

Example of designing a business process oriented autopoietic knowledge management support system.

Mariusz Żytniewski
University of Economics in
Katowice 1 Maja 50, 40-287
Katowice +48 32 2577277
zyto@ue.katowice.pl

□ **Abstract** — Building systems designed to support business processes and knowledge management requires the development of methods facilitating the integration of both these approaches. In order to use organisational knowledge during performing business processes, it is necessary to define the business process that will be supported and the scope of knowledge that will be used, as well as developing the architecture of the system that will provide codified knowledge. These issues have been addressed by the theories and application example presented in this paper. The aim of the paper is to show a developed methodology for the process of building business process oriented autopoietic knowledge management support systems.

I. INTRODUCTION

Integration of knowledge management systems and an organisation's business processes is one of key aspects of managing an organisation's knowledge [1], [2], [3], [4]. In order to facilitate the performance of processes, it is necessary to build IT solutions which, on the one hand, support the performance of a business process, while on the other hand, provide the user with the necessary knowledge that aids them in their activity or even substitute them in decision-making. As indicated by research by Al-Mabrouk [5] and Choy Chong [6], IT technologies are one of key factors of successful use of KM in organisations. At the same time, research by Akhavan et al. [7] pointed out that the most important key factors of successful implementation of KM are the aspects of knowledge sharing and knowledge storage. Therefore, it is important to search for methods for building IT solutions which will support the process of making organisational knowledge available and storing it.

The author's earlier research [8], [9], [10], [11] has shown that the theory of software agent societies and its use in knowledge-based organisations requires a separate view of the characteristics of multi-agent systems. Especially in the area of the application of methods for knowledge representation in such systems and possibilities of using autopoietic solutions to support the different stages of the life cycle of the process of knowledge management [8], [12].

Research into the methodologies used in designing multi-agent systems [13] indicated a range of features that should be considered in the context of building agent societies designed to be used in knowledge-based organisations. Such methodologies should enable:

- Identification of agents' roles in the system and their assignment to individual entities.
- Definition of agents' objectives and tasks.
- Definition of agents' convictions and knowledge.
- Specification of the content of agents' communication.
- Definition of the architecture of agents.
- Specification of the system's architecture.
- Identification of the system's functionality.
- Conceptualisation of the project's field.
- Definition of the organisation's ontology/social relations in the organisation.
- Definition of the environment of the agent society.
- Definition of the environment's resources.
- Mechanism of an agent's interaction with its environment.

Conducted research [13], [14] found out gaps in the methodologies for supporting design of multi-agent systems considered in the context of agent societies in the area of their application for supporting knowledge-based organisations. The author's current research aims to define the possibilities of using the theory of software agent society in building a business process oriented autopoietic knowledge management support system [15], [16]. One of the aspects of creating autopoietic systems to support the integration of business processes and knowledge management is the methodological aspect of the development of such systems [27], which is addressed in the paper.

The aim of the paper is to present the developed methodology for the process of building business process oriented autopoietic knowledge management support systems designed to facilitate an auditor's activities. Chapter 2 will present theoretical elements connected with these issues.

Chapter 3 will contain the assumptions of the developed methodology. Chapter 4 will discuss an example of its application in the area of personal data protection. The summary will feature the diagnosed advantages and disadvantages of the proposed approach.

II. PROBLEM. INTEGRATION OF BUSINESS PROCESSES AND KNOWLEDGE MANAGEMENT

Integration of business processes and knowledge management systems as part of a system being developed may refer to the process of the performance of a task undertaken in a business process or support for a decision-maker participating in the process. This paper will address the latter issue. As was pointed out by Bitkowska [17], a knowledge management system can be divided into four sub-systems:

- databases – which refer to data access and knowledge sharing.
- organizational language – which allows the terms used in an organisation to be understood.
- network links - which enable access to information and knowledge within an organisation and beyond.
- transfer - which enables transfer of knowledge between individuals.

From the perspective of integration of KM and BPM, these sub-systems have to be subject to contextual integration as part of business processes in which they will be used. For that purpose, it is necessary to develop IT solutions designed to support such processes.

In terms of the use of Business Process Management in Knowledge Management, the following postulates of this approach can be formulated [18]:

- business processes, if modelled and captured in business process repository, are a part of codified intellectual capital of the organization,
- knowledge processes in an organisation should be a part of business process repository,
- business process repository could be used for knowledge creation, sharing and distribution.

In terms of the support for participants of a business process, it is reasonable to separate the system's elements that are responsible for the implementation of a process, its flows and orchestration from analytical systems that support decision-making processes [19]. This makes it necessary to build integrating solutions which, apart from linking organisational knowledge as part of business processes, will be able to autonomously process and provide decision-makers with knowledge that is necessary for performing tasks they undertake. One of the postulated elements that integrate BPM and KM is the aspect of knowledge

codification, which should be ensured by such systems. In this case, problems that can be solved by such systems (against the background of integration of Business Intelligence and KM) include [20]:

- lack of support in defining business rules for getting proactive information and support in consulting in the process of decision making,
- lack of a semantic layer describing relations between different economic topics,
- lack of support in presenting the information of different users (employees) and their individual needs,
- difficulty in rapidly modifying existing databases and data warehouses in the case of new analytic requirements.

The above-indicated issues refer to the aspect of the integration of BPM and KM, but are not the only ones in the context discussed in this paper. The problem that appears during the design of systems discussed in this paper is specification of business processes and knowledge resources, as well as translating the defined elements of the system into the application of an IT system designed to support a decision-maker's actions. The definition of organisational knowledge resources in the form of knowledge portals forces a decision-maker to search for specific knowledge needed to perform their tasks. On top of that, part of organisational knowledge can be scattered in the organisation, and tasks will take more time to perform. It is thus reasonable to support the process of integration of organisational knowledge as part of the tasks of business processes performed by decision-makers and to facilitate the methods for building IT systems that aid adaptation of knowledge to process participants.

Notations designed to support business process modelling, such as ARIS [21], BPMN [22] or IDEF0 [23], do not provide ready solutions that specify what knowledge will be provided to a decision-maker during their tasks, its sources or specification. This problem may be solved by using e.g. the KMDL (Knowledge Modelling and Description Language) language [24], but such solution in the case of business analysts requires the use of a new notation when business processes in a company are already documented by means of business process-oriented notations. When a new design notation is used, all the elements of a process have to be mapped to new artefacts. Another problem that appears is specification of knowledge resources. Applied notations usually define their own artefacts describing organisational knowledge without clear indication of how they are codified in the IT system. This results in inconsistency between the definition of knowledge resources in the design and their actual implementation in the IT system. Often, proposed design notations do not address the issues of standards for specification of knowledge resources, defined e.g. by W3C

organisation, which indicate what the structure of the ontology describing knowledge resources should look like.

Specification of knowledge resources based on proprietary sets of artefacts does not allow for their direct translation into available standards for knowledge codification. By using standards for describing knowledge resources in the form of ontology description languages OWL, OWL 2, RDF or RDFS, it will be possible to use the developed ontology again in another project and organisation. This is possible thanks to semantic description of the meanings of the terms used in ontologies.

Another aspect is semantic identifiability of the terms used during the design of knowledge resources by a knowledge engineer, which would make it possible to use the ontology for designing purposes (interpretable by the IT system being designed and by process participants) and for the purpose of system implementation. It would allow a once prepared definition of knowledge resources to be an element of design specification, an element of the system being implemented and to be used to integrate an organisation's knowledge resources with other ontologies.

The literature offers [25], [26] a range of studies which define how knowledge is codified based on ontology description languages. The main types of ontology include core, upper-level, domain, task, and application ontologies. The example presented further in the paper represents domain ontology with elements of application ontology.

It can be concluded that in terms of integration of business processes as part of knowledge management systems, it is necessary to create solutions that ensure:

- The use of generally accepted standards for describing an organisation's business processes, which will allow already operating organisations with diagnosed business processes to easily integrate the knowledge management system as part of employees' tasks.
- The use of standardised descriptions of an organisation's knowledge resources in the form of ontologies and ontology description languages and possibilities of using already applied standards in the process of defining field ontology.
- Mechanisms that allow for translation of the defined ontologies into a format that can be recognised by IT systems, thus shortening the time it takes to implement the system (the ontology developed at the stage of specifying the system's knowledge resources will be able to be automatically used during its implementation) and ensuring interoperability of knowledge resources across various projects and organisations.
- Linkage of the process of specifying business processes and organisational knowledge resources with the process of designing not only systems that automate the performance of processes but also systems that support decision-making.

- The use of codified knowledge resources in defining business rules of a business process and rules for the operation of a decision-making support system. Such translation makes it easier to define control mechanisms that control the operation of a system's elements.
- Extension of the architecture of built systems for integration of business processes and knowledge management by autopoietic elements that support decision-makers' actions through processing the codified resources of the system's knowledge.

The first four postulates refer directly to the aspect of integration of BPM and KM. The next two are connected with integration of autopoietic solutions as part of such a solution. The use of the theory of autopoietic systems impacts additional features of the solution being developed. They include: partially open, self-reference, self-control, boundary-generation, self-organisation through self-production. In such systems, business processes are performed dynamically based on system-resident components, and are subject to constant control. By using the theory of autopoiesis in the process of supporting the performance of business processes, system elements are not only subject to self-organisation, but - through the process - performed production processes can be reproduced and then incorporated into the business process being performed. These actions are carried out in a partially open system, where system elements interact with one another, which is equipped with control mechanisms that limit undesired behaviours within the whole system.

The methodology presented further in the paper and the tool developed to support its implementation fulfils the above-mentioned postulates and constitutes a response to the problems pointed out in this chapter.

III. ELEMENTS OF THE PROPOSED METHODOLOGY

The proposed methodology has been developed based on three main stages with a loopback, which involve the specification of business processes of an organisation, its knowledge resources and an autopoietic element that facilitates integration of knowledge resources within a business process [27]. The methodology comprises the following stages:

- First stage - identification and modelling of business processes.
- Second stage - identification and modelling of an organisation's knowledge resources.
- Third stage - designing and implementation of a process oriented autopoietic knowledge management support system.



Figure 1. Elements of the proposed methodology

Figure 1 presents elements of the proposed design methodology along with the impact of the individual stages on each other. In accordance with figure 1, the following stages have been identified in the methodology:

1. Analysis and development of a business process.
2. Identification of organisational knowledge resources.
3. Designing and implementation of a process oriented autopoietic knowledge management support system:
 - 3.1. Identification of the context of usage.
 - 3.2. Analysis of the roles and responsibilities of autopoietic system.
 - 3.3. Determining the hierarchical structure of the relationship inside the organization.
 - 3.4. Preliminary definition of the architecture of an autopoietic system.
 - 3.5. Indication of the impact of control mechanism on the autopoietic system.
 - 3.6. Essential definition of the autopoietic element internal architecture.
 - 3.7. Designing the interaction autopoietic elements.

The first stage refers to identification and specification of the business process that is supported. On this basis, the usage context of the system being built is defined. The proposed approach uses the BPMN notation for specification of the process supported by a business process oriented autopoietic knowledge management support system. This allows for the use of this approach to an organisation that already has codified processes without the need to codify them once again. Further, the task of a knowledge engineer is to indicate knowledge resources. For this stage, it is necessary to indicate the ontology defining the scope of terms used by the knowledge management system and the

objects that are defined by means of them. In the proposed approach, ontology is defined using the author-developed editor, which uses notation in compliance with OWL 2 specification. The preliminary definition of a business process and knowledge resources can precede the process of designing a business process oriented autopoietic knowledge management support system. The proposed stages of the process of designing such a solution refer to the context of its application, architecture, impact on its environment, rules applied in the system and its interactions. Such division enables the fulfilment of the expected requirements (presented in the introduction), which could facilitate the design of business process oriented autopoietic knowledge management support systems to support knowledge-based organisations. The next chapter will present elements of the proposed methodology as well as the application of the developed design tools.

IV. EXAMPLE OF APPLICATION

The application of elements of the proposed methodology will refer to the process of verification of personal data protection in an organisation. Pursuant to the Act on personal data protection in force on the territory of Poland (Personal Data Protection Act (Journal of Laws of 2016 item 922) and the Resolution of the European Parliament and European Council (UE) 2016/679 of 27 April 2016 on protection of individuals with regard to personal data processing and on free flow of such data, economic entities are obliged to implement a security policy for personal data protection. One of the aspects of this policy is security audits specified in the Act which should be cyclically carried out by an Information Security Administrator. Such audits have to be preceded by establishment of their schedule and approved by a company's Board of Directors.

The first problem with supporting an auditor's actions is connected with the fact that part of the information he/she processes as part of the audit is stored in IT systems of the audited enterprise. The systems where such data is stored do not support business processes connected with personal data protection. The second reason for using the solutions proposed in the paper is the necessity of examining the process of data processing in the context of physical, technical and organisational security measures. This requires that the person who undertakes such activities not only possesses knowledge about the processes taking place in the organisation, their participants and processed information resources, but also checks whether physical and IT security measures work properly, which often goes beyond the auditor's competencies. Therefore, it is reasonable to apply a system for decision-making support which will facilitate the audit process. Another reason is connected with the auditor's needs regarding knowledge resources. In the case of an audit, knowledge about the organisation often has extend beyond the boundaries of the organisation, because the IT

systems used in the organisation can be located at any place (e.g. as a result of using Cloud Computing), and information flows go beyond the organisation. As a result, audit-related activities have to refer to the aspect of IT systems and information flows that are located outside the audited entity. Consequently, we can list a range of premises that indicate the necessity of using the proposed approach to modelling business process oriented autopoietic knowledge management support systems:

- Lack of support of the audit process by IT systems of the audited organisation.
- Necessity of possessing knowledge about organisational, physical and technical aspects of the organisation's operation.
- Necessity of integrating not only IT systems but above all the knowledge about processes in the organisation.
- Necessity of providing the auditor with organisational knowledge about the audit process and knowledge about the organisation itself.
- Necessity of analysing business processes in the organisation and beyond.

Currently available IT systems dedicated to the aspect of personal data protection do not address these issues in a sufficient way and focus on the process of preparing audit documents rather than supporting their preparation. The following sections will present selected aspects of using the proposed methodology in the process of preparing elements of a system designed to support a decision-maker in this process. All the above-mentioned stages are supported by design tools developed by the author.

A. Specification of a business process

As was already mentioned, the first stage is indication of the context of the system's operation connected with modelling the structure of the business process that will be supported. For modelling of this stage, the notation BPMN has been used.

An audit process comprises a number of stages presented in figures 2 and 3. Stages of business process specification include:

- Specification of organizations involved in the process and the posts performing the tasks.
- Determination of relationships inside the organization. At this stage, the relationship is defined within the organizational structure that supports the system. In the case of an organization, it is a structure linking.
- Defining the rules of starting and ending the process.
- Diagnosing the business process tasks.
- Diagnosing the business process events.
- Defining the conditions governing decision gates.

The initial phase involves establishment of audit schedules which have to be approved by the Board of Directors (figure 2).

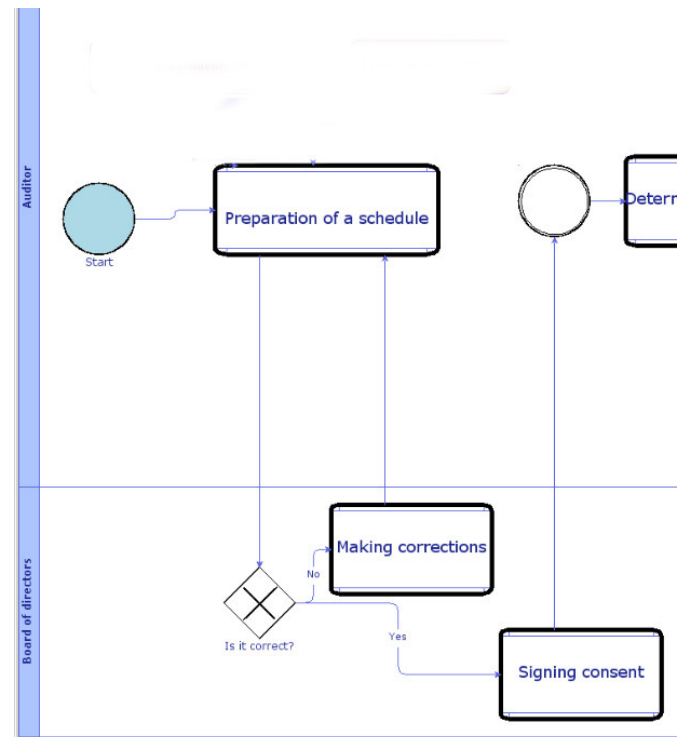


Figure 2. Initial phase of the process of information security audit.

On this basis, cyclical audits are performed during which technical and physical security measures as well as organisational procedures are checked. This aspect is presented in figure 3.

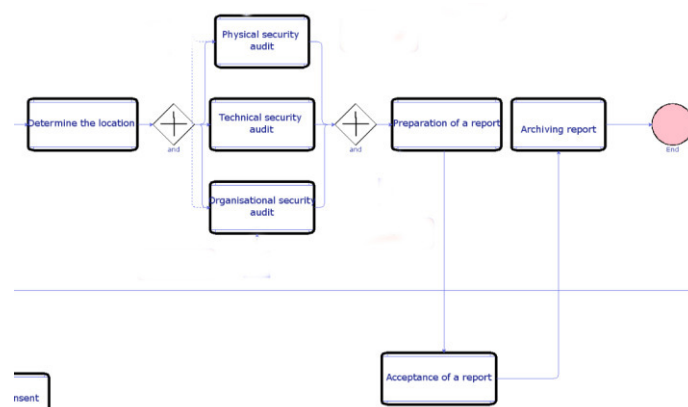


Figure 3. Phase of an information security audit.

A business process specified in this way indicates only an employee's tasks to be performed and is consistent with BPMN notation. In the next steps, it will be extended by KM elements.

B. Specification of knowledge resources

Once elements of a business process are defined (in accordance with the developed methodology), it is necessary to define which resources of organisational knowledge can be used during its performance. The second stage consists of the following sub-stages:

1. Identification of codified knowledge sources (e.g. documents, websites, system-generated knowledge developed in earlier iterations).
2. Identification of non-codified knowledge sources (e.g. experts).
3. Development or update of the ontological model (meta-knowledge) about knowledge resources.

The third stage consists of the following sub-stages:

- 3.1. Definition of the aim of the implementation of the ontology.
- 3.2. Definition of the scope of the ontology and indication of possible design models of ready ontologies.
- 3.3. Indication of the main knowledge resources processed during a business process and consequently the terms of the defined ontology.
- 3.4. Definition of ontological classes.
- 3.5. Definition of class properties.
- 3.6. Definition of the relationships between classes and properties.
- 3.7. Definition of the restrictions controlling the correctness of ontologies.
- 3.8. Definition and specification of knowledge sources for defining instances of objects based on the ontology.
- 3.9. Definition of instances of objects defined by the ontology.

This process can be supported by preparation of a matrix that defines knowledge resources that will be processed during performance of a given process or specified tasks of the process that will be supported by the system. In the example, a matrix of knowledge resources to be used in the process has been defined. The example matrix has been presented in table 1.

Knowledge resource	Source	Type	Description
Leave planning schedule	ERP system	Electronic	Information on the leave planning schedule for audited employees
Building layout	Archive	Electronic/paper	Plan of the rooms in the audited organisation
Site plan	Archive	Electronic/Paper	Plan of the audited room
Certificate of the validity of inspections and systems	Organisational unit	Electronic/Paper	Documents confirming the validity of the inspection of fire extinguishers, alarm system, fire-extinguishing system, UPC, anti-virus system
Collection of data sets	ABI	Electronic/Paper	The enterprise's personal data sets
List of authorisations	ABI	Electronic/Paper	Authorisations to process data
...

Table 1. Fragment of knowledge resources necessary during an information security audit

The knowledge resources diagnosed in this way can be represented in the system as knowledge resources used by the system. For the purpose of specification of knowledge resources, the developed software allows for the development of an ontology diagram which uses terms applied in OWL 2 [28]. This enables a knowledge engineer to adapt the specification of organisational knowledge resources to the requirements and apply commonly used ontologies that allow for the description of the area of the problem being modelled. The design presented in the paper uses elements of the specification The Organization Ontology (W3C Recommendation from 2014) [29]. This ontology uses a range of concepts that enable the description of the structure of an organisation, its members and roles. Figure 4 shows elements of this ontology and elements that extent it, as defined by a knowledge engineer. The defined classes and property assertion are consistent with the specification OWL 2.

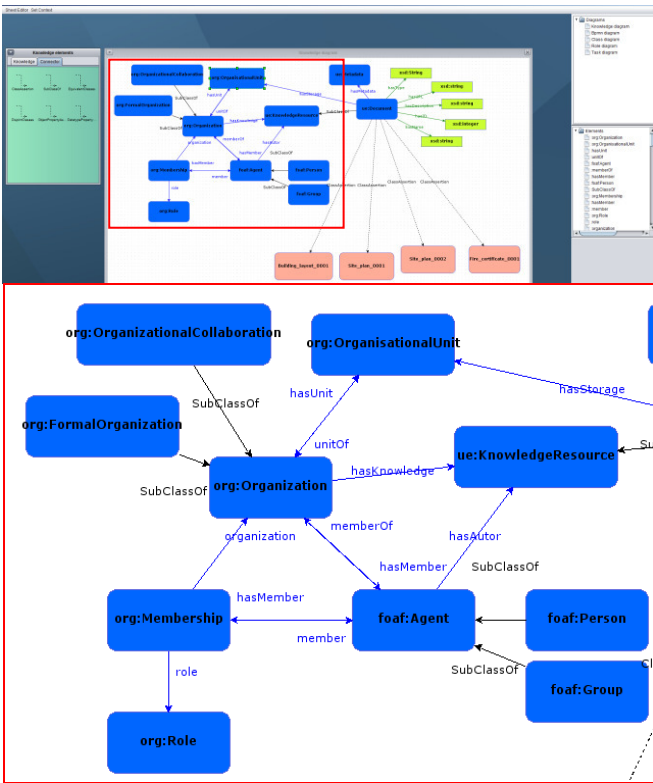


Figure 4. Elements of the domain ontology of the defined knowledge resources of an organisation

Knowledge resources defined in this way can be ascribed to a business process and used during specification of an autopoietic system. A knowledge engineer can ascribe certain knowledge resources in the form of class instances to the process defined at stage 1, define the whole ontology or its fragment. Thanks to that, the person performing the process will have access not only to one/several instances of knowledge resources, but the whole database. The proposal to extend BPMN by ontological elements of the defined knowledge resources is presented in figure 5.

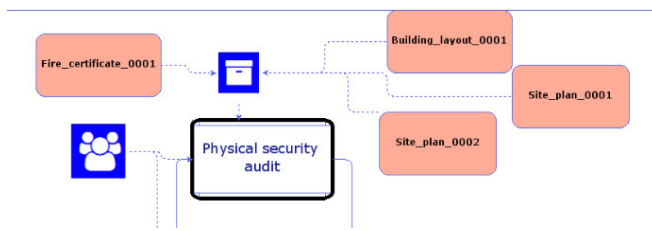


Figure 5. Notation BPMN extended by elements of specified knowledge resources

As the figure shows, the stages of the verification of the physical resources have been extended by elements of the presented ontology. This makes it possible to indicate which elements of organisational knowledge will be processed as part of a business process. At the same time, elements of knowledge resources, thanks to their semantic codification, can be used in the development of an autopoietic system. A

fragment of specified knowledge resources in languages OWL 2, RDF and RDFS has been presented in figure 6.

```

xmlns:owl="http://www.w3.org/2002/07/owl#"
xmlns:xml="http://www.w3.org/XML/1998/namespace"
xmlns:xsd="http://www.w3.org/2001/XMLSchema#"
xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
<owl:Ontology rdf:about="http://ue.katowice.pl/apo/auditor/">
<owl:ObjectProperty rdf:about="http://ue.katowice.pl/apo/auditor#hasMetadata">
<rdfs:domain rdf:resource="http://ue.katowice.pl/apo/auditor#Document"/>
<rdfs:range rdf:resource="http://ue.katowice.pl/apo/auditor#Metadata"/>
</owl:ObjectProperty>
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<rdfs:subClassOf rdf:resource="http://ue.katowice.pl/apo/auditor#KnowledgeResource"/>
</owl:Class>
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<owl:Class rdf:about="http://ue.katowice.pl/apo/auditor#Metadata">
<owl:NamedIndividual rdf:about="http://ue.katowice.pl/apo/auditor#Building_plan_0001">
<rdfs:type rdf:resource="http://ue.katowice.pl/apo/auditor#Document"/>
</owl:NamedIndividual>
    
```

Figure 6. Example of codified knowledge resource in the language OWL 2

The definition covering the semantics of knowledge structures and their implementation can be included into the knowledge database of knowledge management systems and processed by the other IT systems in an organisation.

C. Specification of elements of an autopoietic system

In accordance with the proposed methodology (stage 3.1), the process of designing the system begins with definition of a set of tasks performed by the system. To show the elements of the proposed methodology, the following set of tasks, as presented in figure 7, has been defined. In accordance with the defined table 1, the elements of the tasks performed by the autopoietic system refer to selected knowledge resources. The possible defined tasks include:

- Providing knowledge resources concerning the leave planning schedule.
- Providing knowledge resources concerning the building layout.
- Providing knowledge resources concerning the site plan.
- Providing knowledge resources concerning the certificates.
- Providing knowledge concerning data sets.
- Providing knowledge concerning authorisations.

The main tasks, which have been defined in this way, can be presented based on a use case diagram and by means of a diagram of the hierarchy of a system's tasks. Each of the defined tasks is subject to a separate iteration during the development of an autopoietic system and is treated as one case of its usage. Figure 7 shows the results of one iteration of the developed system with defined tasks of an autopoietic system linked with the task of a business process. This diagram is built during the execution of stage 3.2.1.

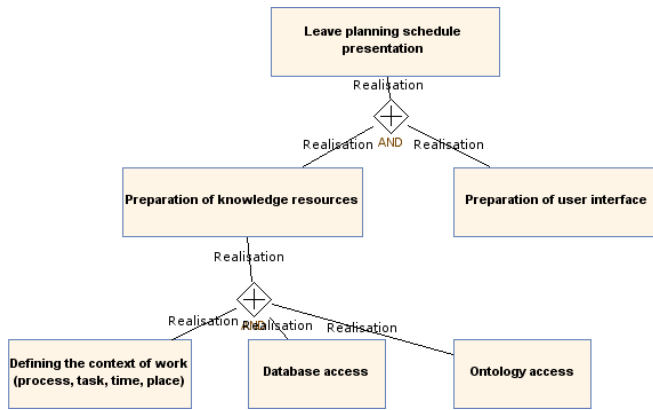


Figure 7. Diagram of the hierarchy of an autopoietic system's tasks (Providing knowledge resources concerning the leave planning schedule)

The tasks, which are defined in this way, can be combined in stage 3.2.2 in roles that are performed by an autopoietic element. These roles may refer to the process of knowledge processing or actions connected with provision of knowledge to the system from external systems. Figure 8 shows an example of defined roles of a system as part of the designed system.

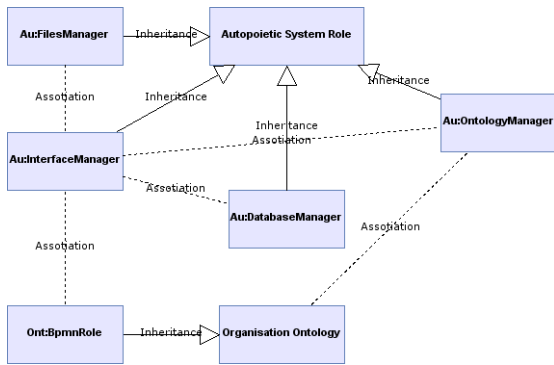


Figure 8. Diagram of roles of an autopoietic system

After defining the tasks to be performed by an autopoietic system, the scope of knowledge and roles of the system's elements, it is possible to design a diagram of programming classes which, thanks to the earlier stages, will be linked to knowledge resources, the system's tasks and roles. On this basis, it is possible to define the code of the autopoietic element. Figure 9 presents a fragment of an autopoietic system class.

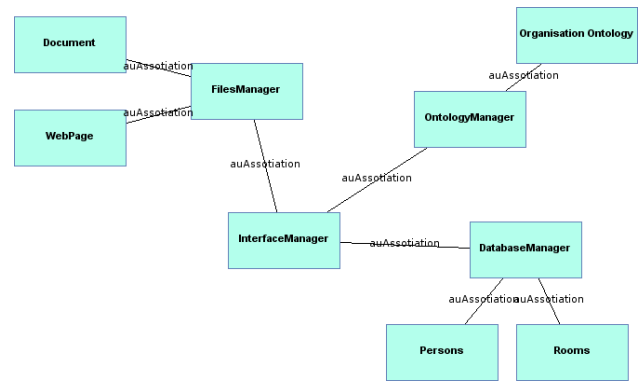


Figure 9. Diagram of classes of a designed system

As a result, the autopoietic element, which is prepared in this way, is able to provide a decision-maker with specific knowledge when a given task performed by a business process is triggered. In this example, it supports, through defined knowledge resources, the defined stages of the verification of data processing compliance.

An element of the user interface of the developed system has been presented in figure 10.

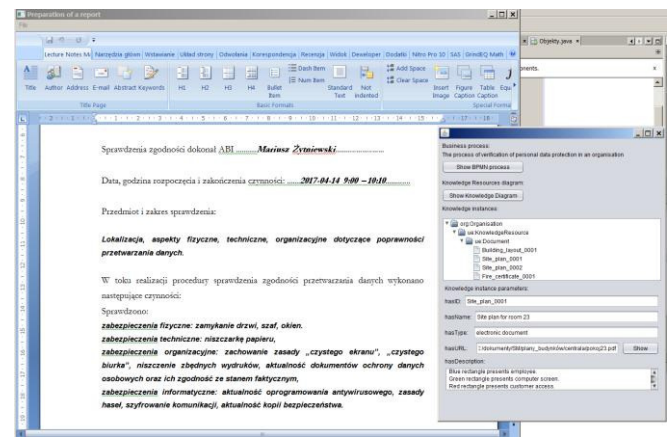


Figure 10. Example of the operation of the developed system

Figure 10 presents a fragment of a report from an audit process and instances of knowledge resources to which the auditor has access.

The design elements presented here fragmentarily address the specification of the system, which can be defined based on the proposed methodology. They do not tackle the aspect of communication between the system's elements or analysis of actions undertaken by autopoietic elements. Examples of the application of these elements of the methodology will be the subject of the author's further research.

V. CONCLUSION

The example of the methodology for designing and building a business process oriented autopoietic knowledge management support system, which has been presented in the paper, covers a broad range of aspects of designing and building decision-making support systems that focus on supporting business processes and knowledge management. The methodology for designing such solutions proposed by the author is applied in his current projects, and its functionality is extended through the developed design tool whose application has been presented in this paper.

The example presented in the paper covers selected aspects of designing a system that integrates BPM and KM. It shows the process of specification of an organisation's business process, the process of defining organisational knowledge in the context of tasks undertaken in a process, the aspect of extending the specification of a business process by elements of knowledge resources and elements of the specification of an autopoietic system.

The main advantages of the proposed approach include:

- Supporting decision-making processes of decision-makers by providing them with contextual knowledge.
- Integration of the ontology on organisational knowledge resources, which can be used in the subsequent iterations of the process of building a system.
- Possibility of terminological integration of defined knowledge resources within the framework of the terms used in standardised ontologies (the example shows elements of integration of a domain ontology with The Organization Ontology, which is a standard of W3C).
- The use of elements of BPMN notation and extension of its artefacts by elements used by a knowledge engineer in designing a system.
- Indication of methods for integrating autopoietic systems as part of decision-making processes of a decision-maker.
- Iterational character of the approach with respect to certain tasks of a business process.
- Possibility of using this approach to build systems that automate business processes and systems designed to support business decisions.

As figure 1 shows, the developed methodology defines a range of loopbacks that impact the process of designing the system and facilitate its integration as part of KM and BPM. In particular, the methodology is contextually oriented. This aspect will be addressed by the author in next papers.

The developed solution has also contributed to gaining a better understanding of processes taking place in an organisation and improving the way they are performed. In particular, the following impact of the implementation

carried out on an organisation's operation can be highlighted:

- Definition of a range of business processes related with the process of personal data protection audit, which has contributed to audited persons' better understanding of the principles of the organisation's operation. Thanks to their codification in BPMN, the person subject to an audit process knows its rules and how it is performed. Additionally, business processes defined in this way can become an element of a map of business processes taking place in an organisation and be used by an autopoietic system.
- Development of the ontology of organisational knowledge resources, which allows knowledge resources to be linked with business processes performed in an organisation. Defined knowledge resources can be used in the process of extending the functionality of the developed software solution. Additionally, if further processes taking place in an organisation are diagnosed, they can be re-used and assigned to further tasks of a business process.
- Inclusion of defined knowledge resources into the operation of an organisation's knowledge portal. Thanks to that, knowledge on the performance of the process of verification of personal data protection and other defined business processes can be made available to employees and help them to better understand how the organisation works.

As a result, the proposed solution supports a typical life cycle of the process of knowledge management and applies to knowledge generation, knowledge evaluation, knowledge sharing, knowledge leveraging and knowledge discovery.

From the perspective of an auditor, the solution has contributed to acceleration of the process of preparing post audit documentation through its partial automation due to the development of an editor for post audit documents.

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