

# Bridging the Gap between Different Interfaces for Business Process Modeling

Katalina Grigorova, Kaloyan Mironov

**Abstract**—The paper focuses on the benefits of business process modeling. Although this discipline is developing for many years, there is still necessity of creating new opportunities to meet the ever increasing users' needs. Because one of these needs is related to the conversion of business process models from one standard to another, the authors have developed a converter between BPMN and EPC standards using workflow patterns as intermediate tool. Nowadays there are too many systems for business process modeling. The variety of output formats is almost the same as the systems themselves. This diversity additionally hampers the conversion of the models. The presented study is aimed at discussing problems due to differences in the output formats of various modeling environments.

**Keywords**—Business process modeling, business process modeling standards, workflow patterns, converting models.

## I. INTRODUCTION

THE accelerated rates of business development in recent years require increasingly the use of process oriented approach as the main driving element of any larger business organization. Thus, management analyzes the organization activities, optimizes them, and presents them through a series of interrelated tasks that make up the optimal business processes supporting the operation of the business environment.

The use of business processes as means of managing the modern business significantly improves its competitiveness and creates a framework that helps to strict implementation of the individual tasks. Leading an organization through process approach demands the constant analysis and optimization of existing activities. This requires the use of a dynamic environment for modeling, implementing and analyzing business processes.

The rapid development of technologies for business logic modeling and the creation of new and more detailed modeling notations, allows the design of increasingly complex and accurate business processes [1].

The presence of multiple modeling standards and their constant renovation provides business with a choice in the workflows interpretation.

## II. THE PROBLEM

The use of business processes in contemporary business management significantly contributes to its competitiveness

Katalina Grigorova and Kaloyan Mironov are with the Department of Informatics and Information Technologies at University of Ruse, Bulgaria (phone: +359 82 888 464; fax: +359 83 845 708; e-mail: kgrigorova@uni-ruse.bg, mr.kaloyan@gmail.com).

and helps clear and easy to follow work rules. Management of business processes by continually optimizing and implementing more efficient processes increases the chances for success of the organization.

In recent years, the scope of the application areas of business processes and business models constantly is expanding. Business process management has its place not only in the traditional business. Its applications are implemented in a wide range of organizations from different fields, such as government agencies, public organizations and foundations, academic institutions, etc. It is a method for improving organizational efficiency and quality and aims to increase business competitiveness by optimizing the activities of providing a product or service.

Many specialists work on the development of tools and environments for business process modeling. There are systems whose purpose is simply to describe the processes to studying, understanding, and documentation [7]. Others, such as Workflow Management Systems, provide ways and means for not only a description of the processes, but also for their implementation, management, and control [8].

The diversity of environments for business process modeling and modeled domain areas shows that many commonly used models are identical or very similar, although they are designed for different areas. Thus, the idea of reusable models arises. There can be distinguished two types of models: models for specific subject area, as well as models that can be used in many areas, with or without specifying parameters. A good example of a business process models is represented in the project Process Handbook of the Massachusetts Institute of Technology, which offers a collection of business practices, structured business processes from different areas [9], [10].

The research work [11] has led to the identification of workflow patterns that describe the behavior of business processes. These patterns range from very simple to very complex and cover cases that are found within most business process models. The researchers have developed a website that contains descriptions and examples of these workflow patterns, along with information and assessment of their maintenance within the various software systems and standards for business process modeling.

One of today's the most powerful standard for business process modeling is Business Process Model and Notation (BPMN). This is a graphical notation to represent business processes in Business process diagrams. Main purpose of this notation is to provide professionals with intuitive business modeling tool that allows describing the complex process

semantics. Another equally widespread standard is Event-driven Process Chain (EPC). Over the years the standard has been developed and perfected and now it is a powerful tool for modeling and analysis used by many organizations.

As the EPC was used for business process modeling over a longer period of time than BPMN, there is a huge amount of models that are based on EPC standard.

Having different standards for business process modeling involves their sharing and the need for a transformation of process models from one standard to another. This is embedded in the idea of building a flexible business environment and is required when integrating or implementing new systems.

Regardless of the reasons for transforming business process models, establishing a mechanism for conversion is not an easy task and requires an integrated approach to problem solving. Another factor complicating the task is the heterogeneous nature of the processes an organization uses. Depending on the activity and business needs, they can be directed to management or monitoring of various resources.

The diverse characteristics that each standard owns, defines the logical elements that compose it. Often the logical scenario of a standard does not have an equivalent representation in another standard. In case of the same operations in the two standards, they are often presented with different graphic primitives, making the conversion more difficult [2]. One of the main problems that hinder the direct conversion of the business processes models from one standard to another are different rules for the connection between the elements of different languages. These links are strictly individual for each standard and are determined by its business rules [3]. This problem is known within the scientific community, attempts have been made to resolve them and there are several proposed solutions. One of the attempts described in [5] offers direct comparison of EPC and BPMN components. This approach follows the common behavior for translating and is directly applicable in the case of conversion, where business logic is more limited. In its application on a large and complex business processes would be achieved discrepancy between the business value of the input and output data.

Converting business information from one standard to another requires a method equally applicable to different volume and complexity of business logic in the process. The correct approach to solving this problem is not seeking direct equivalent between the components in the modeling standards. Finding a way to keep the business logic in standard-independent format and its subsequent performance is preferable solution. This means that the logic of a business process from one standard cannot be transmitted directly to another standard, without losing information and avoiding inaccuracies. The widespread use of business processes, the existence of multiple standards and the need for exchange of information, requires a method to allow the interpretation of business tasks without breaking the logical integrity.

### III. THE PROPOSED SOLUTION

Creating a process for the direct translation of the

components of a standard for describing business processes to another is a complex task and provides both loss of information and misrepresentation of the business process logic. This is mainly due to the discrepancy between different standards for business process modeling and the specific uses for which they were created [4]. Despite these differences, each language for business process modeling holds the key elements needed to describe and create basic models. Thanks to these elements, it is possible to create more complex processes, built of separate logic paradigms. Thus, the business logic of a process can be represented in different modeling standards.

The idea of creating a unified environment for interpreting business processes is based on the use of an intermediate layer, allowing storage of business logic and helping its conversion. The characteristics which must meet "the mediator" of information are:

- To be applicable to various modeling standards;
- To be standardized or well documented;
- To have enough building blocks to cover the maximum number of business tasks (business work cases).

Analogously to business processes, workflow patterns also encompass and manage the logic behind creating a product or service. The essential difference between the two methodologies of business process management is that the use of workflow patterns presents a more detailed and thorough examination of entire process.

Considering the fact that one business process and one workflow follow the same logical process, but with varying degrees of detail, it is possible to represent the business process components by workflow patterns. This allows interpreting the logic of the initial business process transforming it into a more detailed model built by workflow patterns. This method of translation does not intend a loss of data, because the direction of the conversion is from a common model to one with more building blocks

Availability of workflow patterns provokes professionals in business process modeling to experiment with the presentation of these patterns by means of standards for business process modeling. Most often, such experiments were carried out with BPMN diagrams or with the activity diagrams of the Unified Modeling Language (UML). Such representations by means of EPC are hardly known. The authors offer an opportunity to fill this niche by developing the description of workflow patterns using the EPC, as well as using BPMN [6].

As a result of studies made, a method for converting business process models from EPC to BPMN and vice versa is developed. The results show the similarity between the two standards and identify with option to describe the most common business models. The presence of analogous components for performance of the same business logic made both standards suitable for conversion.

Using workflow patterns aims to provide intermediate level for storage of information, allowing preservation of the overall logic of the original business process and easy creation of new business processes in other modeling standards. This is done by encapsulating the workflow patterns in components of

business processes in the desired standard. Thus the transmission of the original data and its presentation in new

business formats, without compromising its integrity or sense, is achieved.

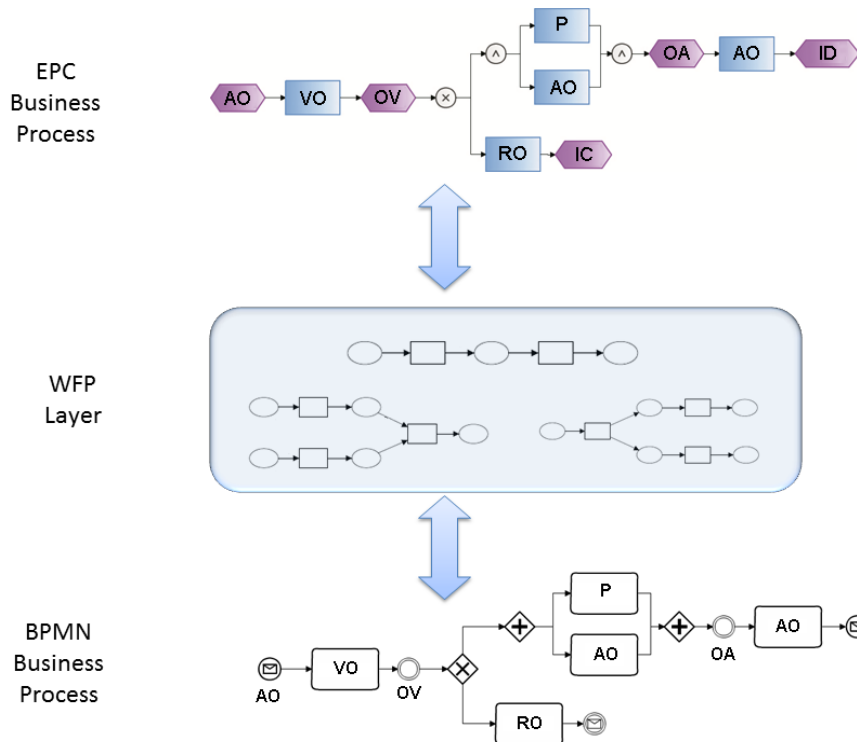


Fig. 1 Converting EPC business process model to BPMN business process model

Fig. 1 presents a diagram tracing the life cycle of converting business processes through workflow patterns.

Pattern	Standard	
	EPC	BPMN
Sequence	+	+
Parallel Split	+	+
Synchronization	+	+
Exclusive Choice	+	+
Simple Merge	+	+
Multi-Choice	+	+
Structured Synchronizing Merge	+	+
Multi-Merge	-	+
Arbitrary Cycles	+	+
Implicit Termination	+	+
Local Synchronizing Merge	+	+

Fig. 2 Presentation of workflow patterns in EPC and BPMN standards

In order to demonstrate the effectiveness of the proposed method for conversion the main instances of business tasks and the ability to represent them through workflow patterns are compared. As a result of the experiment a comparison of standards for business process modeling - EPC and BPMN is

examined. Fig. 2 presents the effectiveness of the proposed method showing that the most commonly used workflow patterns have an appropriate representation as in EPC as well in BPMN.

#### IV. INTERFACES FOR STORING BUSINESS PROCESS MODELS

The rapid pace of development, which characterizes the process-based approach to business management, contributes to the rapid development of systems for business process modeling. The variety of different modeling tools leads to a wide variety of interfaces, used for describing and storing the business information. The presence of many different modeling standards and applicability of different systems (web, desktop, mobile), further increase the number of variations, allowing the retention of data in the form of files.

Analyzing the possibilities of modern applications for modeling business processes, can be distinguished two main types of files that they generate - InApp files and Text-based files.

##### A. InApp Interfaces

This method for describing business logic is strictly individual for each application. This is due to the fact that different systems support different algorithms for exporting data, created specifically for their needs. In most cases it comes to internal company solutions, which does not disclose methods to describe the source data. This is one of the main

reasons for the proportional relationship between the number of systems modeling and the number of file formats, storing business process models.

Using this type of interface is comfortable only within the application that they are created. Integration of output files with a third party is almost impossible and requires specific drivers/ libraries for this purpose. Even if such exist, the process of interpreting information is a complex and slow.

### B. Text-Based Interfaces

This method of storing information allows its interpretation in text-based file - mostly xml, json or plain text. The nature of a business process diagrams allow easy description of its components by tags or other structured information. Analogously to InApp interfaces different applications also represent the data in different ways. However, integration with third environments is easily done through a XML schema, JSON template or other descriptor, showing the structure of the source files. A large percentage of applications generating this type of interfaces additionally allow their visualization. From this comes one of the drawbacks of text-based interfaces - namely the large volume of text describing the graphical interpretation of the business process diagram. However, the operation of this type of files is significantly faster than those based on InApp model.

### C. Perspectives for Storing Business Process Models

Similarly, to the revolution that XML made with the web services, creating a single method of data transmission, it can be argued that the text-based interfaces are the right direction, which should be developed in the business process modeling systems. In support of this assertion is the fact that almost all of the major tools for creating business process models allow their storage through text-based interface. This type of interface is preferred by application developers because the input data are clearly described and are processed very quickly, which makes them suitable for integration with web services. Of course, there are exceptions. One example is the InApp interface of MSVisio. It is an autonomous file format, but XML-based and allows easy integration with other applications. Another example is the platform for business process modeling of Aris Toolset. It allows the storage of business process diagram in XML-based file that is encrypted, and it is not possible to integrate it with other applications. Despite these exceptions, trends in developing interfaces for storing business process models are aimed at creating an accessible and universal method for interpreting business logic.

## V. CONCLUSION

The article presents a new approach for transformation business process models through workflow patterns. The analysis shows the high applicability to various modeling standards. In the context of conversion, application of workflow patterns allows the creation of an independent and detailed logical level, interpreting information and allowing its use for creating new models having the same logic, but

described by a different notation.

An important part of the conversion is related to the storage of models created in a specific modeling environment. The proposed solution uses EPC models created in MS Visio and BPMN models created in Enterprise Architect.

Because of the variety of output formats for storing models still cannot be proposed a unified approach. A specific treatment for each case is necessary depending on the output format of the modeling environment. The unification of output formats would be extremely useful in this regard.

Experimenting with models created in different modeling environments allows to identify common elements in the output formats and thus to approximate approaches for handling various models of business processes.

## ACKNOWLEDGMENT

This work is supported by the National Scientific Research Fund under the contract ДФНИ - И02/13.

## REFERENCES

- [1] P. Harmon, *The Scope and Evolution of Business Process Management*, Handbook on business process management, vol 1, 2nd edn. Springer, Heidelberg, pp 37–80, 2014
- [2] S. Seidel, M. Rosemann, *Creativity management – the new challenge for BPM*, BPTrends, May 2008, bptrends.com
- [3] G. Knolmayer, R. Endl, M. Pfaher, *Modeling Processes and Workflows by Business Rules*, Business Process Management. LNCS, vol. 1806, pp. 16–29. Springer, Heidelberg, 2002
- [4] Ryan K.L. Ko, Stephen S.G. Lee, Eng Wah Lee, *Business process management (BPM) standards: a survey*, Business process management (BPM) standards: a survey, Business Process Management Journal, Emerald Publishing. Vol. 15 Issue 5, 2009
- [5] W. Tscheschner. *Transformation from EPC to BPMN*, Business Process Technology, 1(3):7-21, 2006.
- [6] K. Grigorova, K. Mironov, *Business Process Modeling, Conversion of Models*, Mediatech, Pleven, 2015 (in Bulgarian)
- [7] ARIS, *Business Process Modeling*, Springer – Verlag Berlin – Heidelberg, 2000
- [8] L. Fischer, *BPM and Workflow Handbook*, Future Strategies Inc., 2010
- [9] G. A. Herman, T. W. Malone, *What Is in the Process Handbook?*, 2003, mitpress.mit.edu/books/chapters/0262134292chap8.pdf
- [10] T. W. Malone, K. Crowston, G. A. Herman, *Organizing Business Knowledge*, The MIT Process Handbook, MIT Press, 2003
- [11] W. M. P. van der Aalst, A. H. M. ter Hofstede, B. Kiepuszewski, A. P. Barros, *Workflow Patterns*, Distributed and Parallel Databases, 14(1), 2003

**Katalina Grigorova** is Professor in Computer Science, Head of Department of Informatics and Information Technologies at University of Ruse, Bulgaria. She received MSc degree in Applied Mathematics from Moscow Power Engineering Institute and PhD degree in Computer Aided Manufacturing from University of Ruse. Her research interests include Business and Software Architectures Modeling, Business Process Modeling, Automated Software Engineering, Databases, Data Structures and Algorithms Design, Programming. Prof. Grigorova is a member of Association of Information systems (AIS) and its Bulgarian chapter BulAIS. She is a winner of IBM Faculty Award.

**Kaloyan Mironov** is a PhD student in Department of Informatics and Information Technologies at University of Ruse, Bulgaria. He received MSc degree in Software Engineering from University of Ruse in 2012. His research interests include Business Process Modeling, Computer Networks, Servers, Algorithms Design, Programming, and Robotics. He is a winner of The best paper award of scientific conference CompSysTech'2010.