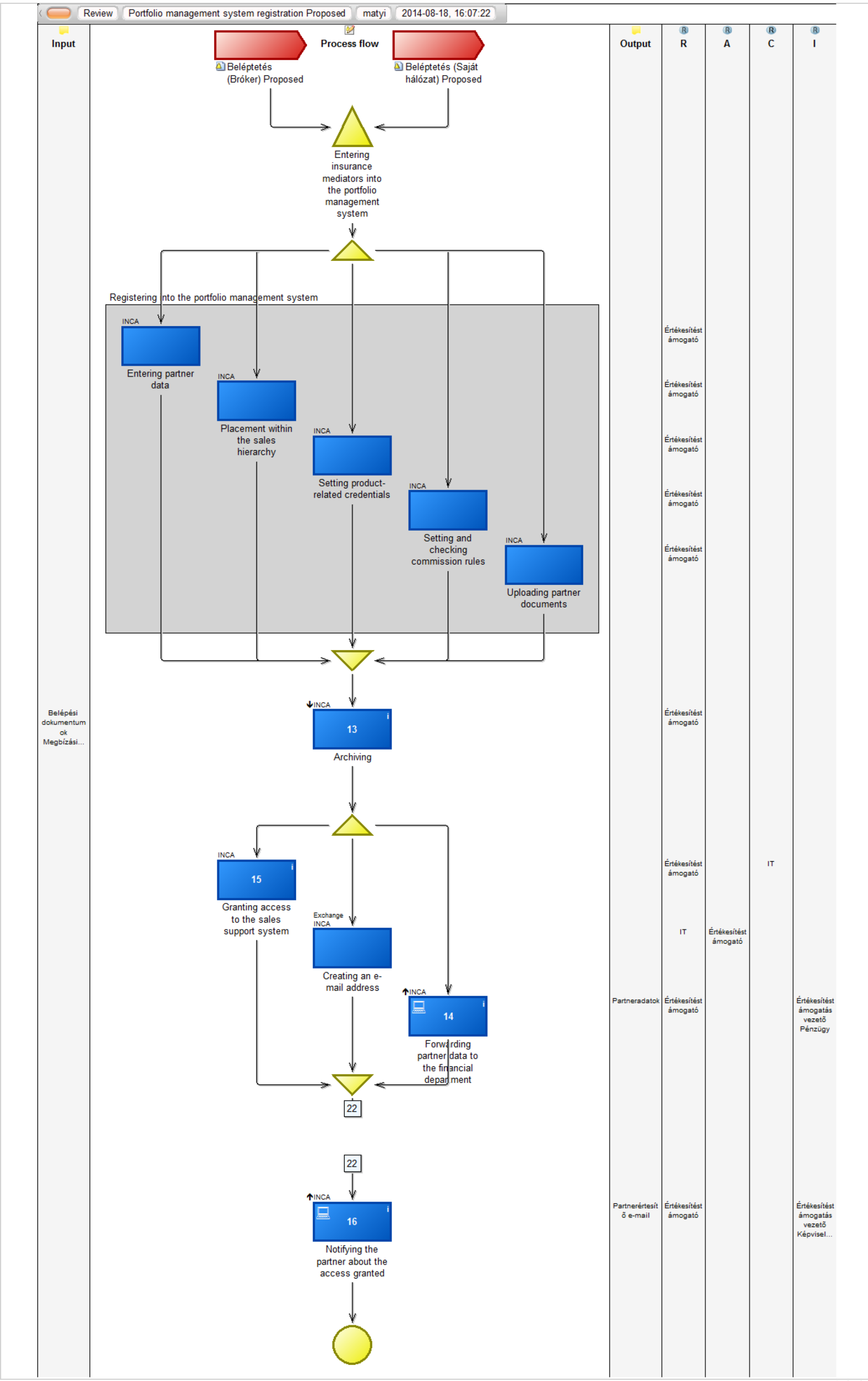
User attributes	
Model type	Current model
Model state	Review
System attributes	
Author	Török Mátyás
Creation date	2014-08-12, 16:36
Last user	Török Mátyás
Date last changed	2014-08-18, 16:07:22

Model content

1. Cross-reference-150736 (Cross-reference)
2. Cross-reference-150739 (Cross-reference)
3. Entering insurance mediators into the portfolio management system (Process start)
4. Parallelity-150745 (Parallelity)

Registering into the portfolio management system (Aggregation)

5. Setting product-related credentials (Activity)
6. Placement within the sales hierarchy (Activity)
7. Setting and checking commission rules (Activity)
8. Uploading partner documents (Activity)
9. Entering partner data (Activity)
10. Merging-150757 (Merging)
11. Archiving (Activity)
12. Parallelity-150748 (Parallelity)
13. Granting access to the sales support system (Activity)
14. Creating an e-mail address (Activity)
15. Forwarding partner data to the financial department (Activity)
16. Merging-150760 (Merging)
17. Notifying the partner about the access granted (Activity)
18. End-150779 (End)


Review
Portfolio management system registration Proposed
matyi
2014-08-18, 16:07:22
Input
Process flow
Output
R
A
C
I
Beléptetés (Bróker) Proposed
Beléptetés (Saját hálózat) Proposed
Entering insurance mediators into the portfolio management system
Registering into the portfolio management system
INCA
Entering partner data
Placement within the sales hierarchy
Setting product-related credentials
Setting and checking commission rules
Uploading partner documents
Értékesítést támogató
13
Archiving
Belépési dokumentumok Megbízási...
15
Granting access to the sales support system
IT
Exchange
Creating an e-mail address
14
Forwarding partner data to the financial department
Partneradatok
Értékesítést támogatás vezető Pénzügy
22
16
Notifying the partner about the access granted
Partnerértesítő e-mail
Értékesítést támogatás vezető Képvisel...

1 Cross-reference-150736

Cross-reference

Description	
Cross-reference	• Insurance Agent Registration - Independent
Type of Cross-reference	Incoming Cross-reference
Changes	
Identification of changes	No change

2 Cross-reference-150739

Cross-reference

Description	
Cross-reference	• Insurance Agent Registration - Captive
Type of Cross-reference	Incoming Cross-reference
Changes	
Identification of changes	No change

3 Entering insurance mediators into the portfolio management system

Process start

Description	
Key process	No declaration
Changes	
Identification of changes	No change

4 Parallelity-150745

Parallelity

Description	
Type	AND
Changes	
Identification of changes	No change

Registering into the portfolio management system

Aggregation

Changes	
Identification of changes	No change

5 Setting product-related credentials

Activity

Description	
Description	In the portfolio management system mediators are given credentials to products they are authorized to sell and manage. Access to a product is granted only if the mediator has attended the related training course and successfully passed the final examination, or if the authorization was agreed on in the contract. A sales support administrator sets the credentials based on the documents provided by the partner at registration. The system can't validate these settings. Credentials are given on a product basis, different credentials

	cannot be granted for product variants or product versions. A period of validity (valid from and valid to dates) can also be set, thus the system will accept offers from the mediator within the determined period only. (However the acceptance of an offer also depends on whether the given product version is currently marketable or not.)
Responsibilities (RACI)	
Responsible for execution	• Sales support personnel
Systems	
Referenced IT system elements	• Insurance Corebusiness Administration System (INCA)
Changes	
Identification of changes	No change

6 Placement within the sales hierarchy

Activity

Description	
Description	According to their predetermined role insurance mediators are placed within the tree structure representing the sales channel. Mediators can take more than one place within the hierarchy. For placement restrictions see Specification D3.1.
Responsibilities (RACI)	
Responsible for execution	• Sales support personnel
Systems	
Referenced IT system elements	• Insurance Corebusiness Administration System (INCA)
Changes	
Identification of changes	No change

7 Setting and checking commission rules

Activity

Description	
Description	Derived commissions are calculated on the basis of commission rules which determine that in case of a given commission type what commission rate is applicable for the given insurance mediator. For insurance mediators working within the insurance company's own network it is not necessary to define commission rules for each agents, because product-related credentials and the placement and role within the sales hierarchy (e.g. AG, UM, AM, PPGA) unambiguously determines what product-related commission rules are applicable for the agent. However it has to be set that the commission calculation for the agent is based on realized premium or stock - it depends on the result of the partner evaluation made in a previous process step. In case of insurance brokers (either working for only the CIG

	or for more insurance companies) it is a more complex issue. If general commission rules are applicable for the broker, then it is enough to define the commission group (1-6) he belongs to and the group's commission rules will be applied to him. However if the contract includes an individual, customized set of commission rules, these have to be created and applied to the broker within the system by setting the necessary parameters.
Responsibilities (RACI)	
Responsible for execution	• Sales support personnel
Systems	
Referenced IT system elements	• Insurance Corebusiness Administration System (INCA)
Changes	
Identification of changes	No change

8 Uploading partner documents

Activity

Description	
Description	All documents provided by the insurance mediator during the registration process have to be scanned and uploaded by the sales support administrator to the portfolio management system. These documents are available within the system for all users who have the right credentials (e.g. sales support department, financial department).
Responsibilities (RACI)	
Responsible for execution	• Sales support personnel
Systems	
Referenced IT system elements	• Insurance Corebusiness Administration System (INCA)
Changes	
Identification of changes	No change

9 Entering partner data

Activity

Description	
Description	As a first step the relationship manager enters the insurance mediator's party- and partner-level basic data. It may turn out that the mediator already exists in the system as a party entity. In such cases it is enough to check party-level data and only new partner-level data are entered into the system.
Responsibilities (RACI)	
Responsible for execution	• Sales support personnel
Systems	
Referenced IT system elements	• Insurance Corebusiness Administration System (INCA)
Changes	

Identification of changes	No change

10 Merging-150757

Merging

Description	
Type	AND
Changes	
Identification of changes	No change

11. Archiving

Activity

Description	
Description	Documents provided by the partner during the registration process have to be archived, paper-based versions are to be stored in a folder. The sales support department itself carries out this task storing the folders in a locker.
Responsibilities (RACI)	
Responsible for execution	• Sales support personnel
Input/Output	
Input	• Registration documents • Megbízási contract • Partner data • Partner rating datasheet
Systems	
Referenced IT system elements	• Insurance Corebusiness Administration System (INCA)
Changes	
Identification of changes	No change

12 Parallelity-150748

Parallelity

Description	
Type	AND
Changes	
Identification of changes	No change

13. Granting access to the sales support system

Activity

Description	
Description	The insurance mediator has to receive a username and a generated password with which he can login to the sales support system. His access to product pages depends on the product-related credentials set in the portfolio management system. If the integration plans come to fruition there will be no need to set credentials in the sales support system, because authentication and authorization of the insurance mediator

	will be done directly by the portfolio management system via web services. If the sales support system won't be integrated, then the IT department will have to be requested to set the required credentials. In document D3.14 we have made a workflow plan for the management of this issue.
Responsibilities (RACI)	
Responsible for execution	• Sales support personnel
Cooperation/participation	• IT
Systems	
Referenced IT system elements	• Insurance Corebusiness Administration System (INCA)
Changes	
Identification of changes	No change

14 Creating an e-mail address

Activity

Description	
Description	Based on the insurance mediator's request the IT department creates an account in the mail system of the insurance company. When it is done, they add the new e-mail address to the partner data within the portfolio management system.
Responsibilities (RACI)	
Responsible for execution	• IT
Accountable for approving results	• Sales support personnel
Systems	
Referenced IT system elements	• Exchange • Insurance Corebusiness Administration System (INCA)
Changes	
Identification of changes	No change

15. Forwarding partner data to the financial department

Activity

Description	
Description	The portfolio management system sends an e-mail to the financial department with the insurance mediator's data in it. Partner data are included both as e-mail text and in an attached spreadsheet. Moreover the e-mal contains a link to the insurance mediator's data sheet within the portfolio management system, where the financial department have access to all related documents (contract, appendices and other documents provided by the partner during the registration process). The e-mail is automatically generated and sent by the system after the sales support administrator has approved it.

Classification	automatic
Responsibilities (RACI)	
Responsible for execution	• Sales support personnel
To inform	• Sales support manager • Finance
Input/Output	
Output	• Partner data
Systems	
Referenced IT system elements	• Insurance Corebusiness Administration System (INCA)
Changes	
Identification of changes	No change

16 Merging-150760

Merging

Description	
Type	AND
Changes	
Identification of changes	No change

17. Notifying the partner about the access granted

Activity

Description	
Description	Having the sales support administrator's approval, the portfolio management system automatically sends the insurance mediator an e-mail. It is sent to the "outside" e-mail address recorded on party level. The e-mail includes the following: - the fact and some main data of creating a user for the partner - access data to the sales support system - list of products the insurance mediator is entitled to sell - access data to the "inside" e-mail account created in the insurance company's mail system
Classification	automatic
Responsibilities (RACI)	
Responsible for execution	• Sales support personnel
To inform	• Sales support manager • Képviselõ - Agent (AG)
Input/Output	
Output	• Partnerértesítõ e-mail
Systems	
Referenced IT system elements	• Insurance Corebusiness Administration System (INCA)
Changes	

Identification of changes	No change

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End

Description	
Type	local
Changes	
Identification of changes	No change

Training of insurance mediators

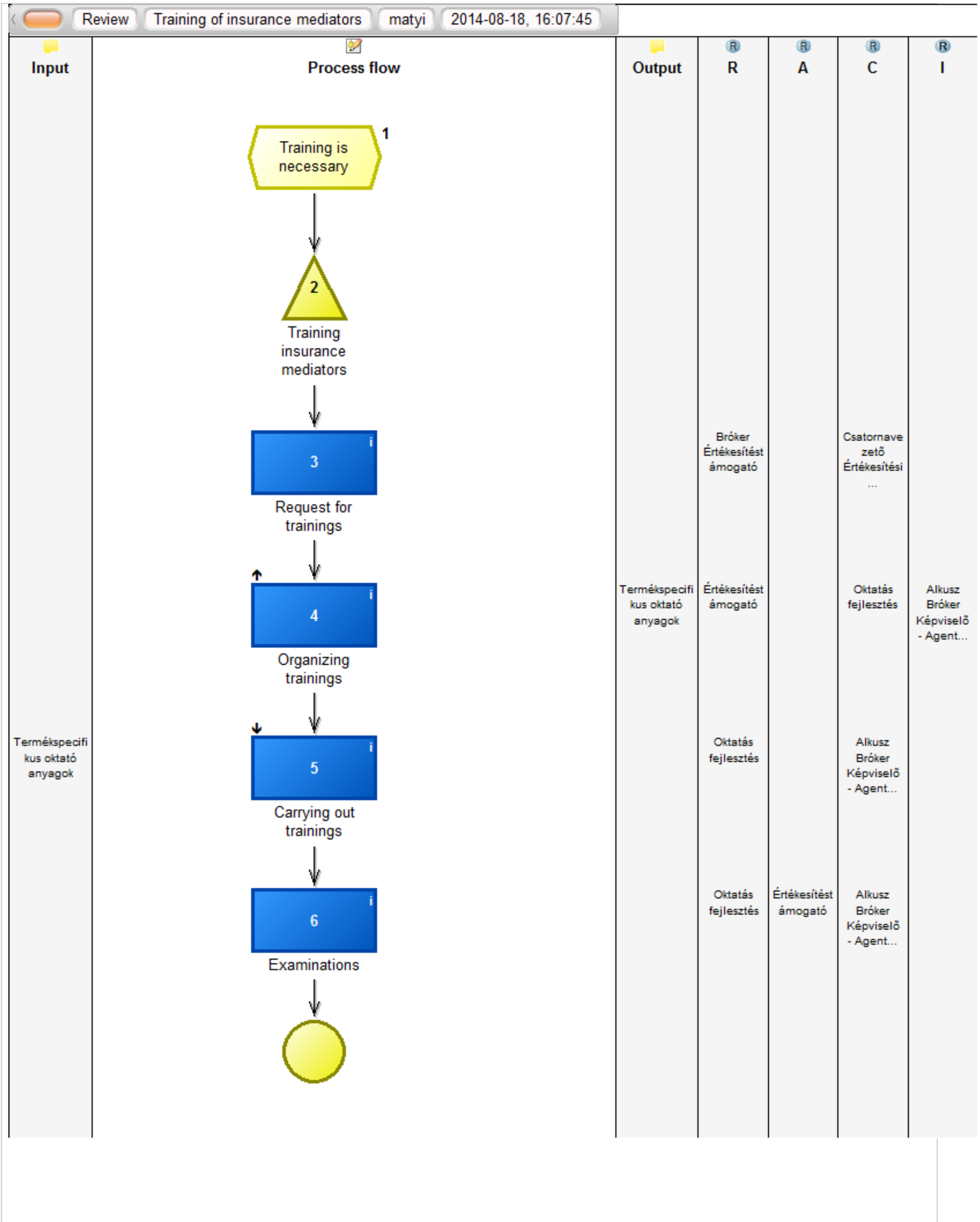
(Business process model)

Description	
Description	A biztosításInsurance mediatorknek termékenként, azon termékekbõl, amelyeket értékesítenek, vizsgát kell tenniük. A függõ ügynököknél az oktatások szervezése, igénylése és a vizsgáztatás is CIG felelõsség, a független ügynököknél ezt a brókernek kell végeznie.
User attributes	
Model type	Current model
Model state	Review
System attributes	
Author	Török Mátyás
Creation date	2014-08-12, 16:36
Last user	Török Mátyás
Date last changed	2014-08-18, 16:07:45

Model content

1. Training is necessary (Trigger)
2. Training insurance mediators (Process start)
3. Request for trainings (Activity)
4. Organizing trainings (Activity)
5. Carrying out trainings (Activity)
6. Examinations (Activity)

End-134432 (End)


Review
Training of insurance mediators
matyi
2014-08-18, 16:07:45
Input
Process flow
Output
R
A
C
I
Training is necessary
1
2
Training insurance mediators
3
Request for trainings
Bróker Értékesítést ámogató
Csatornave zető Értékesítési ...
4
Organizing trainings
Termékspecifi kus oktató anyagok
Értékesítést ámogató
Oktatás fejlesztés
Alkusz Bróker Képviselő - Agent...
Termékspecifi kus oktató anyagok
5
Carrying out trainings
Oktatás fejlesztés
Alkusz Bróker Képviselő - Agent...
6
Examinations
Oktatás fejlesztés
Értékesítést ámogató
Alkusz Bróker Képviselő - Agent...

1. Training is necessary
Trigger

Description	
Description	The insurance mediator is authorized to sell a product only in case he participates the product related training course and successfully passes the final examination. Training may be necessary when a new mediator is contracted, a new product (version) is launched or if an existing partner intends to sell a product that he hasn't sold before.
Changes	
Identification of changes	No change

2. Training insurance mediators
Process start

Description	
Key process	No declaration
Changes	
Identification of changes	No change

3. Request for trainings
Activity

Description	
Description	Insurance mediators have to participate in training courses for each product. Training courses are ended with a final examination which the mediators have to pass successfully. In case of dependent agents it is the sales support administrator's task to hand in requests for product related training courses. Independent brokers can hand in requests themselves for the training of their own insurance mediators.
Responsibilities (RACI)	
Responsible for execution	• Broker • Sales support personnel
Cooperation/participation	• Csatornavezetõ • Értékesítési kapcsolattartó
Changes	
Identification of changes	No change

4. Organizing trainings
Activity

Description	
Description	In accordance with the request the sales support department organizes a training. They arrange for a suitable place, the tutors and they discuss all details with the participants.
Comment	Training costs are paid by the insurance company.
Responsibilities (RACI)	
Responsible for execution	• Sales support personnel
Cooperation/participation	• Oktatás fejlesztés
To inform	• Alkusz

	• Broker • Képviselõ - Agent (AG)
Input/Output	
Output	• Termékspecifikus oktató anyagok
Changes	
Identification of changes	No change

5. Carrying out trainings

Activity

Description	
Description	After every detail is agreed on, training takes place and available printed materials are handed out. Insurance mediators prepare for their final examination and indicate when they are ready.
Responsibilities (RACI)	
Responsible for execution	• Oktatás fejlesztés
Cooperation/participation	• Alkusz • Broker • Képviselõ - Agent (AG)
Input/Output	
Input	• Termékspecifikus oktató anyagok
Changes	
Identification of changes	No change

6. Examinations

Activity

Description	
Description	At an appointed date and time the insurance agent takes part in an examination conducted by a representative of the training department. The examination is a written test taken in an examination room. If the agent successfully passes the examination, the training department notifies the own network administration group in an e-mail.
Responsibilities (RACI)	
Responsible for execution	• Oktatás fejlesztés
Accountable for approving results	• Sales support personnel
Cooperation/participation	• Alkusz • Broker • Képviselõ - Agent (AG)
Changes	
Identification of changes	No change

End-134432

End

Description	
Type	local
Changes	
Identification of changes	No change

9 Appendix: Insurance domain ontology

The xml output of the insurance domain ontology elaborated in the case study.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-4-
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11 Acronyms and terminology

The following glossary is a collection of acronyms and terms with explanations used throughout this paper:

Acronyms:

Acronym	Full Term
ABC	Activity Based Costing
ACSI	The American Customer Satisfaction Index (company that conducts nation-wide surveys)
AD	(UML) Activity Diagram
APQC	American Productivity & Quality Center (non-profit process improvement organization)
BPA	Business Process Analysis
BPD	Business Process Diagram
BPEL	Business Process Execution Language
BPM	Business Process Management
BPML	Business Process Modeling Language
BPMN	Business Process Modeling Notation
BPMS	Business Process Management System or Suite
BPR	Business Process Reengineering
CASE	Computer-Aided Software Engineering
CCPD	Cooperative and Concurrent Product Design
CE	Concurrent Engineering
CML	Conceptual Modeling Language
CMMI	Capability Maturity Model Integration
CONWIP	Constant Work In Process
COPQ	Cost Of Poor Quality
CPD	Collaborative Product Development
CTQ	Critical-To-Quality
DMAIC	Define, Measure, Analyze, Improve, Control
DFA	Design for Assembly
DFC	Design for Manufacturing
DFM	Design for Cost
DFQ	Design for Quality
DoDAF	Department of Defense Architecture Framework
DOE	Design of Experiments

DPMO	Defects Per Million Opportunities
DPPM	Defective Parts (work) Per Million
EPC	Event Process Chain
ERP	Enterprise Resource Planning
ESB	Enterprise Service Bus
FIFO	First-In-First-Out
IDDOV	Identify, Define, Optimize, Validate
ITS	Information and Technology Services
KPI	Key Performance Indicator
LOVEM	Line of Visibility Enterprise Modeling
MDA	Model Driven Architecture
NPD	New Product Development
NVA	Non-Value-Added
ODE	Orchestration Director Engine
OMG	Object Management Group
OWL	Ontology Web Language
OWL-S	Semantically supplemented OWL
PDCA	Plan, Do, Check, Act
PDSA	Plan, Do, Study, Act
QFD	Quality Function Deployment
RACI	Responsible, Accountable, Consulted, Informed
RDF	Resource Description Framework
RMA	Role Manager Agent
SBPM	Semantic Business Process Management
SIPOC	Suppliers, Inputs, Process, Outputs, Customers
SEE	Semantic Execution Environment
SSB	Semantic Service Bus
SOA	Service-Oriented Architecture
TPS	Testing Procedure Specification
TQM	Total Quality Management
UML	United Modeling Language
UML AD	United Modeling Language Activity Diagram
URI	Uniform Resource Identifier
VSM	Value Stream Mapping
WIP	Work In Process
WMA	Workflow Manager Agent
WSDL	Web Service Definition Language

WS-BPEL	Web Service Business Process Execution Language
ZQC	Zero Quality Control

Terminology:

Term	Definition
Activity-Based Costing (ABC)	A model that identifies activities and assigns costs to activity resources used for cost accounting.
Activity: Task	Most elemental form of work. Tasks are comprised of standards, instructions, forms, and skills.
Activity: Sub-Process	Also known as compound activity.
Activity: Transaction	Must be completed right after starting.
Activity Type: Value-adding	These activities provide value to the customer and are what the customer is willing to pay for.
Activity Type: Hand-off	Move work across boundaries. This is where process improvement efforts often focus on decreasing time and costs.
Activity Type: Control	Provides standards and measurements checkpoints in a process. These are quality assurance or compliance type activities.
ADONIS	A graph-structured BPM modeling suite by BOC Group
ARIS Framework	A collection of views that enable you to divide your analysis into perspectives and integrate into a process view.
Batch Processing	Collecting input data, processing the data, and producing output as a set or in a group. Meetings are batching of information flow.
Benchmarking	A standard to measure against.
Boolean	System of process logic using “AND” and “OR” gates or operations.
Buffer	Protective reserve to lessen the impact of incompatibility between production or service ability and customer need. In an office environment, we can buffer with inventory, capacity, and time.
Business Process	A series of activities performed to purposefully achieve a common business goal.

Business Process Analysis (BPA)	Discipline of identifying business needs and problem solutions.
Business Process Execution Language (BPEL)	A standard executable language for specifying interactions with Web Services.
Business Process Management (BPM)	The definition, improvements, and management of end-to-end business processes in order to achieve clarity on strategic direction, alignment of resources, and increased discipline in daily operations. It is a systematic approach to understanding, improving, and managing a business and contains four basic phases; modeling, analysis, design, and management.
Business Process Management Suite (BPMS)	Software that provides the capability to model, design, deploy, execute, analyze, and optimize business processes. It coordinates the flow of tasks while capturing information about the execution of the process to enable continuous improvement.
Business Process Modeling	The activity of representing processes so that the current process may be analyzed and improved.
Business Process Modeling Language (BPML)	A meta language for modeling business processes. It has been replaced with BPEL.
Business Process Modeling Notation (BPMN)	The industry-standard graphical representation for business process workflow diagrams.
Business Process Reengineering (BPR)	A technique of analyzing processes in order to improve customer service, reduce costs, and improve competitive capacity. It begins with an assessment of the mission, strategic goals, and customer needs, and helps organizations critically analyze how they work, and drastically redesign their process.
Capacity Maturity Model Integration (CMMI)	A process improvement approach used to guide process improvement. CMMI addresses product and service development, service establishment, service management and delivery, and product and service acquisition.
Computer-Aided Software Engineering (CASE)	The application of a set of tools and methods to a software system to develop high-quality, defect-free, and maintainable software. This term can also refer to the software used for the automated development of systems software or computer code.
Context Diagram	A diagram that describes the scope and presents hierarchy—it represents the highest level of a system.

Control Chart	A line chart that indicates upper and lower control limits for desired performance. Plot points beyond the limits are considered unacceptable.
Critical-to-Quality Tree	An analysis tool from Six Sigma used to decompose customer requirements into quantified requirements so they can be measured.
Critical Success Factor	An activity or element that it required for an organization to achieve its mission.
DMAIC	Incremental process improvement methodology that identifies a problem area, measures it, determines why there is a problem, and then fixes it.
Department of Defense Architecture Framework (DoDAF)	A framework for developing and representing architecture descriptions for consistency across organizational and national boundaries. It includes a set of products for visualizing, understanding, and assimilating architecture through graphics, tables, and text.
Domain ontology	Identifies all the artifacts that describe a process, regardless of whether it is structured or not . It allows building clearly and unambiguously all process elements, linked with the domain ontologies that specify enterprise concepts, as well as the business rules, roles, outcomes, and all the other inter-dependencies.
Enterprise Resource Planning (ERP)	An integrated system used to manage internal and external resources. It includes tangible assets, financial resources, human resources, and materials.
Event	Something that happens during a process.
Event-Driven Process Chain (EPC)	An ordered graph of events and functions; it represents that every business activity is triggered by an event.
Fault	A system providing a service that it could not complete normally.
FIFO	Process orders in a First-In-First-Out basis. The supplying process stops when the maximum allowable orders is reached, then continues when the minimum number of orders is reached.
Gantt Chart	A horizontal bar chart that illustrates a project schedule. It shows start dates and end dates of project tasks or elements.

Gemba	In a business environment, this refers to the place where value-added work is created.
Genchi Genbutsu	See for yourself to understand a situation.
Hansei	Commit to improvement through relentless reflection and self-awareness; thereby establishing a learning organization.
Heijunka	Reducing waste by producing at a constant rate and leveling the workload.
Histogram	A bar chart representing frequencies.
ITS	Information and Technology Services (ITS), which designs, implements, and supports U-M administrative information systems and processes.
HITS Help DeskH	ITS Help Desk serves as the single point of contact, offering technical and functional support, for U-M staff and faculty who use M-Pathways (including Wolverine Access). Help Desk staff provide telephone and onsite consultation to help users resolve problems and to promote effective use of the systems. Contact Information: Information and Technology Services Help Desk 734.764.HELP (4357), option X itsadminhelpdesk@umich.edu http://www.mais.umich.edu/online_help_desk/ Hours: 8:00 a.m. to 5:00 p.m., Monday - Friday
Jidoka	Supervisory checks within the process to prevent defects, eliminate overproduction, and analyze problems to prevent them in the future.
Kaizen	This is a Japanese term used in Lean manufacturing meaning improvement. In the service industry, it refers to activities that continually improve business functions.
Kanban	A scheduling system that defines what to produce, when, and how much.
Key Performance Indicator (KPI)	A business metric or measurement used to evaluate a factor that is critical to the success of an organization.
Lead Time	Delay between the start and end of a process.

Lean	A production practice focused on improving performance and efficiency, and reducing waste throughout the enterprise and value chain. This process management methodology applies particularly well when we already know the problem is that the process takes too long and is wasteful.
Lean Six Sigma	A production practice focused on reducing waste and improving quality to achieve a higher level of quality faster.
Lean Six Sigma Continuous Improvement Roadmap	On the roadmap of continuous improvement, an organization is identified as residing in a chaos, stabilization, or optimization phase of continuous improvement. Within each of these phases are two process learning stages: • Chaos—oblivious stage or discovery stage • Stabilization—awareness stage or improvement stage • Optimization—best-in-class stage or optimal stage This tool recommends a logical, progressive application of select Lean or Six Sigma tools as an organization reaches different points on the map.
Mix Leveling	Reduce the variation in the mix of activities to be performed by establishing a routine.
Model Driven Architecture (MDA)	Executable systems governed by graphical models.
Muda	Waste; eight wastes include overproduction, waiting, transportation, non-value-added processing or over-processing, inventory (work orders, queues, or requests), defects, and underutilized resources (employee talents). Ineffective or inefficient process flow and variability are the root causes for most wastes.
Pareto Chart	A chart that contains a bar chart with a line graph over it. Individual values are represented by the bars in descending order, and the cumulative total is represented by the line. In process improvement, they can help define areas for improvement.
Pitch	Duration of schedule; the frequency of checking performance against customer needs.
Planned Cycle Time	Work speed

Poka Yoke	Error-proofing or designing features or systems to prevent mistakes.
Process Description(s)	Information about each activity.
Process Map	Flow chart of activities
Process Mining	Gather information from existing sources using diagnostic software capabilities such as audit logs.
Process Model	Providing information to enable processes to be analyzed, simulated, and executed in a flow chart. Models contain diagrams and information about the objects, relationships, and behavior. Multiple diagrams can be linked together based on relationships.
Process ontology	The domain ontology provides vocabulary of concepts and their relationships, about the activities performed and on the theories and elementary principles governing that domain. It is not a glossary of terms, is what defines the company sphere and represents what the company does.
Pull System	The customer requests the product, and the producer provides the product or service on-demand. This method controls the flow of resources based on specific rules and system status.
Push System	A promoted product or service that provides resources to consumers based on forecasts, schedules, or internal timing needs.
Quality Function Deployment (QFD)	A method used to transform user demands into design quality. It is a key practice of design for Six Sigma. This technique is used to identify and document competitive marketing strategies.
RACI	A matrix used to clarify roles and responsibilities by describing participants involved in completing tasks or deliverables for a project or process
Relationship Mapping	Represents communication and dependencies between entities.
Role-Interaction Diagrams	Describes how people get work done at the activity level and what systems they use—including contextual design and information architecture.
Root Cause /Causal Path Analysis	A class of problem-solving methods for identifying the causes of problems or events to develop effective corrective actions to prevent reoccurrences.

Sarbanes-Oxley (SOX) Act	A United States federal law that describes specific mandates and requirements for financial reporting.
Service Families	Natural grouping of services according to similar processes.
Service-Oriented Architecture (SOA)	IT design principles applied during software systems development and application integration that enable flexibility by optimizing reuse of assets.
Simulation Model	Provides “what-if” analysis capabilities and graphical representation of results before and after process improvement.
SIPOC Diagram	A tool used to identify the elements of a process improvement project that are relevant to a process improvement project. The categories are Supplier, Inputs, Process, Output, and Customer. It is a valuable tool for scoping a mapping effort and can be used to identify quick improvements.
Six Sigma	A business management strategy designed to improve quality by identifying and removing causes of defects. The goals are to remove variation and design more capable processes.
Standardized Work	Performing routine work in a standardized, repeatable way to maintain quality.
Statistical Process Control	Using statistical analysis to detect changes in the process.
Takt Image	A means to check performance visibly.
Takt Time	Expected rate of demand (customer need) and the rate of completing work based on customer demand. Takt Time=Available Working Time/Customer Requirement
Throughput	Production or development rate; rate of providing service.
Total Quality Management	A management concept designed to reduce errors produced, increase customer satisfaction, and streamline processes. The approach involves improving quality by ensuring conformance to internal requirements.
Transparency	How visible is it to your customers how your company is run.
Tree Diagrams	Used for root cause analysis.

Value Chain	A series of activities for a firm operating in a specific industry.
Value Stream Mapping	A technique of diagramming the flow of information and materials representing a process to provide a product or service.
Visual Controls	Visual signals to communicate information needed to make business decisions. This mapping can identify wastes or areas requiring further analysis.
Voice of the Customer (VOC)	The process of capturing a customer’s expectations, preferences, and aversions in-depth to produce a detailed set of customer requirements organized in a hierarchical structure, and prioritized.
Volume Leveling	Reducing the variation in demand on a process.