Towards an Integration of Process-Modeling: from Business-Content to the Software Implementation

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Abstract— **One of the important aspects of corporative systems' management development is a usage of the Service Oriented Architecture (SOA), which is a flexible tool for the applied systems' integration. One of the modern methods of applied systems integration is a composite applications construction technology, which allows integration of complex/simple business-operations, converted in the web-services. The core of such composite models development are business-process modeling languages like Business Process Model Notation and Business Process Execution Language, the practical use of which showed the major trends for the farther improvement of these technologies. In the article there are considered the problems of usage and integration of various business-modeling types for Software development and implementation, and are represented their solutions based on the modern approaches. As a practical example, there is illustrated a whole process of the business-modeling standards' usage starting from business analyses until the software development.**

Keywords— business modelligt; business rules; BPMN; BPEL; SOA; ORM

I. INTRODUCTION

The usage of SOA and web-services are very important and effective in the processes of complex software system development and their support (e.g. during of System/component integration, Change Management, Service Development etc.). Their implementation is particularly flexible during the change management process, when estimating of the range of variation is very uncertain, and relates to the hierarchy of dependent classes, methods and data.

From this standpoint, the development of the complex software system's model requires a description of the business context in many aspects: formulation of the requirements, business rules; investigation of case studies, facts, data, class, attributes, methods, dynamic and static models, representations of hierarchy dependencies, and etc. For this various model technologies and tools of modeling are used (Fig. 1).

Which models is better to use in a particular situation in order to describe business correctly and fully, is a topic of discussion among IT analysts, developers and researchers nowadays.

Along with this problem, a very complicated, current and problematic issue is the semantic connection between different modeling technologies and tools as well. Questionable are issues of compatibility diagrams, display quality and problems of syntactic/semantic formalisms also.
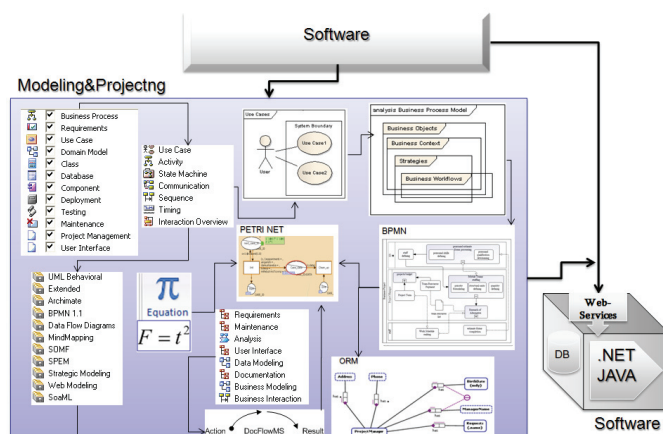

Figure 1. Fragment of complex software systems modeling standards

II. CASE STUDY

In generally, the concept of business-processes implementation is oriented to modeling the full lifecycles of complex software systems, which describes in details the coordination of system-to-system and workflow/human-to-human flows and operations. From this point of view, attention of IT specialists is paid to the improvement of the quality of Business Process Model Notation (BPMN), Business Process Execution Language (BPEL) tools in order to implement flexibly the main principles of business-process Engineering [1, 4].

Besides, these principles support a construction of business processes and organizational structures (Business Process Architect-BPA), which are then transformed into BMPN diagram and compiled into BPEL standard. BMPN is considered as so-called declarative language, and BPEL implements a number of web services simultaneously, according to indicated instructions and sequences of compact business-functions in BPMN [2, 3].

According to the business context, formation of BMPN instructions and multimodal analyze is a non-trivial task, to implementation of which we suggest to use a set of following models: Business-Requirements Modeling, Business Rule Modeling, Object Role Modeling, BPMN, BPEL.

Fig. 2 shows the way of our approach: tasks and issues of business-content are described in the Business-Requirements Model. According to the defined requirements is constructed a Business-Rule model. Business-Rule model represents business incident facts, as well as the activities and their relations. From Business-Rule Model can be generated source code (in the java, C#, etc). Based on the certain facts Object Role Model (ORM) is created, in which on the basis facts can be construct data structure as entity-relationship (ER) diagram and generate data structure - DDL file. Based on Business Rule Model and Object Role Model (activities, relations, data, stakeholders, role) is formed BPMN model (adding web-services and behaviors), that finally can be compiled into BPEL.
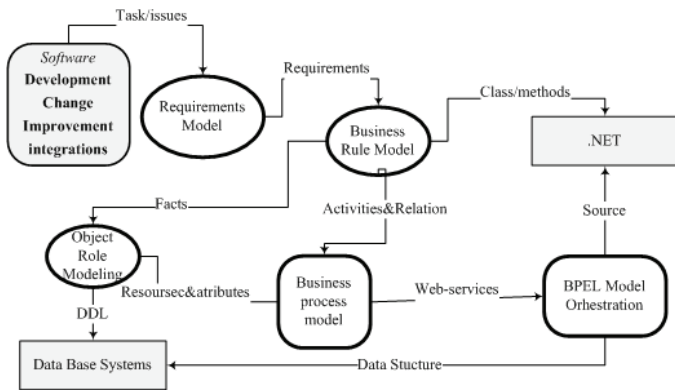

Figure. 2. The way from business contest to the software implementation

As an example we represented fragment of e-commerce processing. Figure 3 shows business-requirements and business rule diagrams. Figures 4, 5 represent ORM, ER, diagrams with following Facts: Customer has Customer_Address, Customer has CustomerName, Customer has BirthDate, Customer order Ammount, Customer order Product, Order chesk Ammount, Order chesk Account, Product has OrderQuality, Product has ProductName, Product has ProductPrise, Account has CardNumber, Account has Valid_Data.

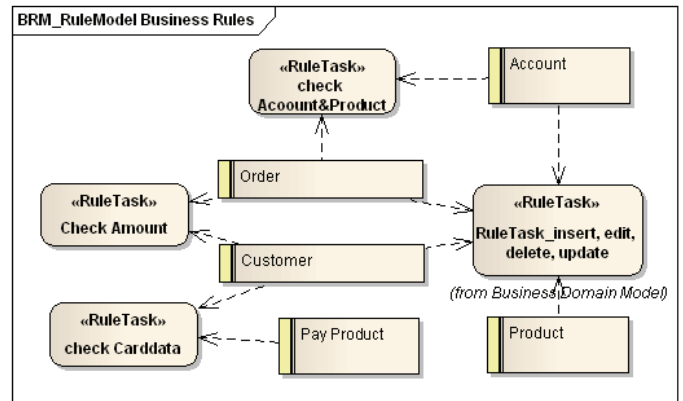Figure 6 shows BPMN and BPEL diagrams. On the Figures 7 and 8 the results of code generation are represented.

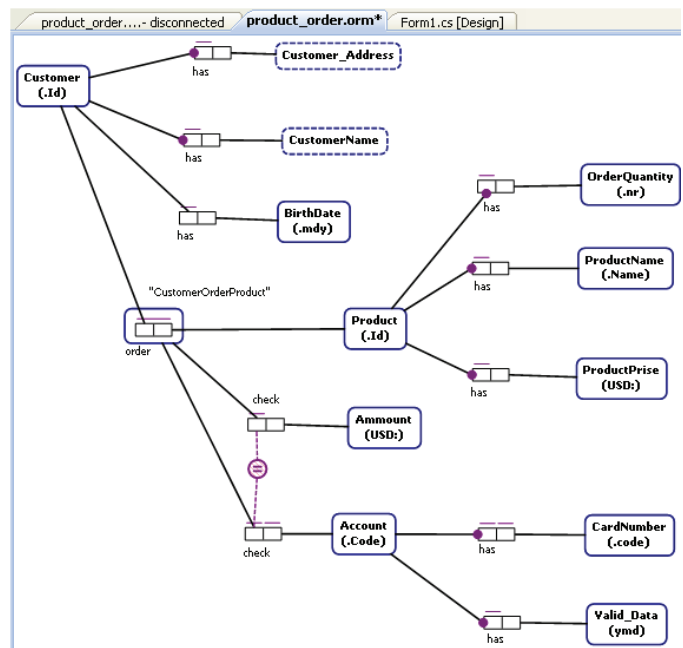Figure 3. Fragment of business-requirements and business rule model
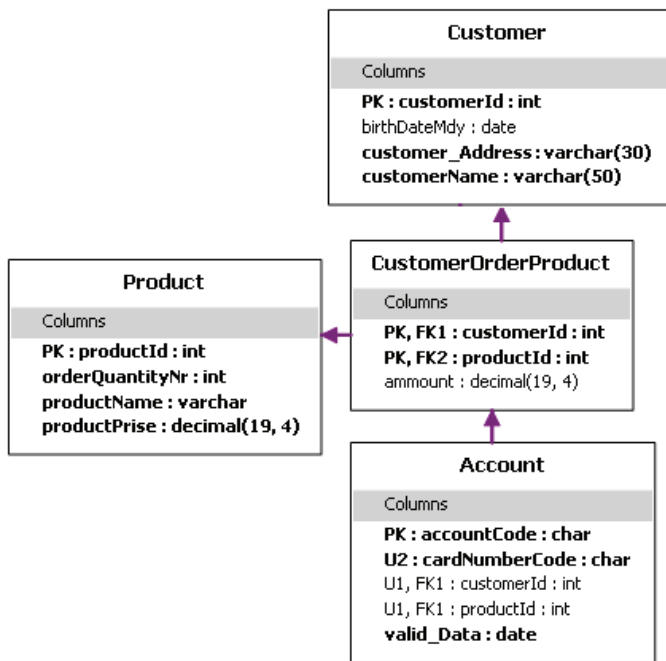

Figure 4. Fragment of Object Role model

Figure 5. Fragment of ER diagram

Figure. 6. Fragment of BPMN and BPEL diagrams

Figure 7. Results of code-generation

ORM is a method for designing and querying database models at the conceptual level, where the application is described in terms readily understood by users, rather than being recast in terms of implementation data structures. It views the application world as a set of objects that plays roles. Sometimes it calls fact-based modeling because ORM verbalizes the relevant data as elementary facts see [3]. During the systems projection stage, the joint work of the business analysts and systems (software) shall be required to precisely determine the major requirements for the realization systems. In this point of view, application of ORM and BPMN models, being currently considered as the agreed standard for all stakeholders of the business sphere significantly facilitates the elaboration of the problem detection phase thus giving the possibility to create the primary carcass of the automation system [2].
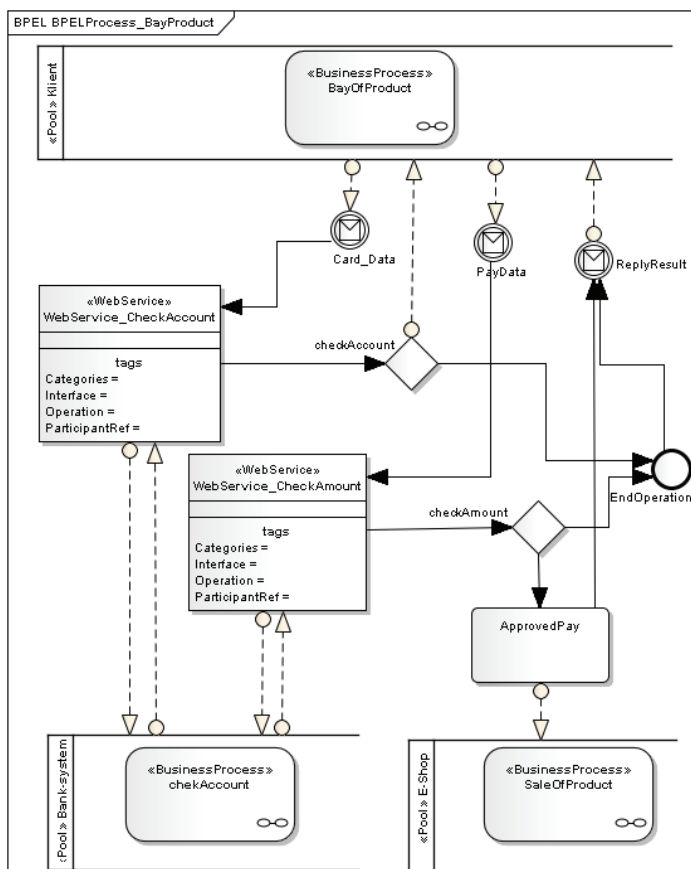

Figure 8. Results of code-generation

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However, the ORM instrument describes the system on the data structure level only and does not provide the determination of the process structures and scenario-relevant system behavior. To describe the workflow and business process lifestyle, the BPMN model is applied. Business Process Modeling Notation secures the opportunity of synchronization of the business model and informational model thus being considered as De Facto standard for description of the web-service based business processes. The priority is given to the visual side of the modeling graphic elements and compatibility of the diagrams. The fundament for such compatibility is the BPML (Business Process Modeling Language) and BPEL (Business Process Execution Language) based on the Extensible Markup Language (XML) [5].

III. CONCLUSION

Described approach of the business modeling is as useful for Change Management as realization of complex Software systems and integration of various applications processes. The model represented in the article involves the direct and reverse projecting mechanisms and the same time it can be formed in XML. Accordingly, within the coherent models, any changes should be reflected in all the related models.

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