EFFICIENT TRANSFORMATION OF USE CASE MAIN SUCCESS SCENARIO STEPS INTO BUSSINESS OBJECT RELATION (BORM) DIAGRAMS FOR EFFECTIVE BUSSINESS PROCESS REQUIREMENT ANALYSIS

[a]ATHANASIOS PODARAS[1], [b]JOSEF MORAVEC[1], [c]MARTIN PAPIK[1,2]

[1]*Department of information engineering, Economic Faculty, Czech University of Life Sciences Prague - CULS, Kamýcká 129, 165 21 Praha 6*
[2]*Institute of Information Theory and Automation v.v.i., Academy of sciences of the Czech Republic, Pod vodárenskou věží 4, 182 08 Praha 8*
email: [a]*podaras@pef.czu.cz,* [b]*jmoravec@pef.czu.cz,* [b]*papik@utia.cas.cz*

Abstract: The basic part of an innovative and modern approach to business process requirement analysis which is based on the simultaneous utilization of UML Use Case approach and the Business Object Relation Modelling approach is analyzed in the present paper. Precisely the transition rules by which the Use Case Main Success Scenario steps are converted into to a BORM diagram, entitled as the Use Case To BORM Transformation Algorithm (UCBTA) transition rules, are presented as a pattern based method which leads to the effective and efficient business process requirement analysis.

Key words: Business process requirement Analysis, UCBTA Algorithm, UCBTA Transition Rules, Use Case Main Success Scenario Steps, BORM Diagrams

Introduction

The most common technique utilized worldwide for detailed requirement analysis is the UML Use Case model. Use Cases are often the foundation of most Object –Oriented development methods [3]. However, it has been stated by IT experts, who strongly recommend UML tools such as Use Case diagrams followed by the Sequence, Collaboration and State Transition Diagrams for the integration of efficient and effective requirement analysis, that the above mentioned tools are mainly oriented at the programming concepts and are regarded as weak [2] in terms of business logic and business process modelling. Provided that stakeholders are not familiar with computer – oriented concepts, communication between IT experts and stakeholders cannot be achieved at the early stages of system development and throughout requirement analysis phase. BORM methodology [4] on the other hand can be successfully utilized in this circumstance while it is business oriented, and it can be consequently absorbed by stakeholders and end users. In BORM diagrams the business process flow is depicted; consequently it can be viewed, controlled and absorbed at a satisfactory level, even by end – users and stakeholders who have no computer orientation. The author's proposal for the derivation of a complete business process requirement analysis is the transformation of the Use Case requirement analysis to the BORM approach with the introduction of a pattern based algorithmic method *(Fig.1)*; the *Use Case to BORM Transformation Algorithm (UCBTA)* [5] is constructed to cover all possible weaknesses that emerge from the Use Case model and the BORM method when they are utilized solely and not simultaneously for defining and analyzing end – user requirements during the requirement analysis of a business process. The mathematical theory behind UCBTA algorithm is the *Non – Deterministic Finite Automaton* [1]. The UCBTA algorithm is comprised of several steps [5]. Throughout the current document the algorithmic phase analyzed is the transition of the Use Case main success scenario to a BORM diagram which aims at the workflow demonstration to the end users of a system or application.
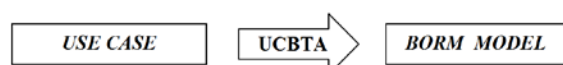

Fig. 1 The General Schema of the UCBTA Algorithm

Objectives and Methodology

Primary objectives of the current paper are:

- the justification of the construction of indispensible specified transition rules according to which the Use Case requirement analysis model is transformed to the BORM approach to business process requirement analysis without data loss

- demonstration of the way according to which Use Case main success scenario steps are demonstrated via BORM Diagrams after the transition is completed

- practical proof that the UCBTA transition rules are the most important part of the UCBTA transformation, due to the fact that end users with no IT background from any business process area are able to absorb the business process functionality.

The root methodologies from which the Use Case To BORM Transformation algorithm stems are the Use Case analysis and the BORM business process requirement analysis.

Discussion - UCBTA Transition Rules

Transformation models are inadequate in the case that part of data is lost during the execution of the transition from the one model to the other. For the precise comprehension of how data loss is eliminated during the transformation of the Use Case Model to the BORM business process requirement analysis approach, the author's concept is based on the creation of specific regulations that cover all the cases according to which the Use Case Main Success Scenario comprised of steps and sub steps is converted to BORM data flows, states and activities. Throughout the sections that follow the above mentioned regulations called UCBTA Transition Rules are analyzed in detail.

Basic UCBTA Transition rule

The basic type of the UCBTA transition rules comprises of the core transition from the Use Case Model to the BORM Business Process model. Throughout the core UCBTA transition, it is depicted how precisely a basic Use Case step of the main success scenario is diagrammatically adjusted to the BORM approach and represented by the BORM Process – Participant interaction model. The Process – Participant interaction model is also entitled as BORM Diagram. In the case that the above mentioned basic main success scenario Use Case step is divided into several sub steps the constructed BORM Diagram includes the aforementioned sub steps as well as they are described throughout the BORM method.

Let us assume a delineated Process and its corresponding Use Case A. The Use Case analysis also involves actors who take part in the process and are defined as Actor A and Actor B who are expressed as participants in BORM. Moreover, the Use Case step of the main success scenario is defined in the following way:

1. Actor A sends message to Actor B

The aforementioned step is supposed to be comprised of the following *sub steps* as well:
1a) Actor A expects reply
1b) Actor B receives message
1c) Message received by Actor B

The main goal is the transformation of the above written step and its subs steps to BORM activities flows and states, without any loss of data.
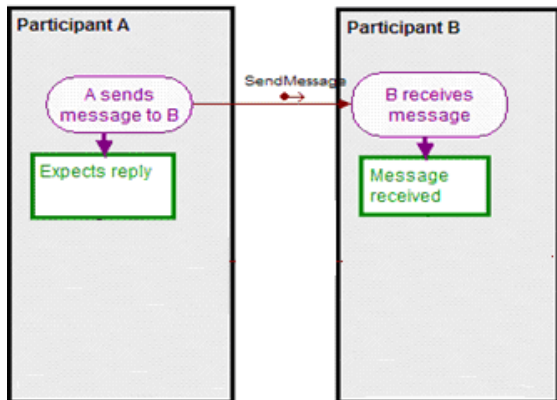

Fig. 2   BORM aspect of Process A after Primary UCBTA transition

As it can be noticed by the reader, the main success scenario step is the corresponding BORM activity which is considered to be the starting point of the data flow. The activity that belongs to the participant who receives the message and the two states are considered to be the Use Case sub steps of the above mentioned step. The currently defined rule is the basis on which the following 3 rules are constructed.

Primary or Initial Step UCBTA Transition rule

The second type of the analyzed rules of the Use Case transition to BORM is the Primary UCBTA Transition. Throughout the primary transition it is explained by the author how the Initial and the second step of the main success scenario are transformed to BORM activities, states and data flows.
The delineation of the primary transition is initiated with the assumption that UCBTA requirement analysis has to be performed for Process A. It is also assumed that the corresponding Use Case which is related to the aforementioned process is Use Case A.
The Use Case analysis also involves actors who take part in the process and are defined as Actor A and Actor B who are expressed as participants in BORM. Moreover, the initial and the second step of the main success scenario are defined in the following way:
1.   Actor A sends message to Actor B
2.   Actor B sends reply message to Actor A
Considering the initial step of the main success scenario the sub steps involved are:

1a) Actor A expects reply
1b) Actor B receives message
1c) Message received by Actor B
2a) Actor B expects new info message
2b) Actor A receives reply
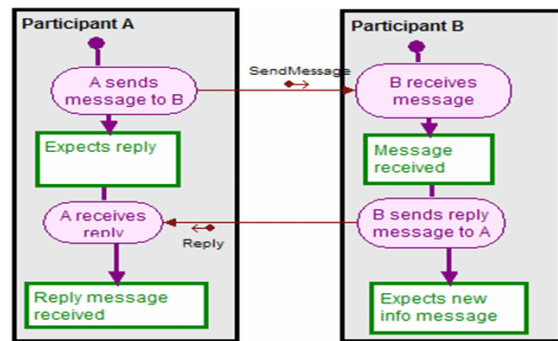2c) Reply message is received by Actor A

Fig.3 BORM aspect of Process A after Primary UCBTA transition

Middle Step UCBTA transition

The second type regarding the UCBTA Transition rules is the Middle Step UCBTA transition. The specific type follows exactly the same transformation path as the Primary UCBTA transition type; the main difference due to which the two types are distinguished is the fact that the Middle transition type refers to middle Use Case steps.

Supposing that the UCBTA requirement analysis should be implemented for a defined Process B. As in the case of the first transition type, its corresponding Use Case B is defined as well. An additive assumption is that the Use Case Steps of which the analyzed Use Case main success scenario is comprised is n, where n ϵ N*.

The Middle UCBTA Transition rule is applied for steps k and k+1, where 2<k<n, k+1 < n and k, n ϵ N*. The steps and sub steps of the main success scenario will be defined in the same way as in the primary UCBTA transition rule, and the BORM aspect is depicted (*Fig.4*) the BORM Diagram. It can be noticed that the difference with the first rule is that the middle step transition in BORM is without starting or ending points.
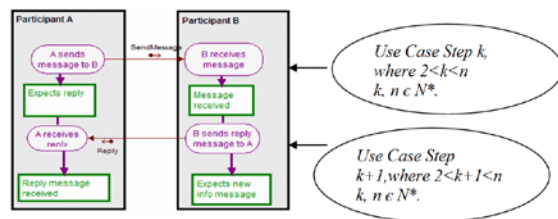

Fig. 4   BORM aspect of Process B after Middle Step UCBTA transition

Conditional UCBTA Transition Rule

The final type of the analyzed rules of the Use Case transition to BORM is the Conditional UCBTA Transition. The specified UCBTA transition rule is based on the fact that one or more steps of the Use Case main success scenario could lead the process in many different states.

1.   Actor A sends message to Actor B
2.   Actor B replies to Actor A, if the message is recognized
3.   Actor B rejects message, if message is not recognized, and procedure terminates
Considering the initial step of the main success scenario the sub steps involved are:

1a) Actor A expects reply
1b) Actor B receives message
1c) Message received by Actor B

In the same way the second step includes the following sub steps:

2a) Actor B expects new info message
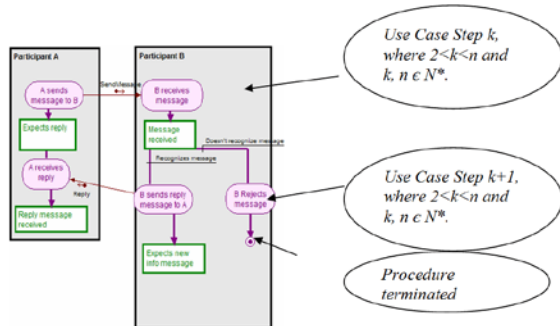2b) Actor A receives reply
2c) Reply message is received by Actor A

Fig. 5 BORM aspect of Process C after Conditional UCBTA transition

Conclusion

The most critical phase of the application or system development is the requirement analysis phase. Throughout the concrete phase the business needs of the end users are defined and analyzed by the IT experts. The most significant of the Object – Oriented methodologies to requirement analysis, named as Use Case analysis, is not adequate for that purpose if it is not followed by an equally tested and pure Object – Oriented approach; the concrete approach is the Business Object Relation Modeling (BORM). For the above stated reason the Use Case to BORM Transformation Algorithm (UCBTA) is introduced as a complete solution to perorm efficient business process requirement analysis. The most important part of the transition from the Use Case model to the BORM approach to requirement analysis is the creation of specific rules that cover all the cases according to which the Use Case Main Success Scenario comprised of steps and sub steps is converted to BORM data flows, states and activities and as a result data loss is eliminated and end users utterly comprehend the business process functionality.

Literature:

1. Derr K.W.: Applying OMT – A practical guide to using the Object Modelling Technique, Sigs Books, 1995, ISBN 0 – 13 – 884842 – 10 – 0.
2. Fowler M., Scott K.: UML Distilled (2nd Edition), Addison Wesley, 1999, ISBN 0 – 201 – 65783 – X.
3. Jacobson I.: Object – Oriented Software Engineering - A Use Case Driven Approach, , Addison Wesley, 1992, ISBN 0 – 201 – 54435 – 0.
4. Merunka V., Knott R., Polak J.: The BORM methodology: a third generation fully object – oriented methodology. In: Knowledge – Based Systems. New York, Elsevier Science International 2003, vol. 16, no. 2, p. 77–89. ISSN 0950-7051.
5. Brožek J., Merunka V., Merunková I., Organization modeling and simulation using BORM approach. Lecture Notes in Business Information Processing, 2010, vol. 63, no. 1, p. 27 - 40. ISSN: 1865-1348.
6. Podaras A.: Object – Oriented Business Process requirement analysis based on the Use Case to BORM Transformation Algorithm (UCBTA), Think Together 2009.