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THE INTEGRATION OF BUSINESS ARCHITECTURE AND IT-ARCHITECTURE BY TRANSFORMATIONAL LAYER

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Abstract

This article propose the approach, which provides the synchronization of the upper level of business architecture models and IT-architecture models. The transitional buffer layer is the central element of the proposed approach, which was named by the authors the transformational layer. It is proposed to execute the transition to the descriptions of the information systems by means of transformational layer via the functional interface. The described approach allows the solution of the principal task of the end-to-end tracing of the information system functions realization from the business architecture level to the application solutions level and the real elements of the system. The proposed approach can be used in designing information systems, transformation of the business models and the development of proactive initiatives concerning the updating of enterprise activity and the search of «bottle necks» in part of the automation. The application of the described approach in this work allowed the increase in efficacy of the support and development of the information system in big logistic company, occupying the leading positions in the market of RF and CIS countries, by means of incorporation of the new pattern of software requirements specification.

Keywords: Quality management, information systems, enterprise architecture

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1. Introduction

On the way to practical use of new digital technologies, there are a lot of actual and complex problems. It's necessary to distinguish among them the problems in sphere of quality management of processes of information systems development (IS). The IS design and development is a difficult process which is related to developing concept solution, and the subsequent detailing and realization in software environment. At the same time it is very important to understand not only how the IS work and how the components operate, but also to follow how the IS incorporates in the enterprise activity. It allows to minimize the fragmentary unlinked implementations and to decrease the risk of system errors.

The most important value in the process of IS designing is the problem of introducing the IS in business processes of enterprise and the influence to business goals. The approaches from the sphere of modeling and management "Digital Twin" of the enterprises are used to solve this problem. The basis for development of these approaches is one of the modern and dynamically developing directions in the sphere of enterprise management - Enterprise Architecture (Gampfer et al., 2018; Gill, 2015; Gong & Janssen, 2019; Hinkelmann et al., 2016; Kirikova, 2017; Kudryavtsev & Arzumanyan, 2017).

2. Materials and methods

A lot of methodologies, standards and notations for architecture management in the sphere of Enterprise Architecture were created, it is necessary to distinguish among them such as Archimate (ArchiMate 3.1 Specification, a Standard of The Open Group, 2020), TOGAF (TOGAF version 9.2, an Open Group Standard, 2020). The following notations are also used in the sphere of Enterprise Architecture: UML (Butch et al., 2004), BPMN (Business Process Model and Notation version 2.0.2, 2020), IDEF (IDEF Standart, 2020), ARIS (Scheer, 1999) etc.

Herewith all methodologies and notations can be conditionally divided on two categories:

• The first allows to execute effectively upper level modeling of the Enterprise Architecture and of the IS, supporting the level of business architecture, but it does not allow to construct the detailed specifications (Archimate, BPMN, separate models ARIS);

• The second allows the constructing of detailed models, it is possible to describe the different nuances of operation of the information system by means of them and to execute work with the low level requirements (UML).

The task is to solve what is related to the construction of interconnections between the upper level descriptions of the functions, supporting the business processes, and the detailed functions of the information system (IS). Some results of the work in the sphere of solution of this task are presented in (Bhattacharya, 2017; Lankhorst, 2004), but it is impossible to say that the final decision was found.

3. Results

The authors of this article propose the approach in order to solve this task which provides the synchronization of the upper level business architecture models and of the IT-architecture models.

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The transitional buffer layer is the central element of the proposed approach which was named by the authors the transformational layer. This incorporation allows the decrease of general indeterminacy, which arises in the process of business goals determination and of transition to be achieved by means of automation.

All the business activity can be divided into business functions of the first level, which are composed of business functions of the second level, created by that two level function tree.

It is proposed to execute the transition to descriptions of the IS by the means of layer transformation via the functional interface, which are grouped in functional blocks, incorporated in two level business functions tree and representing the third level of decomposition.

At the same time, the modeling of the functional blocks and functional interfaces focuses on the decision of tasks of the automation, and the modeling of business functions on the decision of the business tasks.

This connection in one tree allows taking the first practical step to interconnect the level of business architecture and of IT-architecture.

During the development of functional interfaces the task does not set to describe the architecture of specific IS, equally in case of description of the IS by the terms of modeling language UML. The main task on this stage – is to eliminate the requirements imposed to the functionality of information systems as if it is an integral part.

The functional interface is described as if it is the assemblage of possible results, limitations and requirements, formed to the information systems, based on the business needs.

The functional interface – is a method of interconnection of the user and external system with the information system (“black box”), in order to achieve the significant result (achievement of goals and satisfaction of one or more requirements baseline).

The transformation of the collected requirements into the requirements decision takes place after the functional interfaces development.

This process is accompanied by the determination of specific information systems, where the functional interfaces will be realized, and by selection of technological platforms. The models of use case of IS are as the result of this work.

The use case – is an assemblage of the main and alternative flows of steps (events, actions) by the interconnection of the acting party with the IS. The use case of IS contains the description in connection to the specific IS. It reflects the particularities of IS operation, including the descriptions of user’s interfaces, operation algorithms of IS and structures of processed information.

The general scheme of interaction between the business architecture, IT architecture and transformation layer is shown in Figure 1.

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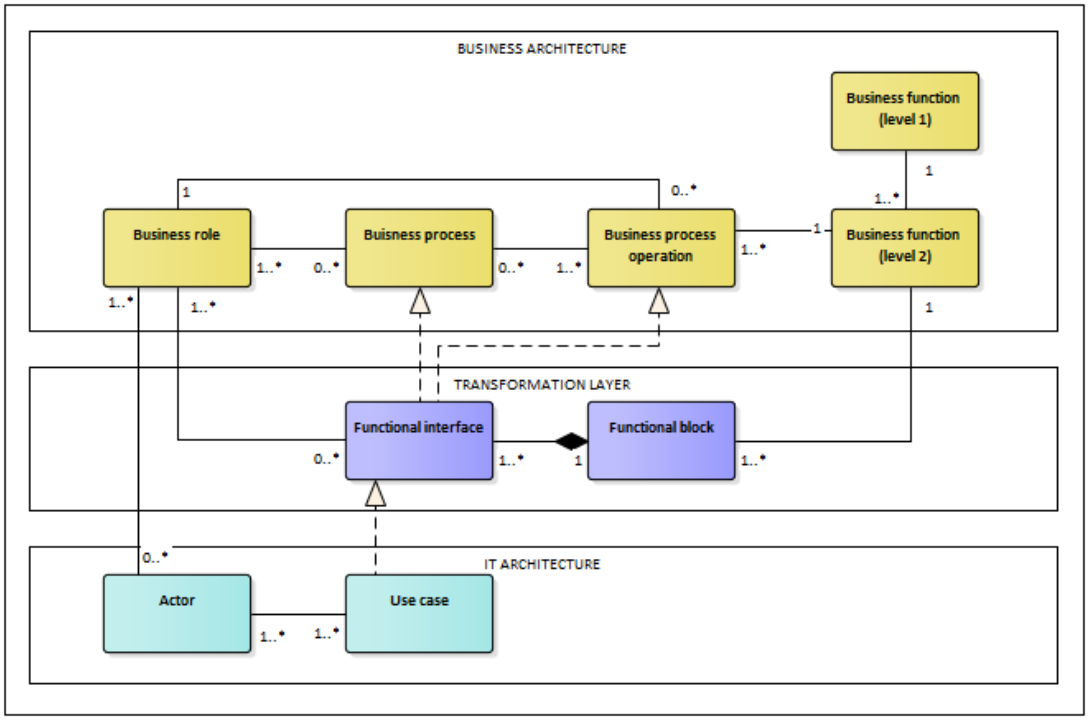

Figure 1. The fragment of the metamodel, describing the through interlayer interconnections between the metaobjects of the business architecture, IT-architecture and the transformation layer

The metamodel is an important artifact, which assigns the basic methodological principals, defined by the collection of used metaobjects and the connections between them and allows the creation of uncontroversial complex models of the system.

The application of the described approach in this work allowed the increase in efficacy of the support and development of the information system in big logistic company, occupying the leading positions in the market of RF and CIS countries, by means of incorporation of the new pattern of software requirements specification. This pattern combines:

• The description of the requirements functional interfaces, which allows the concentration on analyzes of the significant nuances in regards to the business;

• The detailed description of the use case of IS, which allows the modeling of the system architecture, to make the task assignment for the designers, and also to provide the qualitative specification of the developed program code.

Through the example of functional business development, which is related to the management of customer relationship, it is possible to consider the functional interface «Make application for freight transportation». This functional interface is defined by the following collection:

- The possibilities which are presented to the user as, for example, the introduction of defined collection of information about the transportation (sender, recipient, nature of goods, etc);
- The results which will be achieved, for example, the specific data in the IS are registered and the process of transportation planning starts;
- The requirements, for example, the requirements to the speed of processing and storage of information;

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- The limitations, for example, the functional interface effectuates the transportation processing only on the area of RF.

The presented functional interface is realized by means of two interconnection cases in different IS. At the same time these cases are essentially different from each other, because the IS are realized on the different technological platforms (popular Russian ERP-system and web-application on base of java-technologies). The collection of the user's interfaces, operation algorithms and information storage structures is totally different, but, in regards to the functional interface in both IS the equal possibilities and the results with specified requirements and limitations are realized.

According to this approach the interconnectivity of business architecture and architecture of IS totally and specifically realizes:

- The task of collecting and clarification of requirements to the IS with an accent on the business processes and business functions,

- The decomposition task and modeling of IS architecture for further use during the development and the support of the program code of specific IS.

4. Discussion

Thereby, the authors of this work propose the supplement to existent approaches and the methodologies of designing architecture of the systems. First of all the notations UML, increase the possibilities of application of this notation and the interconnectivity with the business architecture elements. At the same time, proposed approach supplements to notation Archimate, allowing the transit from the conceptual description of architectures on different levels of practical realization and to task assignment for development of IS. The proposed approach gives extra conceptual ideas, described in SEBoK (Guide to the Systems Engineering Body of Knowledge (SEBoK), 2020), and allows to make serious step to the fact that the described ideas can be realized in practice, particularly, transit to practical application of functional, logic and physical architectural descriptions.

5. Conclusions

The described approach allows the solution of the principal task of the end-to-end tracing of the information system functions realization from the business architecture level to the application solutions level and the real elements of the system, by means of introduction of new layer, named transformation layer, and the notion of functional interface, related to the use cases of IS.

The proposed approach can be used:

- In designing information systems and in the scale estimation of business changes and of information system layer;
- In transformation of the business models and the development of proactive initiatives concerning the updating of enterprise activity and the search of «bottle necks» in part of the automation.

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