BPMN in Legislation on Example of Public Procurement Law – Case Study

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Abstract. The subject of the study was the use of BPMN in the creations and implementations of legal regulations on examples of projects that concern the reforms of public procurement law and supporting them with IT tools. The most important observation that resulted from the study is that any legal regulations that concern the proceedings are basically (business) information systems and, as such, can be reflected in BPMN as pools (participant). The method of carrying out the procedure itself can be represented using a business-process model that is recorded in BPMN notation in the form of a collaboration diagram; on this, the "regulation" exchanges information (data) with the other entities that carry out the procedure. Precise BPMN recording ensures the unambiguity of a regulation and allows for an assessment of the effects of the regulation before its implementation. The models that were used at the analysis stage can be transformed into executable models using IT tools that support supervision over the implementation of the procedure in accordance with a given regulation; this ensures the full coherence of the regulation and its subsequent implementation (supported by IT tools). BPMN models can be an annex to the regulation and, thus, contribute to its better understanding. On the other hand, the ability to read BPMN models is becoming a core competence – not only for consultants and programmers but also for lawyers and those officials who carry out such proceedings in accordance with a given regulation.

Keywords: business process model and notation (BPMN), public procurement, legislation, business process modeling (BPM), business process management (BPM), open contracting data standard (OCDS)

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1. INTRODUCTION

Legal acts that concern individual proceedings de facto describe the business process or processes that are carried out during the implementations of the proceedings. The implementations of these processes require maintaining the logic that is contained in the legal acts and collecting the appropriate data at the right time. On the other hand, this logic must ensure the possibility of properly implementing the objectives of the proceedings and the state goals that the given legal act serves. Moreover, it is desirable that these implementations of the proceedings proceed efficiently while minimizing financial and social costs and that it can be monitored in order to minimize any violations of the law during their implementations. Monitoring should be carried out by automating the processes that result from the legal acts. The use of formal BPMN notation allows for the recording of the above business processes in a clear and understandable manner as well as for their subsequent automation using IT tools. Based on many years of experience in EBRD (European Bank for Reconstruction and Development) in supporting the creation of public procurement law in various countries around the world, the article shows how to do this effectively and efficiently. Although the article itself is based on the experience of legislation (here, in the field of public procurement law), the experience that results from the applied method can be used for any type of regulation.

2. A FEW WORDS ABOUT HISTORY

Work on initiating the use of BPMN for modeling legal acts began in 2010–2011 at the Institute of Logistics and Warehousing (currently, Łukasiewicz – Poznań Institute of Technology) in the Center for Electronic Economy with Dr. Marcin Kraska. Dr. Filip Nowak led the team on the part of ILIM, and Piotr Biernacki participated on the part of MGX Infoservice as an expert in the area of BPMN. The challenge was to verify, analyze, model, re-engineer, and simplify administrative procedures as part of the project "Simplification of procedures related to starting and conducting business activity through their electronification and implementation of the single window idea" that was carried out by ILIM and commissioned by the Ministry of Economy. The team's task was to find an effective method for verifying the feasibility of administrative procedures that are de facto business processes that lead to the issuance of the right decisions. As part of this work, a method for presenting administrative procedures as business-process models was developed. BPMN notation and private-process diagrams and cooperation diagrams were selected. The procedures were modeled as cooperating (exchanging data) the independent processes that take place in the different public administration units. As a result of this work, numerous inconsistencies were detected within the existing regulations.

During the period of 2012–2013, the Ministry of Economy (together with the Chancellery of the Prime Minister, the Government Legislation Center, and other ministries) implemented activities within the framework of the "Better Regulations

2015" Program that limited the problem of the so-called inflation of law and the frequency of changes in the law, improved the quality of the created (and binding) regulations, and popularized public consultations in the legislative process. Also within the framework of this program, it was decided to use BPMN to verify administrative procedures (Rada Ministrów, 2013). Here, too, the decision was made to use BPMN as a notation for recording the logic that resulted from the examined legal act.

The next stage of the process identification in terms of legislation was the project of modeling public procurement procedures; this started in 2013 and was carried out in the Public Procurement Office (Urząd Zamówień Publicznych) by the UZP team under the supervision of Arkadiusz Koperski. The team was initially supported by a team of consultants from the Institute of Systems Research of the Polish Academy of Sciences (Jacek Nieckuła and Dr. Marek Szelągowski) and at the later stages by MGX Infoservice (Piotr Biernacki). BPMN was selected for modeling in accordance with the "Concept of the methodology of modeling business processes in public administration" (Nieckuła, 2015). Models of the procedures that resulted from the public procurement law were prepared in order to prepare an IT system for the automation of public procurements and the supervision of tenders. The developed models and the need for automation resulted in the need to modify the PPL in order to effectively implement e-Zamówienia; i.e., a portal that supports the implementation of the PPL.

The results of the work of the Public Procurement Office interested the "UNCITRAL Public Procurement Initiative" team, which was working under the supervision of Ms. Eliza Niewiadomska at EBRD. It was recognized that the methodology of the modeling procedures that were adopted by the Public Procurement Office may be used in the reforms of the public procurement law that was supported by the team as well as the automation of the procedures that were related to it in those countries where EBRD operates. BPMN was used at the stages of the following:

– analysis of existing regulations;
– agreement on proposals for changes in law;
– creation of pilot national platforms for electronification.

This has launched a number of projects financed by EBRD.

3. SITUATION DESCRIPTION

As part of the existing legal system, legislation is meant to ensure the implementation of the state's goals. This means that it must ensure the following (see Fig. 1):

– implementation of goals for which given legal act was created;
– coherence of law (it is to operate within existing structure of legal acts and cannot be contradictory to them);
– possibility of assessing effects of regulations – both before adoption of given act and monitoring effects during validity of given legal act;
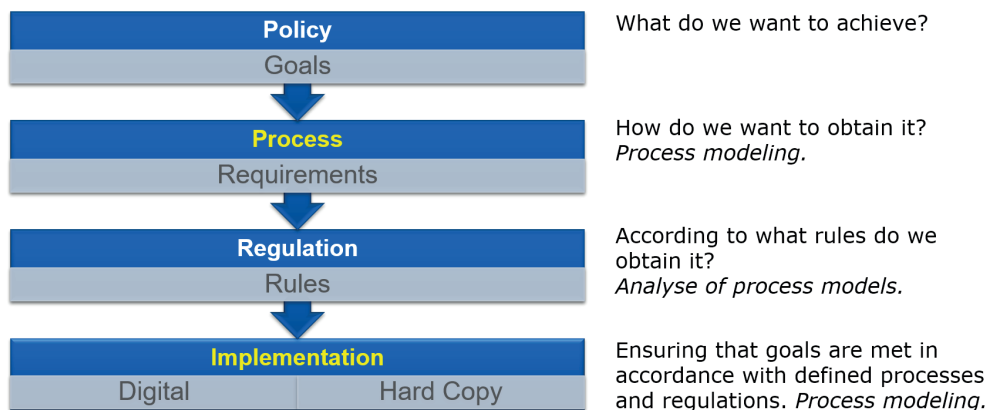– transparency of actions and prevention of abuse.

Policy	What do we want to achieve?
Goals	

Process	How do we want to obtain it? *Process modeling.*
Requirements	

Regulation	According to what rules do we obtain it? *Analyse of process models.*
Rules	

Implementation	Ensuring that goals are met in accordance with defined processes and regulations. *Process modeling.*
Digital	Hard Copy	

Fig. 1. *Hierarchy of activities in creation and implementation of legal regulations*

The second of these requirements requires the verifiability of the possibility of the correct implementation of the procedure that results from a given legal act. By using BPMN (notation that is used to map the implementation of a business process), it is possible to verify whether the proposed method of action is possible to implement in the context of this and other legal acts (legal consistency) and how it will translate into the implementation of the state's goals.

IT systems perfectly support the third of these requirements; therefore, the legal act should enable and sometimes require the automation of collecting any data that is necessary for regulatory impact analysis. At the same time, it should not impose a tool for its implementation.

The fourth requirement can also be supported by appropriate provisions and IT systems. The regulation should require the provision of appropriate data, and IT systems should ensure its collection, protection against falsification, and the provision of only the required data and at the right time. Easy access to information by both law enforcement agencies and the media and other non-governmental organizations facilitates the detection of abuses.

In the case of public procurement, such automation of data collection on procurements can be ensured by national public procurement platforms (e.g., e-Procurement in Poland). EBRD supports reforms of the public procurement laws in various countries by preparing assumptions for the reforms of public procurement laws using best legal practices based on the EU directive (European Union, 2014) , United Nation Commission's on International Trade Law UNCITRAL Model Law (UNCITRAL, 2011) and GPA WTO (WTO, 2012), and any subsequent implementations of solutions in the form of a pilot installation of a platform that supports the digitalization of the public procurement process in a given country. Ultimately, the national platforms are to serve the following:

 – monitoring activities to determine needs and plan tenders (budget);
 – broad notification of planned tenders and individual proceedings (TED, Tenders Electronic Daily – Supplement to the Official Journal of the EU, https://ted.europa.eu/en/);

– collecting and anonymizing offers;
– collecting information and data on individual stages of conducted proceedings;
– concluding appropriate agreements;
– monitoring implementations of orders (including payments);
– detecting irregularities during implementations of proceedings;
– summary of implementation.

In order to ensure a uniform form of storing data on the proceedings, the Open Contracting Data Standard (OCDS) was adopted, along with its extensions.

For these activities, an effective method of visualizing the way in which the proceedings were carried out had to be selected that could be used in different countries regardless of their culture. BPMN was selected; it is used to map the process of carrying out a public procurement, taking different modes of carrying out this order into account. Later, it constitutes a framework for an IT solution for carrying out these orders in digital form.

It can be said that the introduction of BPMN as a method of describing and launching processes is in line with the trend of introducing techniques that are known from BPM into legislation (Szelągowski & Berniak-Woźny, 2016).

4. UNDERTAKEN ACTIONS

An example of the realization of this concept is the MTender project that was implemented in Moldova in 2017; similar projects are being implemented in Ukraine (Prozzoro II), Albania, Kyrgyzstan, Uzbekistan, and Tunisia. As part of the above project, EBRD identified the basic steps that were necessary for completing a public procurement contract. These steps were assigned the appropriate data and forms (based on eForms (European Commission (2019)) that were used to enter/update this data. Reference models of those processes that reflected the individual public procurement modes were created from these steps. The models contained structures that were described in the article "Modelowanie i badania symulacyjne procesów dynamicznych" (Modeling and simulation studies of dynamic processes) (Szelągowski & Biernacki, 2016). By using the executive mechanisms that were standing in the background of the BPMN models, it was verified whether the proposed business rules that resulted from the proposals of the legal regulations ensured the implementation of the goals of the country that introduced the regulation. Any threats that resulted from the method of conducting the procedure were also identified; finally, alternative regulations or procedures were proposed, and the potential benefits of such alternative methods of implementation were assessed. Based on these analyses, a target reform of the public procurement law in a given country was recommended. After the adoption of appropriate regulations, a pilot solution was prepared based on the procedure model in order to automate the process of implementing a public procurement in a given country for the selected area. After launching the pilot installation and the first-annual supervision of its operation, we summarized the benefits that resulted from the law reform and process automation. Then, the solution was transferred to the administration of the given country for further maintenance or the development of the solution.

5. OBSERVATIONS DONE DURING MODELING

The process that is described by a legal act can be defined as the information system of the legal act; therefore, it takes place in one pool from the point of view of the BPMN model (i.e., one participant). This system communicates with other participants (pools) and implements their business processes; these may be entities that take part in the proceedings (see Fig. 2).

Generally, there is no need to model these cooperating processes (subject to their own regulations). We model cooperating processes when a process that is implemented by a given partner is also described by a given regulation (e.g., the process that is implemented by the appropriate appeals chamber that is provided for a given legal act). It is good practice not to include such detailed regulations in the legal act; they should have their own regulations (e.g., lower-level regulations).
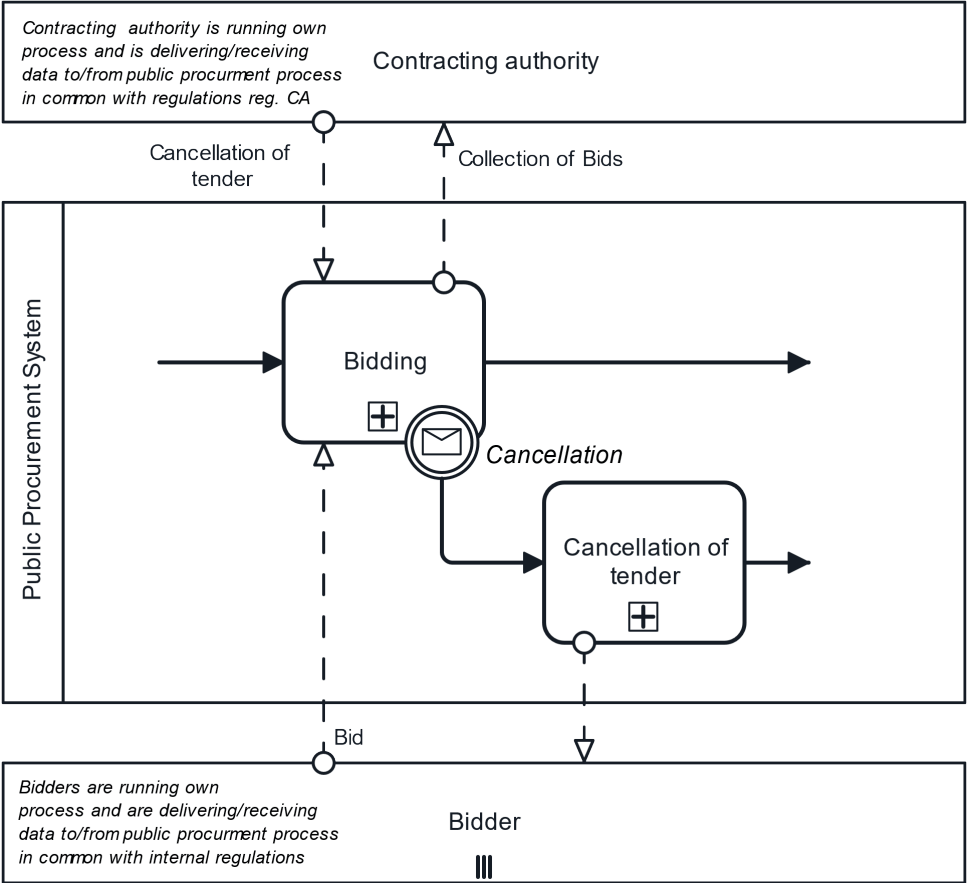
Fig. 2. *Fragment of public procurement process showing flow of procedure and partners that participate in it*

The information system (called the public procurement system in our project) "collects information" or "provides information" to/from the processes with which it cooperates. It can "perform" certain activities that have resulted from the requirements that have been set by the regulation. In the real non-automated world, these operations are performed by the partner (but as part of the procedure that is implemented in accordance with the regulation; i.e., in the information system). The introduction of automation platforms can "take away" the performance of these activities from the partner and transfer them to the IT system that is required by the regulation. For example, the IT system collects offers and makes them available to the tender committee only after the deadline for collecting offers has passed, thus ensuring the confidentiality of the data until the moment of "opening the offers"; it also examines the formal completeness of the offer and informs the person who submitted the offer that it does not meet the criteria for the procedure. The IT system can additionally monitor activities within the implementation of a given legal act and effectively store, analyze, and provide data regarding the implementation of a given legal act.

Another interesting observation was that, regardless of culture and language, people very quickly acquire the basic ability to understand BPMN models; this greatly facilitates discussions on any changes in laws and their effects. Moreover, the speed of noticing inconsistencies or a lack of precision in a proposed solution increases significantly when the models are constructed correctly; this results in finding optimal solutions (at a given moment).

Unfortunately, the use of BPMN also has its limitations. Creating valuable models requires quite in-depth knowledge of the specification on the part of the modelers. Models that are prepared by people with poor knowledge of BPMN did not contribute much to the discussion and were sometimes misleading (truisms were modeled, often incorrectly). We achieved the best results when a BPMN expert with experience in modeling regulations supported the modeling activities of the experts in the areas of legislation (lawyers) and, possibly, implementation (the creators of IT solutions).

6. RESULTS

The use of BPMN significantly facilitated the communication of proposed changes in the law. The models showed how changes in legislation translated into better implementations of the political goals that were related to the implementation of the public procurement. It was shown how automation could shorten the time of a public-procurement implementation and how the acquired data could affect the competitiveness of the offers and the transparency of the process. The threats were illustrated and shown how to minimize them. Finally, it was demonstrated that the proposed reform (including the models that were used during the preparation of the reform and the pilot installation of an IT platform based on these models) actually translated into the improved implementations of public procurements thanks to the pilot platform that was created on the basis of the proposed models of the various procurement modes.

The use of BPMN in the discussion on the models did the following:

– facilitated understandings of proposed changes;
– shortened discussions on effects of changes;
– facilitated implementations of pilot solutions.

How did all of this translate into public procurement in Moldova? A full 20% of the country's procurement costs were saved (see Fig. 3).

This is a measurable effect; in addition to the measurable effect, however, there has been a change in the culture of improving the law (here) in the area of public procurement. Thanks to the modeling actions that resulted from the proposed legal acts via BPMN, the legislators are able to better assess the effects of a given regulation (verifying the "operation" of the regulation by understanding the mechanisms that have resulted from it) and are, therefore, able to better justify the need for and the directions of changes.
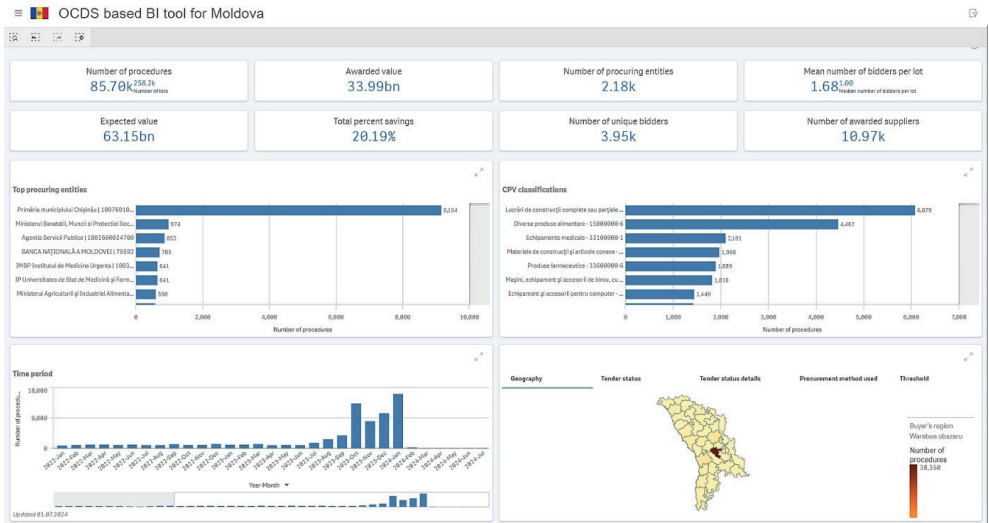

Fig. 3. *Screenshot from MTender showing savings*
Source: https://mtender.gov.md/en/public/open-data [8.09.2024]

Similar effects have been observed in other countries where EBRD operates regardless of culture or language. Wherever BPMN was used at the analysis stage, the speed, and quality of the work on law reforms improved significantly. We are talking about work in multi-lingual environments in countries with such different cultures as Central Asian countries (Kyrgyzstan, Uzbekistan), European countries (Moldova, Ukraine, Albania) and African countries (Tunisia). The consultants from these countries were supported by experts from Great Britain, Spain, Poland, Portugal, Italy, Cyprus, Finland, Latvia, and Romania.

7. THEORETICAL, PRACTICAL, AND SOCIAL IMPLICATIONS

The legal reforms that are supported by EBRD have shown that legal acts concerning proceedings (e.g., a public procurement law) should use BPMN-procedure modeling – both at the legislative stage (the verifications of any proposed regulations) and the later implementation. Experience from previous projects (from other areas of law) confirmed that only modeling the processes that have resulted from the proposed regulations provides a full picture of its effects. The lack of models often causes inconsistencies in the law, leaves room for undesirable gaps in the law, and makes it difficult to properly implement tools that support the implementation of the law. Therefore, legal acts should contain a reference model of the procedure in the form of an appropriate BPMN model. An appropriate method of visualizing a given regulation is to present it on a BPMN model as a pool that exchanges information (data) with other pools (participants). This model should be used for the subsequent automation of implementing procedures and creating the appropriate tools for monitoring the implementations of the procedures. Monitoring translates into more complete control over the effects of the implementation of the given regulations and ensures the greater transparency of their implementation, which, in turn, translates into the possibility of faster corrections of inappropriate regulations and increases citizens' trust in the rule of law.

The need to use BPMN models in everyday practice of creating and implementing laws and regulations means that the ability to correctly create and read BPMN models is becoming an essential competence – not only of the IT world, but also (or perhaps even primarily) of the people who are involved in legislation (creating various regulations and their interpretations) and those officials who implement these regulations. This creates the need for the broadest possible teaching of the basics of this notation and the verification of the ability to use it.

8. SUMMARY

We based our research on work that was carried out as part of EBRD activities; nevertheless, the consultants had experience from their previous activities. The effects that were obtained during the work on the public procurement laws in several countries are consistent with our earlier observations (e.g., with the effects of the activities within the UEPA project). BPMN has proven to be an extremely effective tool for supporting legal reforms. It has been identified that a legal procedure is nothing more than an information system that implements its business processes; these can be modeled using BPMN and communicated with other entities. At the same time, it can be implemented in an appropriate IT system that supports its operation. Therefore, legal acts that concern various proceedings should be supplemented with reference models of the business processes.

Verified knowledge of BPMN is becoming one of the basic skills that are necessary – not only in the area of IT or business analytics, but also in legislations or state administrations (the ability to read procedures). The advantage of BPMN is that it is

a universal and unambiguous platform for analyzing methods of procedures and that it allows for in-depth analyses regardless of cultural factors, language, or areas of interest.

Further work on BPMN models in legislation should concern the creations of libraries of standard activities that could be used in various areas that are covered by legislation as well as the creation of a knowledge base on the effects that result from the applications of given legislative solutions.

The advantage of BPMN is that it is a universal and unambiguous platform for analyzing the flow of activities; this allows for in-depth analyses regardless of cultural factors, language, or areas of interest.

Further work on BPMN models in legislation should concern the creations of libraries of standard activities that could be used in various areas that are covered by legislation and the creation of a knowledge base on the effects that result from the applications of given legislative solutions. Knowledge of BPMN is also becoming a basic competence for lawyers, officials, and consultants. This competence should be subject to verification (certification).

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