Ontology as a Formal Representation of Business Analysis Dimensions in Management Information System Development

Ontologija kaip formali verslo analizės dimensijų reprezentacija kuriant informacinę valdymo sistemą

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Abstract

Decisions being made by future management information systems' (MIS) users during the system's development must be based on business analysis. Because of certain reasons, so called heavy development methodologies give way to agile methodologies. But there is a risk that the results of quick system development will not fit in the company's needs. The solution to this problem may be tools based on ontologies allowing to carry out agile but reliable business analysis. The aim of this work is an introductory identification of business analysis ontology. The participation of the user in agile software development is characterized, artefacts of the business analysis and essential artefacts of the agile development are identified. The results are gathered in the form of the introductory ontologies. The attempt to find the correspondence of artefacts of both activity types in the categories of the chosen ontology concepts is undertaken.

KEYWORDS: business analysis, agile software development, business analysis ontology.

Introduction

Decisions being made by future management information systems' (MIS) users during the system's development process must be the result of business reality analysis and, following from this analysis, requirements to the system (Paul, 2006a, 2006b). The important user decisions concern, among others, the choice of processes to be computer aided, the scope of the management information system computerization and the schedule of development and deployment activities. Many process development models, from cascade model (Beynon-Davies; 1998, 2009) to the incrementral one (Post and Anderson, 2006; Kasprzyk, 2006; Krutchen, 2004), recommend that the requirement specification phase should be preceded by so called heavy business analysis, for example, in accordance with principles of Business Analysis Body of Knowledge – BABOK (see A Guide to the Busi-

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ness Analysis, http://www.slideshare.net/ carlitos5071989/ babok-v20?related=2). Because of the big progress in MIS deployment as well as quick changes in business process structures, classical MIS development methodologies give way to agile methodologies (see Blais, 2014; Moccia, 2012). In accordance with the Manifesto for Agile Software Development, 'we are uncovering better ways of developing software by doing it and helping others do it. Through this work we have come to value: individuals and interactions over processes and tools, working software over comprehensive documentation, customer collaboration over contract negotiation, responding to change over following a plan. That is, while there is value in the items on the right, we value the items on the left more.' (see Manifesto for Agile Software Development, http://agilemanifesto.org/). Manifesto's axioms cited above, together with the assumption that the working prototype must be delivered to the user within one month, force developers to resign from the complete business analysis or at least to constrain it severely. So, there is a risk that the results of such quick system deployment will not fit in the company's business motivation model (BMM), which is an important result of the business analysis. The solution to this problem may be making sure that the business analysts are well-equipped with tools allowing them to carry out agile business analysis in agile software development. It seems that instruments based on ontologies representing knowledge about business, about its analysis and defining requirements to the system may prove useful for that.

The aim of this work is an introductory identification and formalization of organization business analysis ontology using UML diagrams (see Fowler, 2005; Wrycza et al., 2005). This ontology is oriented to decision making while tasks of the agile methodology are being performed. Results of this analysis are generalizations of the authors' experience (see Kulej and Rekuć 1989), recently extended by their participation in the 'Platform of the optimization of business processes in integrated information' programme, supported by the European Union within the European Regional Development Fund, Grant No. POIG.01.03.01-02-079/12 and within European Social Fund., fragment of which was concerned with elaboration of the business analysis ontologies for companies of the transport sector (Galant-Pater et al., 2014). In the middle of 2015, the implementation of an open and intelligent DSS system developed in the framework of agile methodology described in Juszczyszyn et al. (2014) should be finished.

In the current work the participation of the future software user in agile software development process is characterized (chapter 1), artefacts of the business analysis, useful in agile software development and artefacts of the agile methodology, essential from the point of view of this work, are identified (chapters 2, 3). The results are gathered in the form of the introductory ontologies. The attempt to find the correspondence of artefacts of both activity types in the categories of the chosen ontology concepts was undertaken (chapter 4). Finally, remarks concerning the relations between artefacts of agile methodology tasks and the ontology elaborated for the business analysis having importance for the future research are presented.

Participation of the user in agile software development process

For the analysis presented in this work we take into consideration a certain concrete model of the agile software development known as Extreme Programming (see Beck and Andres, 2006; Wells, 2013).

The process starts with the management problem identification and the formulation of requirements for the software to be developed in order to provide the problem solution. The problem may be related to different phases of the organization management cycle: gathering information, controlling, decision making, or may be more complicated, related to many phases listed above. The requirements specification are prepared by the future user of the software. The requirements are divided into two groups: functional (actors together with the set of system use cases) and non-functional (for example, efficiency, scalability, openness,

reliability, security etc.). Functional and non-functional requirements are established during the business analysis, which can be more or less deep, depending on the character and complexity of the problem. The business analysis is connected with the identification and the analysis of business processes which allows to specify the system use cases. A business process is a sequence of directed activities/actions aimed to fulfil a certain need for a product, a service or an information of an external or internal client. The business processes analysis allows to define use cases of the system to be designed. From those emerge functional requirements to the software (Kruchten, 2004, pp. 79-89). The requirements specification in agile methodologies is usually called user stories. A user story is a short description of the requirements demanded from the software, intended to solve the user problem.

Therefore the user is asked to describe business tasks and expectations from the software, although the way in which the problem must be solved is not determined because it may be elaborated in cooperation with a developer.

The user stories are put to estimation by the developer and the user. The purpose of the user's estimation is the determination of the importance of the task, derived from the user story. The purpose of the developer's estimation is the assessment of risk associated with it and possibility to build the system quickly and deploy it within a short period of time.

It often happens that the developer is not able to estimate the given user story because of its complexity. Splitting the user story into smaller users stories is suggested, so that it is possible to assess them. The disclosed new user stories are estimated by the user and the developer.

After the user stories are estimated they must be ranked by their importance for the organization, the developer's risk and the possibility to implement the system quickly. The ranking of the user stories is a basis for an important decision – the choice of the computerization scope. The decision is undertaken by the user with consideration of every ranking mentioned above.

After the scope is determined it is possible to start a sequence of iterations, in which systems and/or their modules are incrementally implemented and tested. The fundamental decision undertaken by the user before the iteration starts is the choice of users stories to be implemented in the iteration.

The implementation process itself is out of our scope, because it is carried out by the developer. Yet during the iterative incremental system development the user is asked to contribute in three issues. First of all, they are asked to write a new user story when it is needed in the iteration. This user story may emerge either as an entirely new one or as a derivative of the existing user stories. Secondly, the user can undertake decisions to reduce the computerization scope (withdraw certain user stories or their components). Thirdly, the user may have the necessity to change computerization schedule (defer or accelerate the implementation of certain user stories or their components). The interaction between the user and the developer is schematically presented in Figure 1.

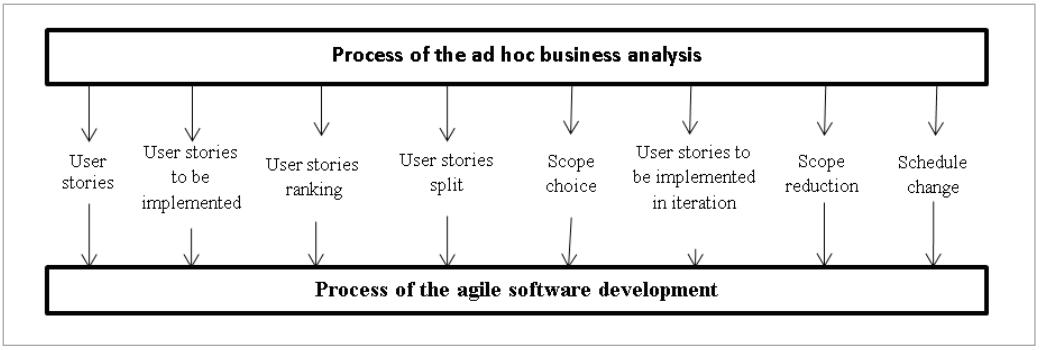
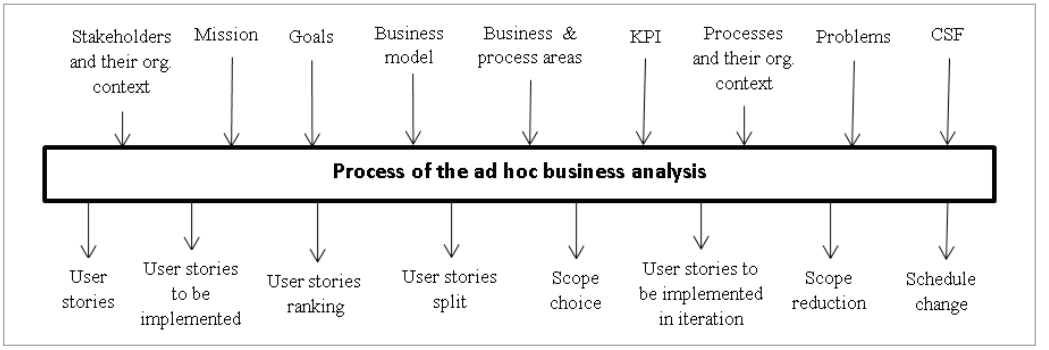


Figure 1
User – developer interaction in the agile software development process

Figure 2
Artefacts of the heavy business analysis as an input to the process of the ad hoc business analysis



Identification of the business analysis artefacts for agile software development

In order to establish which artefacts are useful in playing the role of an agile software development user, we undertake the analysis of the results of so called 'heavy' business analysis. It may give the view of what the user can use as a basis for the decision making in their participation in the agile process. We assume that the classical business analysis, oriented on the identification of the requirements for the software systems, consists of activities being performed sequentially, which is beyond the scope of this paper. This paper takes an interest in the results of those activities. They are the artefacts presented in Figure 2 as a hypothetical input to the business analysis 'ad hoc', namely specifications of:

- stakeholders and their organizational context,
- organization mission and objectives (goals),
- business model,
- business areas (activity areas),
- KPI - key performance indicators,
- process areas,
- process hierarchy and their course in the organizational context,
- functioning problems,
- CSF – critical success factors.

Specifications determine the scope (artefacts) of the business analysis. The result of the analysis is the conception of computerization of the company or of a fragment of its activity, with respect to the facts described in specifications. The artefacts given above may constitute an input to the analysis called here the 'ad hoc' analysis (see Figure 2), which in the agile software development should answer the following questions:

- which activities being business process components can be performed automatically?,
- which activities that are feasible automatically should be automated?,
- in which order should the system's modules for the activities chosen for automation be implemented?

Ad hoc business analysis is formally set to investigate the usefulness relationship between the artefacts enumerated above and the tasks of the agile methodology. The idea of the usefulness relationship representation proposed in this paper is shown in Table 1.

Table 1
Relationship between business analysis concepts and agile methodology tasks concepts

	Agile methodology tasks concepts (Z)
Business analysis concepts (A)	P_{ij}

The business analysis concepts $A=\{A_1, ..., A_{1m}\}$ relate to table rows and concepts $Z=\{Z_1, ..., Z_{1n}\}$ present in agile methodology task

concepts are assigned to its columns. Two dimensional matrix is intended to show the usefulness of the business analysis concept i for the agile task concept j. The not null usefulness $\mathbf{P}_{ij}$ means that the performance of the given agile task needing the concept j must be preceded by the business analysis task analyzing the concept i. It is worth noticing that investigating the existence of non-zero values of the Pi,j demands to identify and to interpret the concepts following from the business analysis of an organization. These concepts – presented in chapter 3 in the form of the class diagrams (Fowler, 2005; Wrycza et al., 2005) – establish a system of knowledge about the organization subject domain.

Business analysis artefacts for agile software development tasks

During the last years efforts on the unification of the approaches to an organization description have been undertaken by the Object Management Group (OMG, www.omg.org). The OMG systematizes and formalizes methods of expressing concepts like goals, their achievement, business rules, business processes, organizational structures etc. The examples of the results are following specifications (see the review given in Rekuć, 2013 and specifications on www.omg.org):

- Business Motivation Model (BMM),
- Semantic Business Vocabulary and Rules (SBVR),
- Business Process Maturity Model (BPMM),
- Business Process Definition Metamodel (BPDM),
- Business Process Modeling Notation (BPMN).

Regarding the necessity of the active participation of business people in the information systems development, graphical languages (and models) are needed to enhance the understanding between user and computer science specialists. The idea of using models is expressed in the Model Driven Architecture approach (MDA, see MDA Guide, 2003). The very well-known solutions of this idea are diagrammatic languages UML and BPMN, which allow to achieve better understanding mentioned above but also, to some extent, to transform graphical specifications into those executed automatically. The communication between participants of management information systems development process is extremely important. Yourdon (2003) describes what consequences may a lack of this kind of communication have in any information systems software life cycle models: cascade, iterational, V and spiral (see Kasprzyk, 2006; Kruchten, 2004; Wrycza et al., 2005; Cobb, 2011).

The communication between the participants has a special meaning in agile software development. Although classical models are not accepted in agile methodologies, good practices of communication of business specialists and software developers play important role in them. Besides the practical implementation of principles of the lean software development (Martin, 2003; Cobb, 2011) the most important postulate is to fulfill the project stakeholders' needs (Pichler, 2010). It may be ensured by a unified knowledge system and good communication. Some of the OMG standards used in the MDA approach can help to realize that postulate. It concerns especially the development of the domain dictionaries, reducing complexity by dividing into contexts, packages and components as well as defining and decomposing problems (Coplien and Bjørnvig, 2010). Domain ontologies as well as functional and organizational analysis based on the Computation Independent Model (CIM) concept may also be useful. Ontologies presented in Figures 3 to 11 conform the CIM concept, especially CIM-Knowlege Model AND CIM-Business Model (Asnina and Osis, 2011).

The business analysis concepts (Figure 2) constitute the system of interrelated notions (Figure 3), which have different interpretations in the management science (see Griffin, 1999; Yeates, 2006).

Organizations function carrying out their missions by using the chosen business model and taking into account business situations of other stakeholders. The mission is specified by a hierarchy of goals accepted for business areas or for the chosen business processes. Monitoring the way in which the goals are achieved consists in observing how key performance indicators' (KPI) values change.

When business processes are running management problems arise and they hinder achieving the accepted goals. Those difficulties can be constrained or eliminated by providing critical success factors (CSF). Computerization is the example of the CSFs deployed in organizations.

Figure 4, partly drawn up on the basis of the Cadle's (2006, pp. 83-86) and the Griffin's (1999, pp. 118-120) proposals, shows the interpretation of the 'Stakeholder' concept.

It is a person or other organization, that is directly concerned with the organization's functioning, and that is materially interested in its results. They participate in the processes or projects creation and may exert an influence on them by taking part in their realization or by immediate, active interest in their results (Griffin, 1999).

Figure 3
The system of the organization business analysis concepts

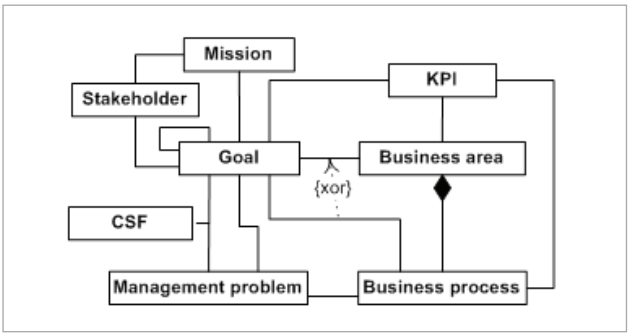
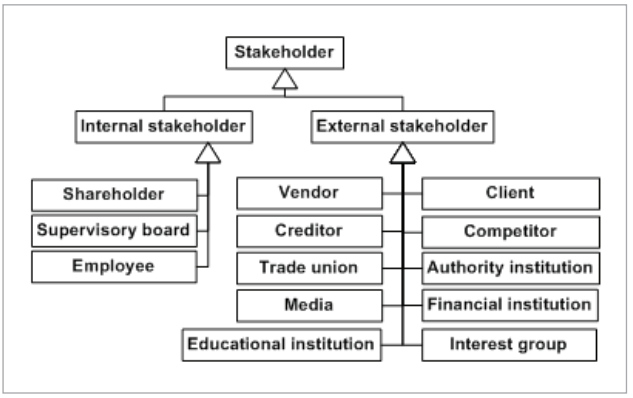
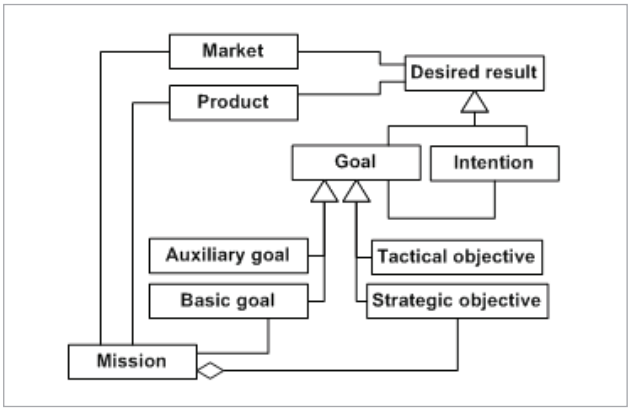


Figure 4
The stakeholder concept



Stakeholders may be internal (employees, shareholders, supervisory boards) or externals (clients, vendors, competitors, state authorities, particular interest groups, financial institutions, media, trade unions). Stakeholder organizational context is a system of conditions, roles and positions through which the stakeholder influences the course of the process.

Figure 5
Concepts of an organization's mission and goals



An organization's mission (see Figure 5) determines its functioning as a whole, defines activity needed to realize a vision, in other words, a general imagination of the 'state (possibly unattainable), in which an organization as a whole intends to be in a distant time perspective' (Rekuć, 2013, p. 33). The mission's definition should contain the indication of: the nature of the activity, (for example, 'provide', 'produce'), product or service together with the specification of the market and the client.

The organization's goal (aim, objective) is a state or a situation in an enterprise, which should be achieved or maintained; it is a long-term idea defined rather in qualitative than quantitative terms and fairly general. Basic and strategic goals are the components of the mission.

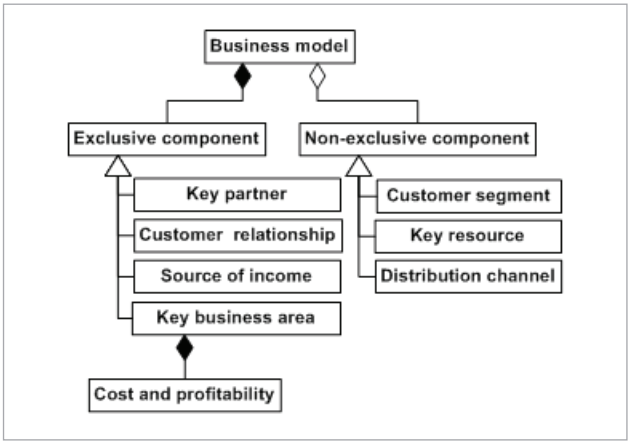


Figure 6
The business model concept

The goals translate (specify) an owners vision into the organization's mission, while the business model specifies business conditions for the mission's realization on the market (Figure 6). It describes the circumstances of the way in which the organization creates a value, as well as ensures and derives profits from this value (Osterwalder and Pigneur, 2010, p. 18).

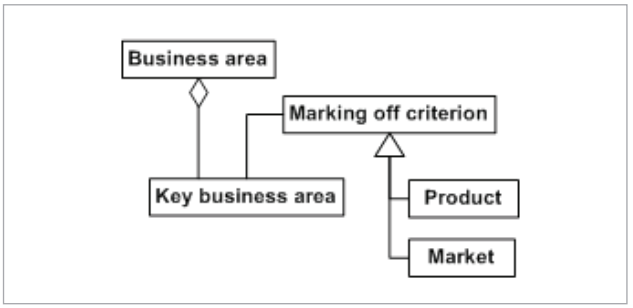


Figure 7
The business area concept

The business area concept is understood (see Figure 7) as a separated activity being a subject of a separated management and bringing effects to itself or to the superior system, for example, in the form of its own profit or effect in the superior system.

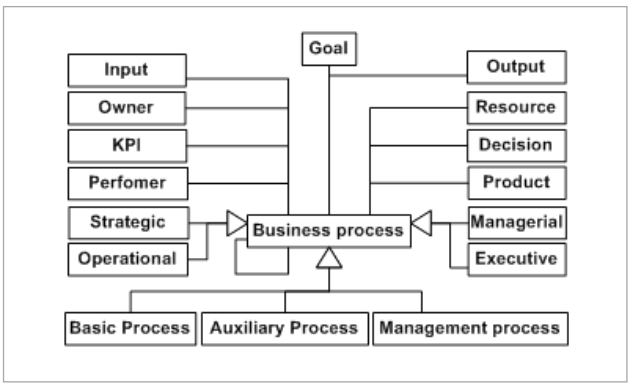


Figure 8
The business process concept

Business areas are divided into process areas. A process area is a set of processes run in the organized activity cycle, starting from establishing goals then realizing activity programming, planning, organizing, supplying, executing, controlling, sales, etc. until after-sales service.

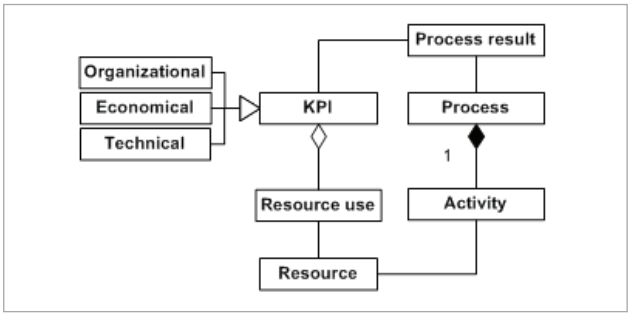
The main concept of the business analysis is the business process concept. By Davenport's definition (1993, p. 5), 'a business process is a structured set of activities designed for providing a client or a certain market with a concrete result'. The classification of the business processes depicted in Figure 8 was made on the basis of works by Grajewski (2007, p. 66-68), Porter (1985) and Trzcieliński et al. (2013).

Processes in organizations often are classified by the rank of the decision-makers' positions (managerial and executive) and by the horizon of the decision effects (strategic and operational processes). The division based on the function's meaning (basic, auxiliary and management processes) is more difficult. Through the basic processes the client perceives and assesses the quality and efficiency of the organization's functioning, because they immediately create its added value (for example, marketing, sales, product development, dis-

tribution activities). In contrast, auxiliary processes weakly influence organization's external image and only generate the added value indirectly. They are such processes as: storage, conservation, execution maintenance, quality control, staff recruitment and assessment and accounting. Dichotomous participation of those processes in the added value creation complements management processes that have a long-time influence on the way in which the added value is generated. Regulują procesy podstawowe i pomocnicze, monitorują ich efektywność oraz zgodność z misją, strategią i kulturą działania organizacji.

Organizational context of the business process is determined by the organizational structure. It is derived from roles that are to play while a process is running. Roles are played within positions, e. g., permanent places in the organizational structure with precisely determined competences and responsibilities. The positions are created, first of all, for fulfilling business processes executive and monitoring functions.

Figure 9
The key performance indicator concept



The basis of the efficient business process monitoring in business and process areas are correctly defined KPI - key performance indicators (Figure 9) or indicators of the state of the work.

KPI can be perceived as an analytical tool, measures (see ECTA, 2011) facilitating decision-makers assessment of the real state and helping them to make rational decisions. What is more, they support technical staff in better exploitation of the organizational infrastructure (Burnos, 2010; Bragg, 2007). Conclusions following from the KPI value tendency analysis may belong to the system warning of the management problems and point at their cause.

Problems are facts, events hindering the achievement of organization's goals. Problem solving, in addition to performing tasks, is the essence of the manager's work, in which the same organizational structure components, such as: initial data, operating and transforming rules, restricting conditions, and goal characteristics (Szczurowski, 2013; Supernat, 2003) are used.

In the case of tasks all components are known, but problems arise when at least one structure component is not clear-cut determined, e. g. is unclear, uncertain or dynamic. Taking into account the scope of this work, it is difficult to propose a useful classification of management problems, because at the same time they constitute both a graph of dependences and the hierarchy of components hindering the course of business processes. Using the works by Nosal (2001), Simon (1977), Griffin (1999), Ramus and Szczepankowski (2005), management problems were divided as shown in Figure 10.

According to Nosal (2001), management problems may be convergent or divergent. The convergent problem has one solution, is strict and has little freedom of variant choice. In the ontological sense, it concerns the explanation of the dependency, verification of the hypothesis or diagnose. In the praxeological sense, it consists, among others, of maintaining the enterprise state, creation of the efficient method, procedure or technology, building a strategy and a business plan and making the best decision. In contrast, the divergent problem has many equivalent solutions, is unclear with big liberty of solution search. Ontologically it is connected, among others, with the determination of the changeability scope, with the deviation and exception assessment and with the definition of the typical and untypical solutions.

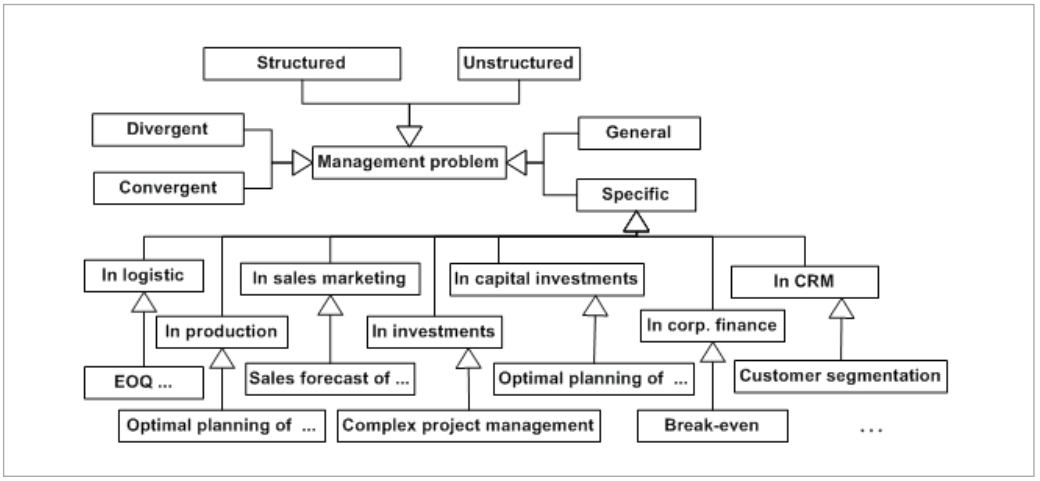


Figure 10
The concept of management problem

Praxeologically the divergent problem concerns, among others, the determination of the possibility scope, the scope and the goal changing and the determining of the new strategy.

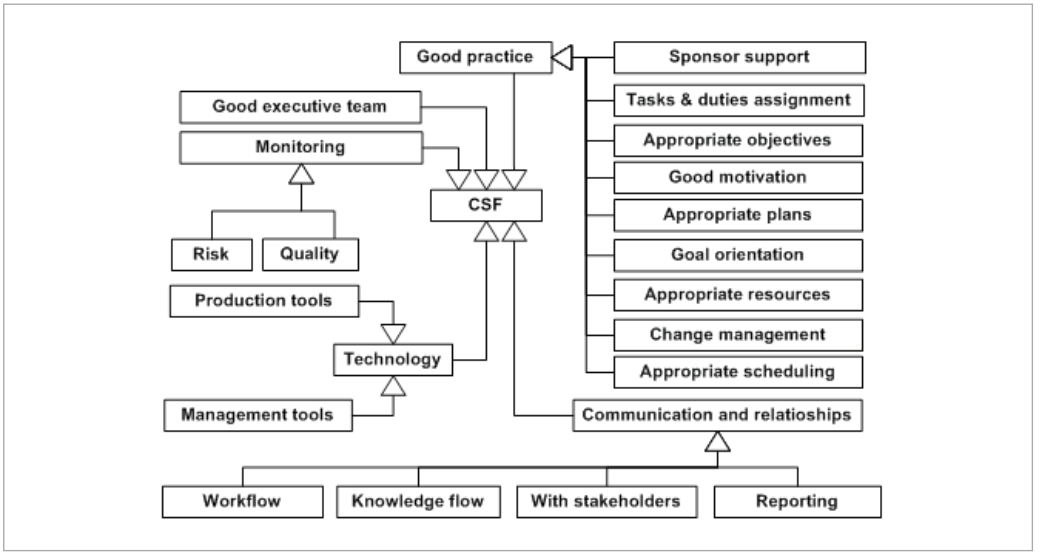
Management problems division into structured and unstructured problems is known. It follows from classification of programmable decisions, used by Simon (1977), which deals well with the structured problems and un-programmable decisions that try to solve unstructured problems. In operations research, notions of general and specific problems (Ramus, Szczepankowski, 2005) are used. Especially specific problems classified in the concrete process areas of the enterprise's activity are associated with scenarios of the IT technology deployment in an enterprise. As shown in Figure 10, those classifications are neither complete nor disjunctive.

Ability to avoid, restrict or eliminate problems is bigger in organizations, in which critical success factors – CSFs – exist.

A critical success factor is an organization's activity area, which efficiency cannot fall below the value preserving synergy on the level high enough for achieving the organization's goals. The ranking of the critical factors is an important business analysis result. In the knowledge based economy, in addition to the social factors (see Walczak (2010) and Clements and Gido (2009)), the leading places in this ranking are taken by IT deployments which support decision making processes. Taking the Young proposals (Young (2007)) cited by Walczak (2010) as a basis, the classification of critical success factors has been elaborated and shown in Figure 11. In accordance with this proposal, the success of projects in organizations is conditioned mainly by:

- well matched project team, employees that possess appropriate knowledge and skills,
- use of good management practices embracing, among others, appropriate definition and orientation of goals, definition and preserving of resources, project sponsor support and engagement (consisting in solving the most important problems on the highest management level), well prepared plans and schedules of the project, appropriate task and obligation break down and assignment as well as motivational system, management skills,
- good communication and relationships with project stakeholders (informing them about successive works), reliable reporting,
- regular monitoring and control over the work progress and risk,
- appropriate technology for task execution and project management.

Figure 11
The concept of critical success factor



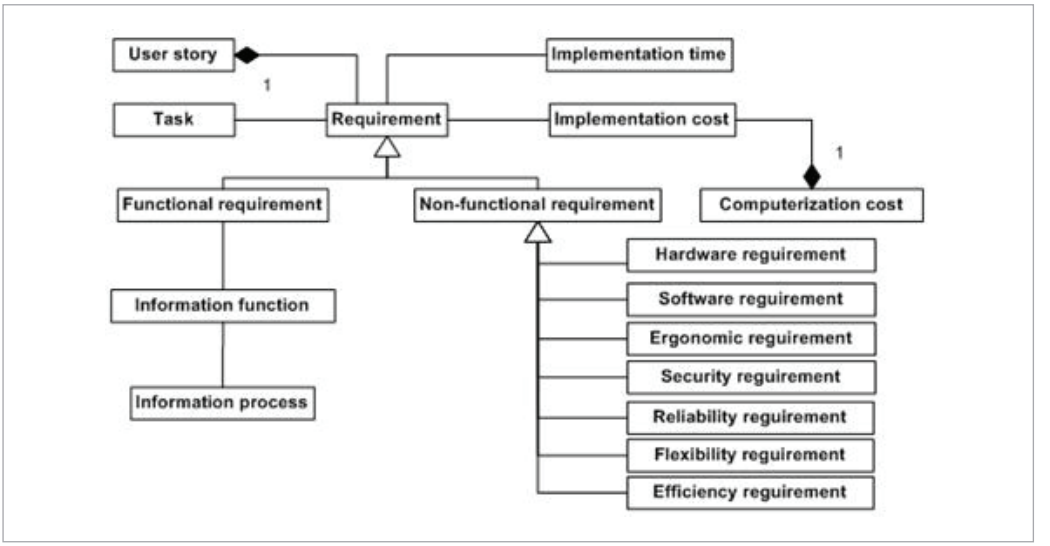
The organization business analysis concepts presented on the diagrams shown in Figure 3 to Figure 11, their complexity and diversity confirm the reasonableness of investigation of their relationships with agile software development methodology concepts.

Artefacts of the agile software development methodology

Artefacts of the 'ad hoc' business analysis and, at the same time, user decision's components are: user stories, user stories to be implemented, user stories ranking, user stories division, scope choice, user stories to be implemented in iteration, scope reduction and schedule change (see Beck and Andres 2006; Wells, 2013). User stories are sets of requirements against the system being developed and intended to solve the company's management problem. The requirements are the basis for the programmers' tasks specification.

Figure 12 presents basic user stories concepts. The requirements may be functional or non-functional. The functional requirements are directly connected with information functions of the system. The non-functional requirements concern the other system's features and are often classified as shown in Figure 12. Essential features considered as requirements

Figure 12
Ontology of user requirements as parts of a user story



are: implementation cost and implementation time, because they can be used as the criteria in the choice of the requirements to be implemented. The total computerization cost is the derivation of the requirements implementation cost.

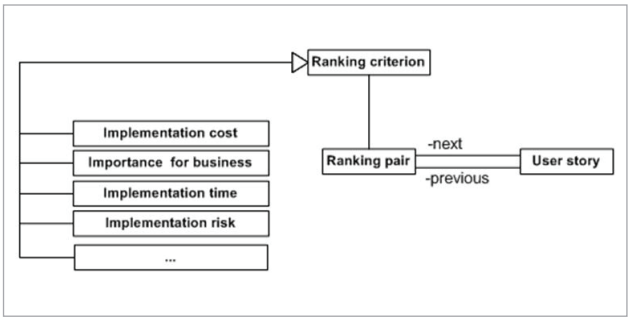


Figure 13
Ontology of the user story ranking

The decision which user stories to choose for implementation has to be based on certain criteria. They are (see Figure 13) among others: cost, implementation time, importance for the business as well as risk. The user, having few rankings of user stories, may choose one ranking and, for example, take from the ranking list top needed user stories. During the rankings construction they may use multi-criteria decision analysis methods, applying artefacts realized in the business analysis. The useful artefacts rankings also could be:

- ranking of the stakeholders importance (together with their organizational context), for whom user stories implementation is planned,
- ranking of the specific management problems and CSFs,
- ranking of the key activity areas,
- ranking by the assessed KPI improvement,
- ranking by the importance of decisions making in the business under analysis, requiring computer support.

Splitting the user stories into smaller ones take place when the developer is not able to assess project characteristics, such as implementation time. Then the project becomes risky. Obviously, the splitting is accompanied by the choice of the decomposition criteria.

Figure 14 shows an ontology of the user stories splitting, assuming that the user may decompose a user story applying criteria connected with the requirements types (functional or non-functional), including for example, importance for the business considered. In such a situation, business analysis artefacts, such as those listed below will prove useful:

- specific management problems and CSFs (in order to rationally break down problems into sub-problems),
- KPIs and their assessed improvement (in order to take into account more precise measures),
- business processes, their importance, products, resources used as well as decisions that require computer support made during their course of actions.

The next artefact is the choice of the computerization scope. It consists in specifying the list of requirements to be implemented during the project. Since the user stories are considered as certain task units, they are arranged by importance for the business, risk and time consumption, creating the rankings described earlier. In the choice of the user stories for imple-

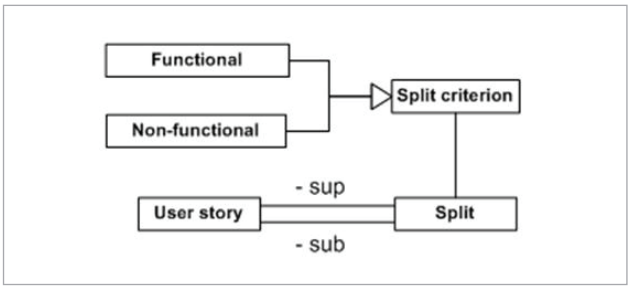


Figure 14
Ontology of the user story split

mentation the user has to be guided by business considerations similar to those used in the choice of user stories to the implementation. The user may then accept similar business analysis artefacts discussed for the choice of the new user story.

The choice of the user stories for implementation in an iteration may be a problem of the user but also a technical one. The iteration is a 1-3 weeks long fragment of software development and it brings about concrete, useful and tested result (a version of a prototype). Therefore, the choice is conditioned by developers' considerations. Nevertheless, one can say that also the following considerations concluded from the artefacts analysis are worth attention:

- user stories implemented in the iteration are related to the same business process, and even to the decision sequence of that same process, to ensure that the implementation ends quickly,
- in the choice, those user stories that are related to the same process or processes (or their fragments) which have common results (outputs) are preferred,
- in the choice, those user stories which have complete descriptions of parameters and algorithms are preferred.

Conclusions

The analysis carried out in this work is neither enough complete nor enough accurate. Nevertheless, its results can be used to point at the directions of the further, detailed research. Moreover, concrete results of the identification and analysis included in chapters 3 and 4 allow to formulate conclusions concerning relations between artefacts of agile methodology tasks and the ontology elaborated for the business analysis. They are as follows.

1 In the efficient application of the light, agile software development methodology, there is assumed, that the user has a quick and unlimited access to knowledge about an organization represented by the heavy business analysis ontology.

2 During an application of the agile methodology, the user has to represent interests of different stakeholders, e. g. to know their individual needs following from the business analysis.

3 Thanks to the ontology, it is possible to formalize the system of concepts for the business analysis as well as for the software development.

4 Elaboration of ontologies of both activity types should allow to precisely define the relationships between artefacts and, in consequence, the rules of the user's deduction in making decisions in the agile software development.

4 Decisions being made within agile methodology require many useful rankings based on the artefacts of the business analysis.

5 In decisions concerned with new (original, bad described) implementations the use of many rankings of artefacts and methods of multi-criteria decision making is more probable.

6 Decisions in quick (short-term) implementations are based on particular (fragmentary) ontologies concerned with business process parameters and resources identified on the level close to elementary.

More detailed research, addressed to problems only mentioned in this work, will lead to conclusions of more practical character. Rated among them may be, above all, proposals of measurements for detailed expressing of the usefulness relationship from the Table 1. It must be connected with the extending of the scope and the level of detail of the elaborated ontology, so that it gets the real importance for proposals of practical vocabularies used in agile development of software which satisfies the changeable user requirements.

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Santrauka

Rekuć Witold, Szczurowski Leopold. Ontologija kaip formali verslo analizės dimensijų reprezentacija kuriant informacinę valdymo sistemą

Straipsnyje siekiama identifikuoti ir formalizuoti organizacijos verslo analizės ontologiją taikant UML diagramas. Ši ontologija orientuota į sprendimų priėmimą *agile* metodologijos užduočių atlikimo metu. Straipsnyje apibūdinamas ateities programinės įrangos vartotojas *agile* įrangos kūrimo procese, įvardinami verslo analizės artefaktai, naudingi kuriant *agile* programinę įrangą, ir *agile* metodologijos artefaktai, kurie yra esminiai šio darbo požiūriu. Rezultatai fiksuojami pradinių ontologijų, nusakančių organizacijos verslo analizės konceptus, formatu: subjektas, organizacijos misija ir tikslai, verslo modelis, verslo sritis, verslo procesas, esminis veiklos rodiklis, valdymo problema, kritinis sėkmės veiksnys, taip pat artefaktų kaip indėlio į *agile* įrangos kūrimo procesą ontologijos: vartotojo reikalavimai kaip vartotojo pasakojimo dalis, vartotojo pasakojimo reitingas ir vartotojo pasakojimo perskyra. Buvo siekiama rasti sąsajas tarp abiejų veiklų tipų pasirinktose ontologinių konceptų kategorijose.
Straipsnyje formuluojamos šios išvados:1. Jei *agile* programinės įrangos kūrimo metodologija taikoma sėkmingai, manoma, kad vartotojas turi greitą ir neribotą prieigą prie žinių apie organizaciją, reprezentuojamą „sunkiosios" verslo analizės ontologijos. 2. *Agile* metodologijos taikymo metu vartotojas turi atstovauti skirtingų subjektų interesus, pvz. būti susipažinęs su individualiais poreikiais, išplaukiančiais iš verslo analizės. 3. Ontologija atveria galimybes formalizuoti konceptų sistemą verslo analizei ir programinės įrangos kūrimui. 4. Abiejų veiklų tipų ontologijų detalizavimas turėtų padėti tiksliai apibūdinti ryšius tarp artefaktų ir vartotojo dedukcijos taisyklių priimant *agile* įrangos kūrimo sprendimus. 5. Sprendimai, priimami *agile* metodologijos rėmuose, reikalauja įvairių reitingų, pagrįstų verslo analizės artefaktais. 6. Sprendimų, susijusių su nauju (originaliu, netinkamai apibūdintu) pritaikomumu, atveju įvairių artefaktų ir daugiakriterinių metodų reitingų taikymas padidina sprendimų priėmimo tikimybę. 7. Sprendimai greitam (trumpalaikiam) pritaikomumui yra pagrįsti specifinėmis (fragmentiškomis) ontologijomis, susijusiomis su verslo proceso parametrais ir ištekliais, identifikuotais lygmenyje, artimame elementariam. Detalesnis tyrimas, nagrinėjantis problemas, kurios šiame straipsnyje tik paminėtos, leistų formuluoti praktiškesnes išvadas. Tarp jų visų pirma galėtų būti detalaus naudingumo ryšio raiškos (1 lentelė) matavimo pasiūlymai. Tai turi būti susieta su detalizuotos ontologijos apimties ir detalumo didinimu siekiant realaus poveikio besikeičiančius vartotojo poreikius atitinkančios *agile* programinės įrangos kūrimui naudojamiems praktiniams žodynams.

REIKŠMINIAI ŽODŽIAI: verslo analizė, *agile* programinės įrangos kūrimas, verslo analizės ontologija.

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