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BUSINESS MODELING IN THE PROCESS OF INFORMATION SYSTEMS DEVELOPMENT

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K e y w o r d s: business model, business modeling, external perspective, internal perspective, UML modeling language.

A b s t r a c t

The paper aims at presenting the role and importance of business modeling in the software generation process. The business model is the simplified description of the organisation that allows designing the optimal information system (IS) satisfying the needs of the user and allowing achievement of the company goals. Both generation and integration of information systems are dependent on the business modeling quality.

The Enterprise Architect tool and the object approach were used for drafting the description of phenomena and processes taking place within the organisation. This allowed presenting the organisation in two perspectives: external and internal. Understanding the perspective that was considered in designing the given model is an important factor influencing appropriate interpretation of the model and its correct use in the information system development process.

MODELOWANIE BIZNESOWE W PROCESIE TWORZENIA SYSTEMÓW INFORMATYCZNYCH

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S ł o w a k l u c z o w e: model biznesowy, modelowanie biznesowe, perspektywa zewnętrzna, perspektywa wewnętrzna, język modelowania UML.

A b s t r a k t

Celem artykułu jest przedstawienie roli i znaczenia modelowania biznesowego w procesie wytwarzania oprogramowania. Model biznesowy to uproszczony opis organizacji, który pozwala zaprojektować optymalny system informatyczny (SI) realizujący potrzeby użytkownika i umożliwiający osiągnięcie celów firmy. Od jakości modelowania biznesowego zależy zarówno tworzenie, jak i integracja systemów informatycznych.

Do realizacji opisu zjawisk i procesów zachodzących w organizacji wykorzystano podejście obiektowe i narzędzie Enterprise Architect. Pozwoliło to na ukazanie organizacji w dwóch perspektywach: zewnętrznej i wewnętrznej. Zrozumienie perspektywy, która była brana pod uwagę w trakcie konstruowania danego modelu, jest ważnym czynnikiem wpływającym na prawidłowe zinterpretowanie modelu i jego poprawne wykorzystanie w procesie tworzenia systemu informatycznego.

Introduction

The point of business modeling is to create such an image of the organisation, which, being the description of the reality will become the base of the software backbone or the description of that backbone. Business modeling allows understanding the structure of the organisation and the processes taking place within it. For each employee of the organisation the role that he performs within it is defined. That method of description allows finding imperfections and bottlenecks that frequently hinder operation of the organisation or limit the undisturbed flow of knowledge or information.

In case of business processes modeling the authors use business objects and classes of business objects to present models understandable to the future IS users. Business processes are modelled to define the scope of the information system design involving optimisation of processes and modification of functioning of the organisation.

The object approach, thanks to the characteristics such as abstraction, encapsulation, polymorphism, modularity, hierarchy, specific meaning of notions used, ease of reflecting the reality seen by the user in the formalised format and legible diagrams, can be applied in business processes modeling. That way of seeing the reality facilitates development, formulation and design of the information architecture and infrastructure in the organisation.

Process approach to the description and analysis of the organisation allows presenting the dynamism of changes occurring in the organisation as well as its internal structure, understanding of interactions among the people, processes and technologies and removing the differences between the language of the IT and the language of business.

The nature of business modeling in the context of the information system development

Business processes modeling means obtaining and organising the knowledge on the organisation, the rules effective in it as well as goals and expectations of software users. The methods of obtaining the knowledge involve analysis of the available documents, including the legal regulations,

descriptions of workstations, principles of employing and financing of the activity as well as observation of work in the organisation and interviews with the potential users. Systematically conducted interviews and observation of the organisation facilitate adjustment of the primary model and enrich the model with additional details.

It is worth remembering that the aim of modeling is to catch the image of the whole and disregarding the unimportant details. As a consequence, modeling is done to perform restructuring of business processes and also to introduce fundamental changes in the functioning of the organisation or company.

Business models are used in defining the functional and non-functional requirements for the software being developed and present the image of interactions between the organisation and its business environment.

The business model development process is of iterative character, it is developed gradually and improved with the progress of analysis and expanding the knowledge on the subject organisation. Describing a business process requires defining the operations that are components of that process, defining the order of performance of those operations and indicating the scopes of responsibilities of the process participants.

The author proposes that any business system should be analysed considering the external and the internal perspective. Each of the perspectives focuses on slightly different aspects of the system, although they are mutually interlinked.

The first of them, the external perspective, describes the business system environment. The focus is just on those processes that involve objects external to the system (e.g. client, business partner, supplier, etc.). The second one, the internal perspective, allows obtaining answers to the question how the business system provides the services within the identified business processes[1]. In this case the employees and tools involved in satisfying the needs of the environment (presented by the external objects) and the operation of the necessary business processes are identified here.

The software developing team should take care to establish the correct model of the organisation, so that the artefacts[2] created could become the backbone of the information system. Business modeling represents the first stage of the IS development. It allows finding the elements of organisation in

[1] The business process is the set of activities contributing to the results of the company, organisation taking into account both the processes involved in creating the goods/services and supporting processes (Dąbrowski et al. 2007, p. 28). The processes of, e.g. production, sales of products, processing of complaints, supply of goods, purchase of materials, repair of equipment, etc. are examples of processes.

[2] Artefact is the result of modeling – a specific design product, e.g. specification, model, software file, application file, test, report, etc.

the structure or behaviour that allows achievement of the situation where the software developed is consistent with the earlier specified needs of the users. It is worth noticing that before the costs of software development are incurred optimisation of business processes will take place, which will result in elimination of errors and minimisation of costs in the information system development process.

The business systems modeling process may accelerate comparison of processes to the similar or identical ones employed at other companies significantly.

Languages and tools of business processes modeling

The UML (Unified Modeling Language) allows presenting various business system aspects in the descriptive and graphic way and serves visualisation, specification, construction and documentation of the artefacts of the systems using computer software. Three famous methodologists of software engineering – Grady Booch, Ivar Jacobson and James Rumbaugh, created the UML. The contribution of each of them to the development of the new concept is presented by, e.g. WRYCZA et al. 2005, pp. 18, 19, DĄBROWSKI et al. 2007, p. 28, GRAESSLE et al. 2006, p. 32.

Many CASE (Computer Aide Software Engineering) tools, such as, e.g. Enterprise Architect, MagicDraw UML, Visual Paradigm, Star UML etc. that use the UML can be used for modeling of business processes. Application of the CASE tools increases the level of communication between the specialists in different scientific disciplines, influences strengthening the relations with the client and also improves the legibility of the documentation prepared and facilitates its modification. This results in the correct formulation of the problem (specification of requirements) and better understanding of it, which helps in more accurate determination of criteria for verification of the assumptions made (TAŃSKA 2009, p. 184).

Increasingly rarely IT solutions are developed by individual programmers and increasingly frequently they are developed by specialised project teams. As a consequence use of tools supporting the development process is fully justified as highlighted by Sacha 2010. The UML and the Enterprise Architect are good tools facilitating efficient and comprehensive development of applications by analysts and designers. They also facilitate verification of work progress by the managers and design team members.

The initial models are created during the strategic analysis and they precede the decision on system development. They usually describe the business processed taking place in the user organisation. The use cases

diagram with the basic elements in the form of the icons representing the actors, ovals representing the cases of use and lines representing the relations between them is the graphic representation of the model.

Business modeling can be defined as the bridge between two worlds that is the business and the information technology. Supporting the organisation with the IT solutions is possible when the needs in that field have been diagnosed. The developed models of business processes represent simplified, abstract images of the actual business processes.

External perspective

From the external perspective the business system is seen as a black box. The focus is on the external objects and their links to the business system. Three groups of business diagrams are used: the use cases diagram – DPU, the activities diagram – DA and the sequences diagram – DS.

The use cases diagram (Fig. 1) presents the actors, business cases of use and their mutual interrelations. It does not describe the internal procedures but provides a good insight of the functions supplied by the business system to the actors (participants from outside the system). The link between the actor and the business case of use occurs when the actor has the possibility of using a specific function of the business system.

DPU design from the external perspective involves 7 stages. The first involves identification of the suppliers of the knowledge on the business environment and gathering the knowledge obtained. Stage two is the identification of clients, partners, other business systems using the goods and services rendered by the business system. Stage three involves identification of the potential cases of use, that is which goods and services are available to the actors. Stage four is immensely important as during it the cases of use and actors are linked to determine who may use the goods and services rendered by the system. The focus of stage five is on the description of the actors, i.e. whom or what they represent while stage six focuses on what should be done. The verification of correctness of the model created is the seventh stage.

As it can be noticed easily, the use cases diagram is not the element sufficient for the complete description of organisation operation. Yes, it presents the role and services (functions) rendered by the organisation to the entire environment but it lacks the information on how those services are rendered. That is why it is necessary to use the activities diagram and the sequences diagram.

The activities diagrams (Fig. 2) describe the procedures effective in the business system. The interactions between the environment (the actors) and

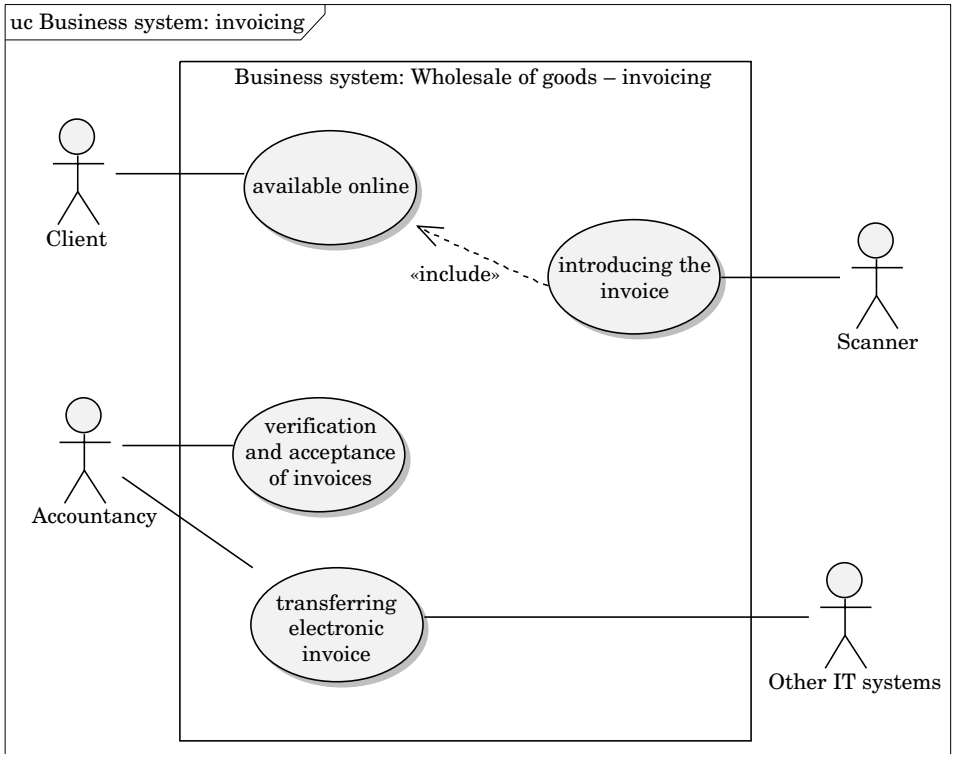

Fig. 1. Business use case diagram for the business system
Source: Author's own work.

the business system are the subjects of those diagrams. The activities diagrams allow looking at the system from the perspective of the functions held in it. They allow representing the events taking place in parallel or in sequence. The activities diagrams may be developed at different levels of detail. From the external perspective those diagrams represent business processes as seen by the external objects. The actions and the control elements (decisions, division, merger, initiation, completion, etc.) are the key components of the activities.

I propose starting the design of the activities diagrams with those at the low level of detail (high level of abstraction) encompassing a few business cases of use. Thanks to that we may obtain a good insight in the chain of interrelations between the clients and partners on one hand and the business system on the other.

The sequence diagrams (Fig. 3) describe the chronological development of the interaction. They focus on the information passed between the parties to the interaction. Those diagrams provide a good base for describing the exchange of information between the system and the partners and clients.

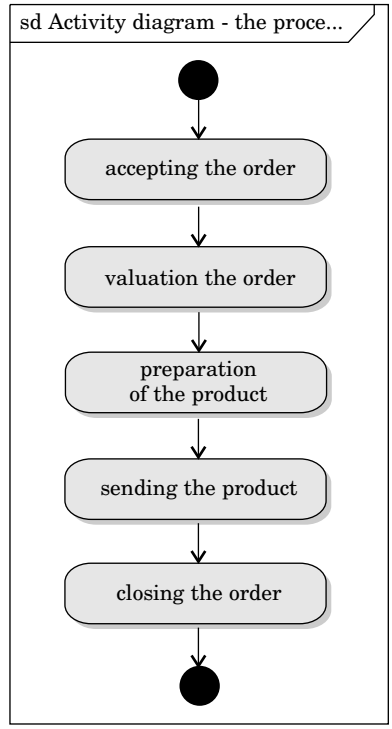

Fig. 2. Business activity diagram – the client's perspective
Source: Author's own work.

The sequence diagrams serve visualisation of information exchange and illustrate the chronology of that exchange. If the client or business partner uses the service offered than between the supplier and recipient communication takes place. That process may be described as a series of interactions. As a consequence, sequence diagrams may be used in case of the exchange of messages between the business system and the external objects.

The DS design from the external perspective involves six stages. The first represents the answer to the question of who participates in the sequence. This means identification of the actors and the business system. It is also important to determine who initiates the sequence – stage two. Stage three involves the description of the exchange of messages between the actors and the business system, i.e. what messages are exchanged. Stage four involves identification of the interaction development, i.e. the sequence of interactions. Stages five and six involve input of complementary important information and verification of the perspective.

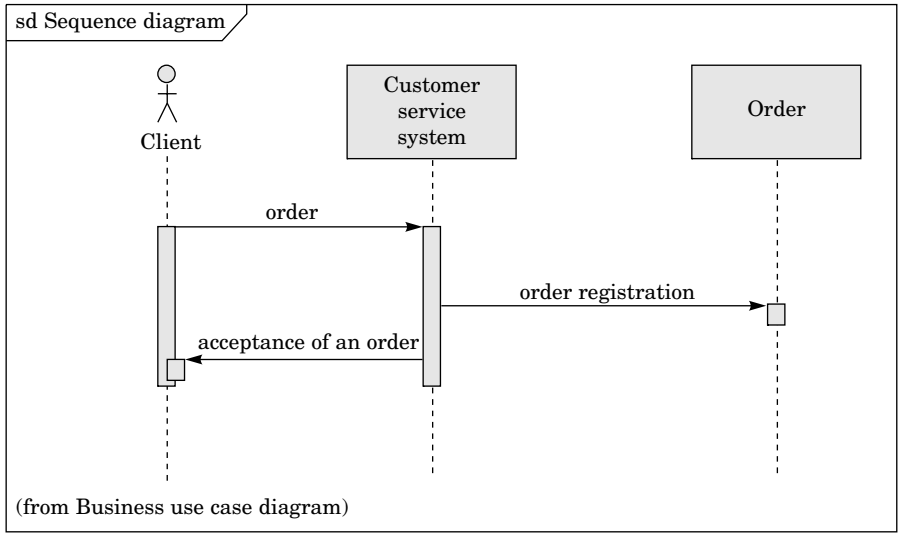

Fig. 3. The diagram of sequence

Source: Author's own work.

As a consequence, identification of the major processes of the organisation determining its position and success in the competitive market is the outcome of the analysis from the external perspective. The: actors, activities, interrelations between the actors, activities and resources, entry conditions/effects of the processes/operations, the sequence of events, simultaneous progress of processes and synchronisation points are the basic elements of that process.

The business system seen from inside

The internal perspective describes the internal process and activities as well as the structures of the business system. Information systems and people involved in the business process are responsible for supplying the goods and services. It is irrelevant whether the process conducted is manual or supported by IT tools. The internal perspective of the business system is described by means of the business diagrams of packages (DP), classes (DC) and activities (DA).

The organisation structure plays an important role in the internal perspective of the business system. The units within the organisation (e.g. departments, sections, positions, etc.) are described in the form of packages. This is the universal mechanism for organisation of objects (elements) into groups. The diagram of packages (Fig. 4) serves modelling the aggregates of objects

that the packages are and allow modeling the business system at high level of abstraction. This means that it can contain employees, business objects and other organisational units. The organisational units are responsible for performance of activities that are components of processes. Those units are in whole the components of the model business system while the units functionally corresponding to them situated outside that system are the actors.

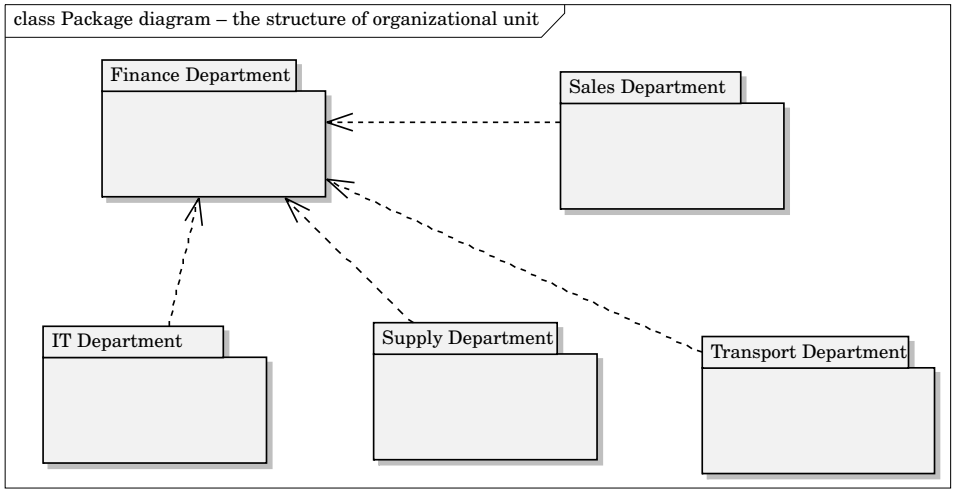

Fig. 4. Package diagram

Source: Author's own work.

The DP design involves a number of stages, including drafting the DP outline in the business system, identification of the additional organisational units, attributing employees and business objects to appropriate organisational units, identification of additional organisational units (employees, business objects) and verification.

The diagram of classes (Fig. 5) illustrates the structural elements of the business system. It describes the interrelations and links between the employees, business objects and external objects.

Designing the DC involves identification of classes, associations between classes and verification of correctness. It is worth noticing that it is useful to use classes defined in the diagrams of packages.

The diagram of activities (Fig. 6) illustrates the internal business processes within the business system. The goods and services offered by the business system are the subject. It should be remembered that as opposed to the activities diagrams created from the external perspective the diagrams of activities for the internal perspective do not cover the links to the actors. They

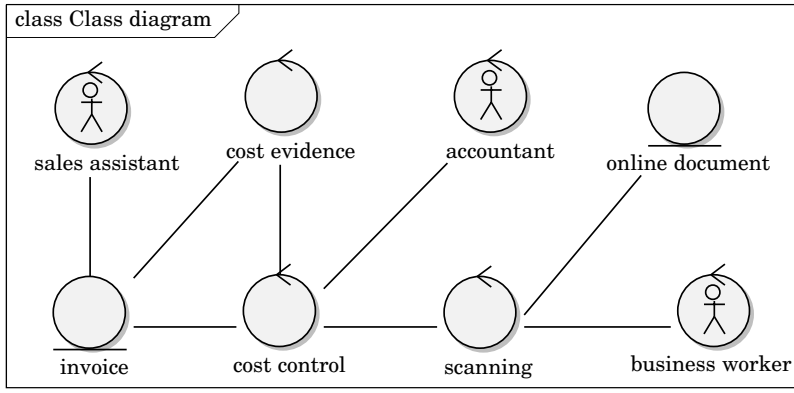

Fig. 5. Class diagram

Source: Author's own work.

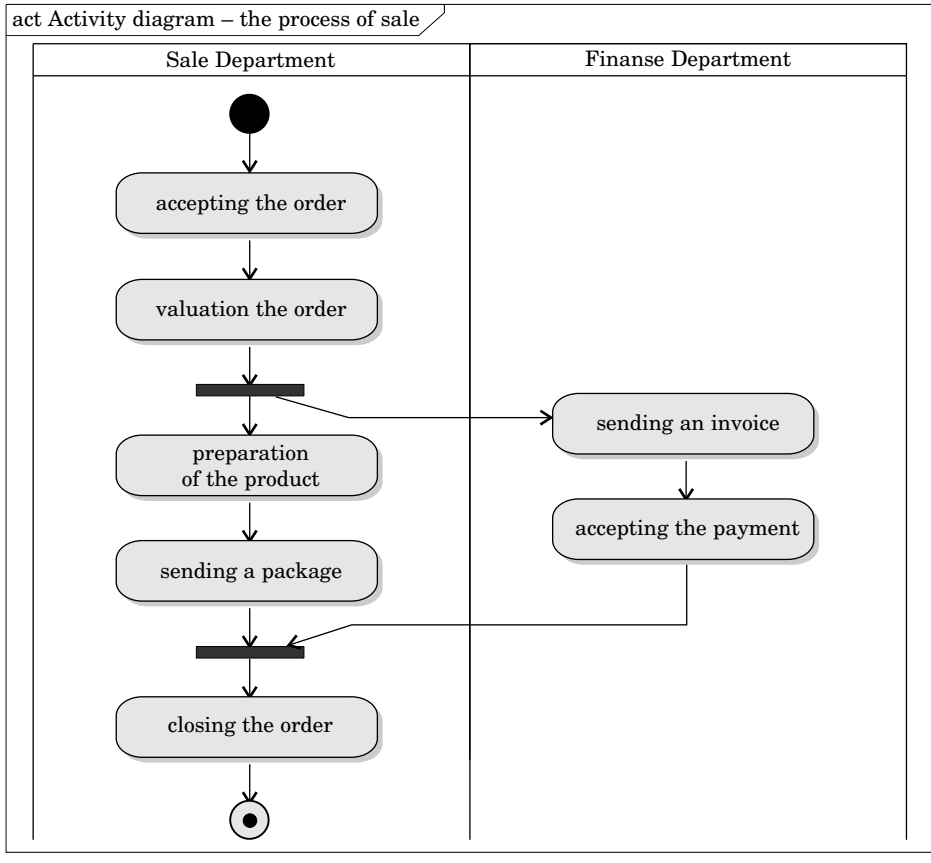

Fig. 6. Activity diagram – internal perspective

Source: Author's own work.

form the base for creating instructions on the base of which the employees operate.

The sample diagram of activities illustrates the method of performing the sales of goods and it requires cooperation of the sales department that prepares the dispatch and the accounting department that issues the invoice. Here the direct division of activities and allocation to departments (sales department and accounting department) was employed using the swimlane mechanism.

Conclusion

In this paper the author draws attention to the issue of business modeling and the role it plays in the information system development and integration process. Every business system is analysed as a whole employing two perspectives – the external and the internal one. The comprehensive study and description of the reality are possible thanks to the business techniques such as the case use diagram, diagram of classes, diagrams of activities, diagrams of packages and diagrams of sequences.

The business model developed according to the proposed methodology documents the interactions of the organisation with the external world, collaboration of objects within the organisation, flow of data in the system and communication inside the system. The process of designing the business system model is presented in the paper in the synthetic way.

Development of the correct business system model forms the base for further design works. Application of the CASE – Computer Aide Software Engineering tool allows systematic introduction of changes to the design and monitoring of consecutive software development stages.

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