

From the Parliament to a Polling Station: How to Make Electoral Laws More Comprehensible to Election Administrators

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ABSTRACT

This article suggests that law modelling (using Business Process Model and Notation, BPMN) could make electoral laws more comprehensible to different stakeholders, and in particular, to election administration, especially in cases of complex elections with multiple voting channels. This solution helps election administrators to translate the complexity of electoral laws into clear instructions. By this, election administration can adapt to the frequent changes in laws, reach better regulatory compliance, and address the barriers they meet during the delivery of the elections, like overtasking and lack of institutional memory. As a proof of the concept, we demonstrate the applicability of the proposed solution by modelling one voting channel available in the 2019 parliamentary elections in Estonia, advance voting. The article contributes to the theory on election administration and suggests how this solution could be used in practice: in the field of the electoral law and outside of it.

Keywords: electoral law, law modelling, election administration, BPMN, Estonia, design science research

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“Laws can be visualised and modelled like other governmental processes and these models can be used as guidelines to develop workflows.”

(Olbrich and Simon 2008, 43)

INTRODUCTION

ELECTORAL LAWS REGULATE WHO ORGANIZES ELECTIONS and how they are organized. However, in practice, it is not always easy to transform electoral laws into clear instructions. First, the legal language of electoral laws might be difficult to comprehend for non-lawyers. Second, some electoral laws allow for multiple interpretations (Kropf, Vercellotti, and Kimball 2013; Suttman-Lea 2020). Third, electoral laws change frequently, which does not make the task of implementing laws easier. To the contrary, “the potential for error increases when the law changes” (Alvarez and Hall 2006, 497). Given the frequency of modifications, some of

them might “go unnoticed even for several decades” (Ciaghi, Weldemariam, and Villafiorita 2011, 33). Still, in the end, election administrators need to implement the laws and derive from them instructions for poll workers. The more difficult this process is, the less possible it becomes to deliver elections properly.

The process of transforming electoral laws into instructions affects not only election administrators and poll workers but also voters. Given that local election administration involves a high level of discretion (Hall, Monson, and Patterson 2009), the possibility of multiple interpretations of electoral laws might have significant consequences on the conduct of elections and on voters. Poll workers can also exercise discretion, and the more complicated the laws are, the more discretion poll workers can exercise (Atkeson et al. 2014). Thus, poll workers are street-level bureaucrats making “legal decisions on the fly on Election Day” (Alvarez and Hall 2006, 496). Discretion also allows poll workers to “decide to what extent they will follow laws and procedures” (Hall, Monson, and Patterson 2009, 508). As a result, the way electoral laws are implemented can impact the quality and integrity of elections.

This article aims to answer the research question: “How can electoral laws be made more comprehensible to election administrators?” It presents a new approach of how laws could be converted into instructions, which would clearly indicate actors and their activities. This article presents a proof of concept for Business Process Model and Notation (BPMN) as a heuristic tool that may be applied to electoral laws to make them more comprehensible to election administrators and poll workers, limiting individualistic interpretation in different contexts. Such models are especially important in contexts with complex elections with multiple voting channels. To demonstrate how the proposed tool works, we apply it to a case study of the Estonian electoral law, in particular, the Riigikogu [National Parliament] Election Act, in the version for the 2019 parliamentary elections (Riigikogu Election Act 2019).

The article proceeds with a theoretical framework which informs the problem identification (Fedorowicz and Dias 2010). The theoretical framework presents an interplay between the literature on election administration, usage of diagrams for law modelling, and, particularly, the applicability of the BPMN tool to electoral laws. A methodology

section follows, before delving into the detailed explanation of how to use BPMN to model electoral laws, and its demonstration on a case of the Estonian electoral law. The discussion section presents the findings derived from the first application of the BPMN to the electoral law. The conclusion elaborates on the implications of this research.

THEORETICAL FRAMEWORK

The theoretical framework builds on three strands of literature. It starts with an overview of the literature on election administration, with the aim of introducing the problem of comprehensibility of electoral laws by election administrators and poll workers. Then, it proceeds to the literature on the usage of diagrams for the modelling of laws. After that, it narrows down to one particular tool for modelling (Business Process Modelling and Notation) and its application to the field of election administration.

Election administration

Globally, electoral law experiences frequent changes that cause some scholars to call it “an ever-changing field” (Geddis 2005, 60). Since the 1990s, “Italy shows a sort of ‘hyperkinetic’ attitude toward changing its electoral law” (Baraggia 2017, 274). In Canada, since the 2000s, “nearly every area of election law” has been reformed (Pal 2017). And the U.S. is not an exception (Kimball, Kropf, and Battles 2006; Levitt 2012). Election administration implements electoral laws, that is why they need to closely follow these changes.

Furthermore, to implement electoral laws, election administrators need to interpret them: laws constrain and direct election administrators, while still leaving “considerable room for interpretation” (Kropf, Vercellotti, and Kimball 2013, 244). This subjectivity could be partisan: election administrators could interpret laws in a way that helps their party (Kimball, Kropf, and Battles 2006; Kropf, Vercellotti, and Kimball 2013; Nussbaumer 2013). Ambiguity of electoral laws could also further contribute to “varying interpretations” (Suttmann-Lea 2020, 714) at the level of poll workers.¹ In fact, poll workers are the “most

¹Poll workers have different titles in different jurisdictions, such as election judges. To be consistent with other research, we refer to them as poll workers in this article.

direct arbiters” (Suttman-Lea 2020, 714) of electoral laws. In the case of poll workers from the city of Chicago, Suttman-Lea (2020) finds that personal experiences of poll workers play a role in their interpretation of electoral laws. This subjectivity could challenge the consistency in law application, resulting in unequal treatment of voters. Furthermore, the issue of law interpretation is even more critical in federalist systems with decentralized election administrations, like in the case of the United States or Switzerland.

The need for law implementation requires election administrators and poll workers to have a good understanding of electoral laws and the electoral process. However, that is not always the case: the problem of not understanding their job has been reported by 21 percent of poll workers in the U.S. (Fischer and Coleman, 2008 as cited in Burden and Milyo, 2015), with some poll workers not understanding even basic election laws and procedures (Alvarez and Hall 2006) and some not being able to comprehend instructions (Douglas 2015). Nevertheless, particular moments of the electoral process demand a “nearly flawless peak-capacity performance” (Alvarez and Hall 2008, 830) from the election administrators and poll workers, which is difficult to achieve in such settings.

The abovementioned aspects of electoral law implementation require additional resources from election administration, which is frequently underbudgeted and overtasked (Hale and Slaton 2008; Kimball and Kropf 2006). Electoral activities demand the involvement of election administrators at the maximum capacity, which leaves limited resources for dealing with complicated electoral laws: “as election administration becomes increasingly complex, clerks may believe that they spend more energy complying with the requirements than actually helping citizens vote” (Burden et al. 2012, 743).

Training could potentially help increase comprehensibility of electoral laws and make law implementation more consistent. Training is also a way to address principal-agent problems in elections (Alvarez and Hall 2006). Nevertheless, recent research established in the case of the U.S. shows that the way training is organized now does not bring uniformity in law implementation (Burden and Milyo 2015). To the contrary, training results in a “wide variation in their [poll workers] level of understanding of basic election laws and procedures” (Alvarez and Hall 2006, 497), with poll

workers finding training to be “difficult to understand” (Burden and Milyo 2015, 45). Furthermore, while this article operates mainly with two terms—election administrators and poll workers—the reality is more complex: terms for election personnel vary, and each of them can stand for an elected, permanently or part-time employed, or volunteer workforce. This can affect the training environment and subsequently the training outcomes.

Among possible improvements, poll workers suggest that they be provided with handouts/reference materials after a training. Another considered solution to address some aspects of the abovementioned problem is the development of standard operating procedures (Alvarez and Hall 2008; Alvarez, Hall, and Atkeson 2009; Brown and Hale 2020; Kropf, Vercellotti, and Kimball 2013) derived from electoral laws, in order to maintain “a minimum level of consistency” (Alvarez and Hall 2008, 830) in administering elections. Even though election administration in the U.S. has become ever more professionalized, and training has improved over time, there is still a need for training, expressed by both academics (Brown and Hale 2020; Kropf et al. 2020) and practitioners (Adona et al. 2019; McCormick 2020).

Institutional memory might also help in implementing laws with consistency. However, poll workers might have difficulties with accumulating considerable institutional memory. First of all, poll workers are not permanently engaged in these roles (Burden and Milyo 2015; James 2019). This results in high staff turnover. Therefore, there is a need for a tool that would allow new staff to learn quickly how to deliver elections, and who is responsible for what. Second, even experienced poll workers have few chances to “develop a shared set of organizational norms to ensure consistent running of elections” (Suttman-Lea 2020, 2), or “retain their knowledge of election law and procedure from election to election” due to “the infrequent nature of elections” (Atkeson et al. 2014, 948). Third, even in the cases when all poll workers are well trained, situations of emergent replacement may arise, ranging from pandemics (Krimmer, Duenas-Cid, and Krivonosova 2020a) to national disasters (Stein 2015) to negligence² (OSCE/ODIHR 2018).

²In every fourth polling station in Italy, some polling station members did not show up and were replaced by volunteers.

These situations also require a tool for quick learning or at least understanding of the electoral procedures, derived from the electoral law.

We accept that in some environments poll workers do not work directly with the electoral law. They rather receive abbreviated instructions developed for them by a higher level of the election administration. However, in such instances, instructions cover solely responsibilities of a considered actor. As a result, the actors know only their own responsibilities: the instructions provide no vision of the overall election management. Given that the scope of the actors involved in election delivery is growing (Garnett and James 2020), the need for understanding what the other actors' activities and responsibilities are will be increasing.

Academics as well as practitioners emphasize the importance of providing poll workers with visual aids to assist them on the Election Day (AIGA Design for Democracy and Election Assistance Commission 2016; Election Assistance Commission 2016). Visual aids could simplify information, convey the meaning graphically, and serve as a precise summary or a reminder which could be used on Election Day. Training for poll workers frequently spreads the message that there is no need to memorize everything. Nevertheless, on Election Day, under significant time constraints, poll workers could find it more feasible to use a one-page diagram, rather than searching through lengthy handouts (Douglas 2015). Guides which are used nowadays by states and counties of the U.S. are considered to be "virtually unusable on Election Day" (Douglas 2015, 367) because of their length and complexity. The same applies to the checklists (Douglas 2015). The post-election audits in the U.S. confirmed that very detailed, but not user-friendly, guides were one of the reasons why some voters were disenfranchised by mistake (City Commissioner's Office 2013). An overview of national practices in the U.S. also claims that guides in the current form are ineffective and not sufficient to prevent poll workers' mistakes, and that poll workers "have little training and few resources to help them when issues arise," while "the right tools" would make mistakes avoidable (Douglas 2015, 354). That being said, the demand for other instruments is well articulated.

However, visual aids are always considered as supporting materials to those already used (e.g., handbooks, checklists), not as a substitution. Among the variety of visual aids, diagrams and

flow charts are favored (Election Assistance Commission 2016).³ In comparison to checklists or handouts, mostly designed for internal use, visual aids such as diagrams could be printed out and displayed as posters at the polling station for the benefit of all participants in the electoral process. This could boost confidence in the electoral process on the part of both election administrators and voters. Furthermore, diagrams are not only used for Election Day activities, but have been also applied to election audits (Alvarez, Hall, and Atkeson 2009).

Models, diagrams, and legislation

In general, public administration activities are more regulated than those of the private sector, with most of them being fixed in legal documents (Olbrich and Simon 2008). Therefore, the link between the law and processes is perhaps most evident in the field of public administration. Election administration, being a part of public administration, follows suit. First of all, it is heavily regulated at the subnational, national, and international levels (Venice Commission 2002). In addition, international organizations, such as the Organization for Security and Co-operation in Europe Office for Democratic Institutions and Human Rights (OSCE/ODIHR) and the Venice Commission, frequently assess national electoral laws and provide recommendations on how they could be improved.

Nevertheless, legislation is frequently written in a way so that sections constantly refer to other sections and subsections, without explicitly repeating the content. When implementing a piece of legislation, an actor might not know which subsections are relevant to a particular practical question, thus, "the reader has to work through all the text" (Smith and Schwarz 1987, 981). One of the available instruments to address this issue is diagrams. A diagram could help "to lead the user through relevant parts of the legislation only" (Smith and Schwarz 1987, 981). Diagrams could be also used to help new employees to understand their job, to "provide a document which would act as a reference when resolving difficult cases," and to "highlight ambiguities and impracticabilities" in the legislation (Smith and Schwarz 1987, 987).

³With some recent innovations like picture guides (see, e.g., St Louis City Board of Elections' developments). https://www.eac.gov/sites/default/files/document_library/files/Election-Day-Picture-Guide-sample.pdf

Process modelling brings together diagrams and processes. When considering what the difference is between models and diagrams, in short, a model is “a graphical presentation of a process, function or system” (Van der Waldt 2013), which could take the form of a diagram, but not exclusively: “a model simply enables the reader to visually register and comprehend all the variables and relationships among them” (Van der Waldt 2013). It is particularly good in dealing with complexities, and if implemented correctly serves as a “communication base” for all involved actors (Becker, Rosemann, and von Uthmann 2000, 31).

Comparative studies of electoral laws usually use content analysis (Blais, Massicotte, and Yoshinaka 2001). However, in the field of e-government, law modelling and analysis have been widely used, giving rise to the research field of legal informatics (Ciaghi, Weldemariam, and Villafiorita 2011), legal visualization, and visual laws (Boehme-Neßler 2011a, 2011b). Still, this modelling of laws and procedures is not necessarily conducted in favor of public administration (Ciaghi, Weldemariam, and Villafiorita 2011). Olbrich and Simon (2008, 43) present an overview of approaches to “visualizing legally-defined processes,” bringing evidence that laws have been illustrated since medieval times. One approach to law modelling they present is the translation of paragraphs of a law into process models. Such an approach follows the narrative of the law and builds models on a paragraph-by-paragraph/article-by-article basis. Nevertheless, such an approach might not allow following the sequence of processes from the beginning to the end, as the very same process might be mentioned in different parts of the law. Another strand of literature answers the question “how one derives requirements from a law?” (Siena et al. 2008, 1). A large share of this research field covers the production of software specifications from laws (Gorín, Mera, and Schapachnik 2010).

Business process model and notation

There are many ways of creating process models. Among the variety of modelling languages, we focus on Business Process Model and Notation, because it is considered as a “de facto standard for process modelling” (Walser and Schaffroth 2010, 4). The main difference between BPMN and diagrams is that BPMN is a standardized and widely adopted language, unlike diagrams, which are specific to the au-

thors who produced them, meaning that different authors could depict the same processes with diagrams differently. Each element of BPMN has a defined meaning, clear to anyone who is familiar with the language. Diagrams are the drawing tools, while BPMN is the modeling tool. BPMN is also better in capturing complexities and being able to depict more complex processes in a precise manner.

The common language is of particular importance for contemporary election administration. In countries with decentralized election administration, there is a clearly articulated need for the common language: “at the core, election officials across the country want to do things well and follow the same general blueprint of how to get there,” as well as to “have a common understanding of how things work” (Hubler and Patrick 2020, 155).

BPMN is a standard developed by the Object Management Group to provide a notation that can be understood by all business users and that can bridge “the gap between the business process design and process implementation” (OMG 2011). BPMN was created by the consolidation of the best practices from other different notations into a single standard notation for the purpose of communicating process information in a simple way to a wide range of stakeholders (OMG 2011). It helps to show tasks/activities/responsibilities illustratively and linked, in time and between stakeholders. BPMN has the advantage of representing any organizational process through a dynamic lens, while being easy to comprehend by any reader and widely accepted in academia (Geiger et al. 2018; Mili et al. 2010).

BPMN has been applied to the field of e-government (for quality improvement of e-government services) (Corradini et al. 2011), public administration (for standardization and staff training) (Walser and Schaffroth 2010), and election observation (for attributing each activity to a particular actor and, based on that, for identifying overburdened actors, overlapping activities, and for attributing costs for every activity, by calculating the cost efficiencies of various ways of voting) (Krimmer et al. 2018; Serrano-Iova 2019). Walser and Schaffroth (2010) refer to the successful example of BPMN usage by the Federal Department of Foreign Affairs of Switzerland for training frequently changing staff. The Australian Department of Finance and Administration used BPM to model a parliamentary workflow which simplified staff

communication (Villanova University 2020). The U.S. Department of Defense has been using BPMNs for improving processes and use of data for at least a decade (zur Muehlen, Wisnosky, and Kindrick 2010). BPMNs are extensively used in health care in order to create an “understandable graphical model, where management and improvements are more easily implemented by health professionals” (Rojo et al. 2008, 1). Electoral process modelling has been on the agenda of election administrators in the U.S. since 2013 (Hubler and Patrick 2020), in order to create “a visualization of a complex system that functions as a sort of road map for the who, when, and how of election administration” (Hubler and Patrick 2020, 156), and a learning tool.

Ciaghi et al. (2011) and Ciaghi and Villafiorita (2012) conduct law modelling with the help of BPMNs. They use BPMNs for “the visualization and formalization of business processes” (Ciaghi, Weldemariam, and Villafiorita 2011, 29). They differentiate two steps of research: (1) modelling procedures, and (2) analyzing procedures (based on the models). In Ciaghi et al. (2011), they conduct only law modelling, leaving the analysis for further research. In any modelling language, the mark-up of laws is usually conducted manually; hence, it is resource intensive. Nevertheless, the contemporary approaches to law modelling allow automatization of at least some steps in this process (Ciaghi, Weldemariam, and Villafiorita 2011), although it should be applied with care, given that laws frequently allow multiple interpretations.

Finally, a variety of free software is available for the development of BPMNs, thus making this tool accessible for wider populations and contexts. This means that in BPMN a reader finds all in one: a language, a method, a technique, and software for process modelling. For these reasons, we believe BPMN deserves to be tested as a solution for the outlined problems. At the same time, we are not advocating for a particular modelling language.

Table 1 summarizes the aforementioned aspects of the problem. The objectives of the proposed solution aim to resolve these issues.

METHODOLOGY

The aim of this research is to address a very particular administrative challenge in the field of election administration, by creating an artifact or a new

practice (Romme and Meijer 2020) that could solve (at least some aspects of) the problem. For this purpose, this research follows the design science research strategy which brings rigor and generalizability to the research (Fedorowicz and Dias 2010) by allowing to “explore and demonstrate the possibilities of new artifacts” (Goldkuhl 2016, 445). So far, there are only a few examples of the design science in the field of election administration (Kasse, Moya, and Balunywa 2013), but it has been widely recognized in a broader field of public administration (Barzelay and Thompson 2010; Romme and Meijer 2020).

This article follows the steps of the design science process developed by Peffers et al. (2007):

- theory-informed problem identification and definition of the objectives for a solution,
- design and development of a solution,
- demonstration of a solution in some setting,
- evaluation of a solution, and communication of results.

Problem identification focuses on operational and institutional aspects of election administration. The demonstration is performed on a case which serves as a validation example of the proposed solution (Goldkuhl 2016). For a case, we chose a holistic (with a single unit of analysis) extreme/unusual case (Yin 2017), to serve as a proof of concept. For a case study, we focus on the Estonian electoral law. The main reason for choosing Estonia as a case was the complexity of the electoral context, yet simplicity in the presentation of the electoral law. This dichotomy makes Estonia an unusual case:

- Estonia provides to all eligible voters multiple voting channels. Many of them are provided simultaneously, at various locations. This increases the complexity of elections and the risks for double voting (Krimmer et al. 2018).
- Estonia has multiple stakeholders, both public and private, involved in the delivery of elections (Krivonosova 2019).
- Estonia has a 15-year record of using new voting technologies, in particular Internet voting (Krivonosova et al. 2019; Serrano-Iova 2019; Vassil et al. 2016; Vinkel and Krimmer 2017).

Moreover, the Estonian electoral law and its most recent updates are publicly available. The latest

TABLE 1. THE PROBLEM AND THE SOLUTION'S OBJECTIVES

<i>Aspect of the problem</i>	<i>Objective</i>
Complexity of electoral laws and frequent changes	The solution will not be able to decrease the complexity of electoral laws or changes to it, but it will allow local election officials to deal with this complexity with fewer resources.
Lack of time of local election officials to deal with complicated cases during Election Day(s)	Unlike lengthy handouts, the solution leads the user “through relevant parts of the legislation only” (Smith and Schwarz 1987, 981), could be depicted in one-page format and be displayed for the common use.
Local election officials might interpret electoral laws with subjectivity and/or partisan interests in mind, which results in voters not being treated equally	The solution will aim at unifying interpretation by providing clear and easy to comprehend instructions, thus, limiting the ability of local election officials to interpret electoral laws, but not eliminating discretion. However, the solution also provides opportunities for oversight (by voters, election observers, and others), which could result in a more consistent implementation of the electoral laws.
Non-efficiency of poll workers’ training and lack of institutional memory in election administration	The solution will allow new staff to learn quickly how elections are delivered and who is responsible for what, especially in the situations of emergent replacement. The solution can help to provide poll workers with more uniform training. The solution will help to “develop a shared set of organizational norms” (Suttman-Lea 2020, 2) and “retain [...] knowledge of election law and procedure from election to election” (Atkeson et al. 2014, 948).
Need for visual aids for poll workers to assist them on the Election Day. Such visual aids should: <ul style="list-style-type: none"> • simplify information • convey the meaning graphically • serve as a precise summary or a reminder which could be used on the Election Day 	The proposed solution: <ul style="list-style-type: none"> • substantially simplifies organizational processes (Walser and Schaffroth 2010); • conveys the meaning graphically: “a model simply enables the reader to visually register and comprehend all the variables and relationships among them.” (Van der Waldt 2013) • leads the user “through relevant parts of the legislation only” (Smith and Schwarz 1987, 981) • serves as “a document which would act as a reference when resolving difficult cases” (Smith and Schwarz 1987, 987) and “communication base” for <i>all</i> involved actors (Becker, Rosemann, and von Uthmann 2000, 31) • deals particularly with complexities • is scalable (smaller jurisdictions with less capacity can utilize and build on BPMNs created by bigger jurisdictions)
Current aids for poll workers are: <ul style="list-style-type: none"> • lengthy • complex • not user-friendly • “virtually unusable on Election Day” (Douglas 2015, 367) because of their length and complexity. 	Unlike checklists or handouts, mostly designed for internal use, the visual aids such as diagrams could be printed out and displayed as posters at the polling station for all participants in the electoral process. This could boost confidence in the electoral process of both, election administrators and voters. The solution could also be applied for (post-) election audits.

version of the law presents all the amendments and changes, thus eliminating the need to navigate among older versions to discover what is still valid. Furthermore, the state itself provides the official translation of the law into English.

This article focuses on the most recent elections, the 2019 parliamentary elections in Estonia. The time frame covers the election- and post-election periods of the electoral cycle (Krimmer, Triessnig, and Volkamer 2007). Following the approach of Goldkuhl (2016), the analysis builds on a detailed legal analysis, and the researchers’ previous study and experience of work procedures and principles in the field of election administration. The primary source of the data for the modelling is the Riigikogu Elec-

tion Act (Riigikogu Election Act 2019). Additionally, we complemented it by on-site observations of the electoral law implementation and interviews with the electoral stakeholders, conducted in groups of at least two people from the Cost of Democratic Elections research project. The article illustrates both steps of visualization (Ciaghi, Weldemariam, and Villafiorita 2011), modelling and analysis. The mark-up of laws is conducted manually, independently by each author of the article.

The limitations of this research lie in the narrative existing in the field of public administration regarding the application of private sector approaches to public administration research. According to this discourse, business approaches might not be fully

applicable to the field of public administration (Lips 2019), due to some “fundamental differences between public administration and private/commercial organizations” (Goldkuhl 2016, 447). However, BPMN has been proven to be applicable to different fields of public administration (as presented in the previous section), including election administration (Krimmer, Duenas-Cid, and Krivonosova 2020b; Serrano-Iova 2019) and immigration law modeling (Ciaghi, Weldemariam, and Villafiorita 2011). Furthermore, the studies on election administration favor solutions derived from the private sector (Douglas 2015), because they are politically neutral and do not require reform. Combined with the low resource-intensity of this solution, BPMN as a tool can be implemented at the polling sites immediately, thus demonstrating the intrinsic value of this solution. The limitations of the proposed approach lie in the extent to which it limits the discretion of poll workers: even the most comprehensible instructions might not convince poll workers to follow them. Previous research (Atkeson et al. 2014; Suttman-Lea 2020) established that poll workers’ beliefs and perceptions of fairness might more accurately explain variations in policy implementation. Another limitation relates to using the English translation of the law (even though the official one) which means we might be missing some (cognitive-) linguistic dimensions (Goldkuhl 2016).

DESIGN OF THE SOLUTION

Step 1

The analysis starts with the *identification of the relevant legislation(s)*. A thorough reading is necessary. The initial reading will permit the identification of articles that describe processes and activities, and the actors involved in the mentioned activities. It will allow classification of each article as either irrelevant or relevant for the modelling. This way of classifying articles is not final, and the modeler might consider an irrelevant article relevant (or vice versa) depending on the scope of the modelling. Nevertheless, not reducing at all the number of articles to be modelled will lead to a situation probably encountered by Krimmer et al. (2018), where individual articles of the then Municipal Council Election Act or MCEA (Municipal Council Election Act 2017) were modelled with BPMN.

The example provided by Krimmer et al. (2018), and identified as the activity “Ascertaining voting results in a Voting District Committee,” corresponds in its entirety to article § 54 of the MCEA (Municipal Council Election Act 2017). The model is quite detailed in some aspects, but less in others, and quite complex as it does not follow the BPMN guidelines. This was a model for a single individual activity, while Krimmer et al. (2018) state that “31 processes with 177 activities” were identified in the almost 85 articles of the MCEA (Municipal Council Election Act 2017). Among those, they selected “four major processes” consisting “of different sets of activities depending on voting channel and voting location” (Krimmer et al. 2018, 123). The selected 37 activity models (“22 activities for I-voting, 8 activities for early and advance voting, and 7 activities for election day voting” (Krimmer et al. 2018, 123) were individually created in order to apply an accounting approach to assist in the calculation of electoral costs. This level of detail is not necessary for electoral administrators attempting to understand the sequence and responsibility of processes for an election. As such, it is recommended to identify the relevant articles necessary for the scope of the modelling.

Step 2

The next step concerns *recognizing the different voting channels* available in the elections. Voting can occur remotely or in the polling stations, before or during the Election Day, and on a paper or electronic ballot. The specific combination of these components gives rise to the different voting channels available to cast a vote. For example, Internet voting refers to casting an electronic ballot remotely before the Election Day, while postal voting is a similar endeavor with a paper ballot, and advance voting happens on paper ballots at the polling stations before the Election Day. We strongly suggest that whatever the scope of the modelling is, to model according to the various voting channels, because it will help illustrate the process, events, and actors in a manner that can take advantage of the inherent sequence and conditional flows of BPMN and its other elements. Modelling per voting channel also allows the identification of the shared activities for all channels. For example, printing of ballot papers is usually centrally organized, and only then distributed to every paper-based voting

channel. Therefore, this activity happens only once per elections, however, it concerns every paper-based voting channel.

Step 3

Once the voting channels have been identified, and those desired to be modelled chosen, *the various actors and processes they perform need to be assigned to them*. Some voting channels, like those for advance, early, and postal voting, are much more focused on local election administration than others (i.e., Internet voting). Internet voting is generally managed more centrally, at a higher operational level, and might even involve the national electoral bodies. In the other cases, many of the activities and responsibilities are managed at the local level of election administration.

Taking the example of modelling one voting channel, swim lanes can be used to distinguish each relevant actor. A pool would be used to represent an election management body, team, or actor, and lanes could illustrate specific responsibilities of exceptional individuals (such as the head of a polling station that must sign an affidavit or a final report), as presented in note 1 in Figure 1.

Step 4

Once assigned, *the correct sequence of processes must be established, and they must be connected to one another*. Since electoral process management is a multi-actor endeavor, the processes of a single voting channel may involve more than one electoral administrator. This is why it is of particular importance to model carefully with the help of the electoral law. For example, at the local level a large number of activities and checks must be performed in a specific sequence. There are also multiple conditions to verify the eligibility of voters. All of these activities should be attributed to the correct actors and in the correct sequence, both legislatively and logically. For example, voter eligibility checks should occur before handing the ballot to the voter but after setting up the polling station. Additionally, and as previously mentioned, there are shared activities that are homogeneous in most or all voting channels. These must be added to the BPMN in an accurate manner that reflects what is written in the law.

All activities are illustrated as rounded rectangles. There are some activities, named sub-processes

in BPMN nomenclature, that might contain a complex net of sub-activities. They can be illustrated as collapsed rounded rectangles with a “plus sign” (like in Figure 1). When the plus sign is clicked on, the rectangles will expand (like in Figure 2). When expanded they will add a greater level of detail and will contain other activities, events, and connections between them. The level of detail of the model should be established by taking into consideration the capacities of the user and the creator of the model. By having the option to show or hide some of the activities, the same model can be used at both the local and higher electoral administration levels. The activities will be connected by a solid line with an arrowhead, which shows in which order the activities are performed.

Events are situations that happen anywhere in the process, and can also be used as the starting point of a process or sub-process. The Timer, Condition, and Message Events relate to a specific time, condition, or message/item, respectively, that must be fulfilled in order for the process to start or continue. The Timer Start Event can be used when there is a time precondition in the law for a certain activity, e.g., a specific date and/or time for starting advance voting (see note 1 in Figure 1). The Message Start Event describes the receipt of an item in order to start a process, e.g., receiving the voter’s ID in order to check a voter’s eligibility, or receiving the materials to prepare the polling place (see note 1 in Figure 2). The Conditional Start Event can be used for any other precondition that might need to be fulfilled in order to initiate a process. The events can also occur during the process, and the diagrams are a bit different, depending if the actor needs to receive or send (“catch”/receive or “throw”/send) something (see note 5 in Figure 1).

Gateways are used to indicate paths that either merge or fork depending on conditions. There are Exclusive, Parallel, and Event-Based Gateways. The Exclusive Gateway can be used when there is a *decision* to be made by the actor (see note 3 in Figure 1). The Parallel one can be used when the actor must accomplish different activities that themselves are not in a sequence, as described by the law (see note 2 in Figure 2). The Event-Based Gateway is an Exclusive Gateway but the precondition is an event, not a choice nor decision (like in the Exclusive Gateway).

Consistently following the naming conventions mentioned above will guarantee the comparability

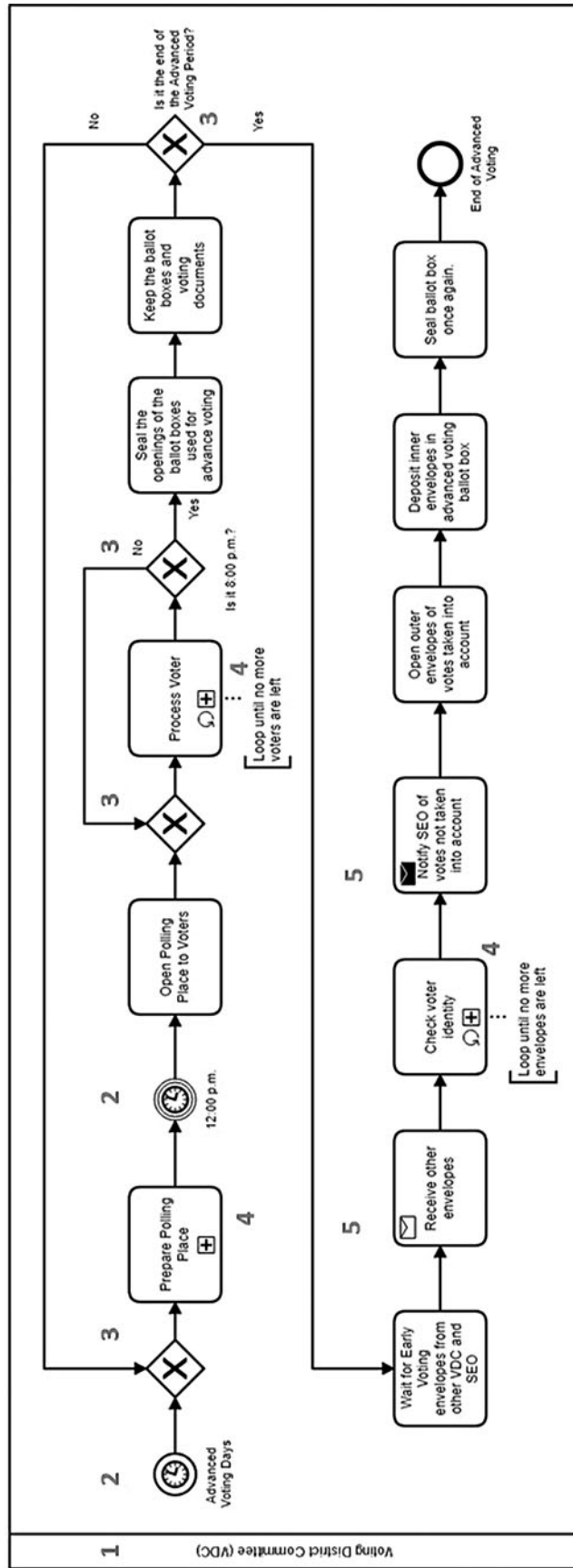


FIG. 1. BPMN of the advanced voting delivery in the 2019 Parliamentary elections in Estonia. (1) The “pool” or exterior rectangle presents the whole process, which is attributed to the actor performing the modelled activities and sub-processes. (2) The “clock” sign illustrates when an activity depends on a specific time/deadline. The first clock starts the whole process, while the second one requires the time to be 12:00 p.m. before proceeding further. The reading for this model is following: the process starts only on advanced voting days, and the polling places open at 12:00 p.m. (3) The “cross” sign illustrates gateways in the model; either they indicate the points at which recurring activities are starting over, or where a decision must be taken (yes-no questions in this model) in order to proceed. (4) The “plus” sign illustrates a sub-process (i.e., the activity has sub-activities). In the application format, by clicking at this button, a list of sub-activities emerges. The model could be printed with or without displaying sub-activities. (5) The “envelope” sign demonstrates that the activities are dependent on receiving (white envelope) or sending (black envelope) physical artifacts. In this model, the envelopes are received and a physical notification (e.g., letter, e-mail, message, etc.) must be sent to the State Electoral Office (SEO).

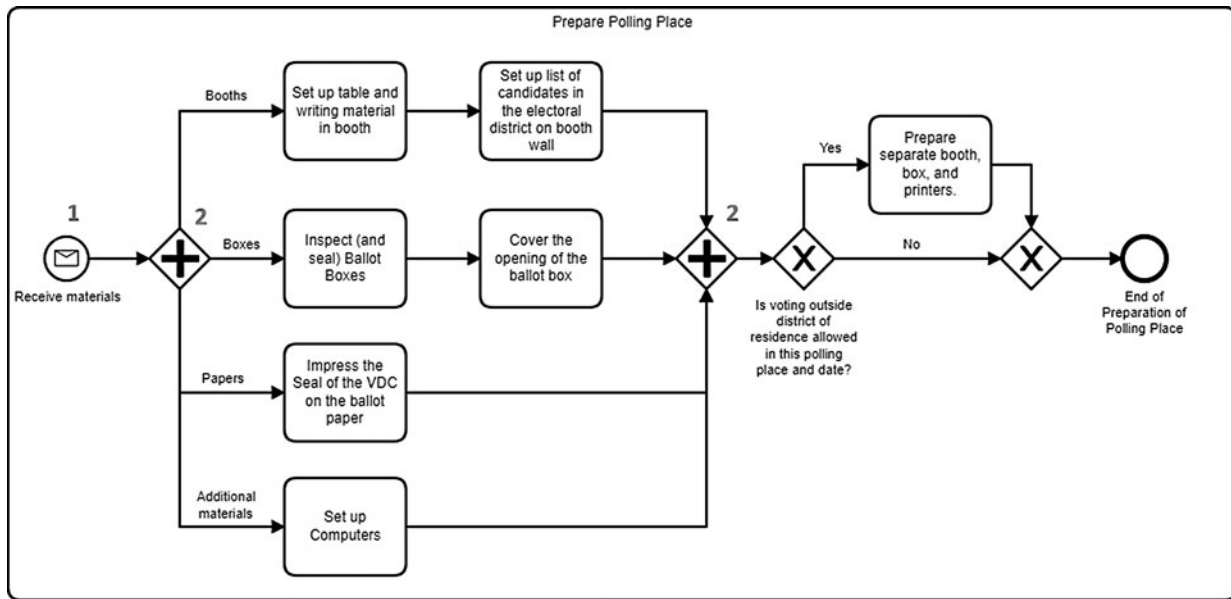


FIG. 2. Expanded sub-process “Prepare the Polling Place.” (1) The “envelope” sign at the beginning illustrates when an activity depends on the reception of a specific message or item. In this model, preparing the polling place can only start after the materials have been received. (2) The “plus” diamond sign illustrates parallel gateways in the model; they indicate the starting and ending points where multiple activities should be undertaken in parallel. In order to proceed, all the parallel activities must be completed.

of models, which is one of the determinants of the quality of models (Becker, Rosemann, and von Uthmann 2000).

Step 5

Once the model is complete, *a review is necessary* to make sure that no process, component, actor, or relationship has been omitted. It is highly recommended to review the model from start to finish, with and without the law to see if something has been omitted or if something does not seem correct or logical. If, after consulting with the relevant legislation, there seem to be some incongruities, we recommend a final step.

Step 6

In the case that there are issues when modelling, lack of clarity in the electoral law, or just questions regarding to the process, *it can be complemented with observations and interviews with electoral management bodies (EMBs)*. This step could also serve as a check of the semantic correctness of a model, which “postulates that the structure and the behavior of the model is consistent with the real world” (Becker, Rosemann, and von Uthmann 2000, 32).

DEMONSTRATION: MODEL OF ADVANCE VOTING DELIVERY IN THE 2019 PARLIAMENTARY ELECTIONS IN ESTONIA

Distinct legislation regulates different levels of elections in Estonia: the Riigikogu Election Act 2019, or the Municipal Council Election Act 2019, or the European Parliament Election Act 2020, depending on the type of election being conducted, the national, local, or European Parliament elections, respectively. Even the eligibility of voters depends on the level of elections: those who are eligible to vote in local elections might not be eligible to vote in parliamentary elections. The legislation also differ in scope and designation of electoral administrators; however, most activities and processes remain similar. Besides, for every election, the central election administration prepares a handbook for poll workers. In the 2019 parliamentary elections, this handbook consisted of three parts: instructions regarding procedures at the polling station, the electoral law, and the form with checkboxes, with instructions prevailing. These instructions concerned solely the responsibility of poll workers, while the law mentions responsibilities of multiple actors. Still, the translation of the law into instructions takes more space

than the law itself. Besides the handbook, poll workers in Estonia are provided training, either in person or in a digital environment.

Step 1: Identifying articles that explicitly refer to an actor involved in the management of elections and a process

The articles, irrelevant for the modelling, will be ones that describe the bases of the election system (Municipal Council Election Act 2019, para. 1; Riigikogu Election Act 2019, para. 1), specify the characteristics of individuals who are allowed to vote or participate as candidates (Municipal Council Election Act 2019, para. 5; Riigikogu Election Act 2019, para. 4), or state the competences of the electoral management bodies (Municipal Council Election Act 2019, paras. 12, 19; Riigikogu Election Act 2019, paras. 9, 15), among many others. These descriptive articles only indicate overarching characteristics of processes, rights, and obligations of individuals. These abstract concepts will not be modelled because they do not pertain to the concrete activities we are attempting to visualize.

As an example of the relevant articles, we have ones that describe the preparation for electronic voting (Riigikogu Election Act 2019, para. 48), the procedure for voting on a paper ballot (Municipal Council Election Act 2019, para. 45; Riigikogu Election Act 2019, para. 39), or ascertaining the voting results from different voting methods (Municipal Council Election Act 2019, paras. 54–55; Riigikogu Election Act 2019, paras. 57–60). These articles present a sequence of events, and/or the actors, thus concretely describing processes that must be undertaken during the elections.

Step 2: Identifying the corresponding voting channels

In the 2019 parliamentary elections in Estonia, voters could cast a vote through eight voting channels (see the Table 2). *Postal voting* was available to voters residing abroad, upon a written application submitted to the Estonian foreign mission in the country of a voter's habitual residence. The deadlines for submitting an application and returning a ballot paper were established individually by every foreign mission. *Voting in the diplomatic missions* was organized for at least two days from the 15th to the 10th day before the Election Day. *Internet voting* was available to voters on a 24-hour basis from the 10th to the 4th day be-

TABLE 2. VOTING CHANNELS IN THE 2019 PARLIAMENTARY ELECTIONS IN ESTONIA

<i>NN</i>	<i>Voting channel</i>
1	Postal voting
2	Voting in the diplomatic missions
3	Internet voting
4	Early voting in county centers
5	Advance voting in county centers
6	Advance voting in ordinary polling stations
7	Election Day voting
8	Home voting

fore the Election Day. *Early voting in county⁴ centers* means that the voting happened from the 10th to the 7th day before the Election Day in the designated polling stations where voters could vote irrespective of their residence. In 2019, most of such centers were located in supermarkets. *Advance voting* was organized at every polling station (county centers and ordinary Voting District Committees—VDCs), from the sixth to the fourth day before the Election Day. *Election Day voting* was available for 11 hours on Election Day at every polling station. *Home voting* happened on Election Day, on request by a voter, meaning that a part of the VDC took a mobile ballot box and the required voting materials and visited the voter at the voter's location. For the demonstration, we chose to illustrate advance voting at the polling station, due to the various local-level activities that must be undertaken, thus, active involvement of poll workers.

To demonstrate the concept of an activity shared by some voting channels, we consider the activity of processing the votes cast in advance. The paper ballots cast in advance of Election Day are centralized, sorted, and sent to the corresponding voting district at which a voter is registered. This activity would be shared for postal voting, voting in diplomatic missions, early, and advance voting.

Step 3: Assigning actors and processes they perform (see Step 1) to identified voting channels (see Step 2)

At the local level, the electoral management body is the VDC. Therefore, the model will have only one pool (as illustrated in Figure 1). The VDC has at least five members: the municipal council appoints

⁴A county is an administrative unit of Estonia. By law, every county should provide to voters at least one county center.

the chairperson and one half of the members, political parties appoint the other half. Therefore, election administrators in Estonia might be partisan.

Advance voting requires the VDCs to perform the following processes. The processes are presented in the sequence that they are mentioned in the electoral law (Riigikogu Election Act 2019):

- prepare polling place (Riigikogu Election Act 2019, paras. 34–37);
- seal the openings of the ballot boxes used for advance voting after the close of voting (Riigikogu Election Act 2019, para. 36);
- open polling place to voters (Riigikogu Election Act 2019, paras. 38–40);
- process voters (Riigikogu Election Act 2019, paras. 39–40);
- check voter identity (Riigikogu Election Act 2019, paras. 39–40);
- keep the ballot boxes and voting documents (Riigikogu Election Act 2019, para. 40);
- receive early voting envelopes from other VDCs and State Electoral Office (SEO) (Riigikogu Election Act 2019, para. 48);
- notify SEO of votes not taken into account (Riigikogu Election Act 2019, para. 48);
- open outer envelopes of votes taken into account (Riigikogu Election Act 2019, para. 48);
- deposit inner envelopes in advance voting ballot boxes (Riigikogu Election Act 2019, para. 48);
- seal ballot box once again (Riigikogu Election Act 2019, para. 48).

This sequence does not necessarily follow the logically correct sequence of the processes: for instance, the law mentions the process of sealing the openings of the ballot boxes before the process of opening the polling place and other processes happening during the voting. This emphasizes the importance of the BPMNs in easing the establishment of the correct sequence of electoral processes. Some of the mentioned activities also have sub-processes. Step 4 further analyzes them.

Step 4: Organizing the processes, within each identified voting channel, in the correct sequence, and connecting them to the corresponding actors with the correct relationship

Figure 1 illustrates a collapsed model of advance voting organized by the VDC. It initiates with a

Timer Start Event because advance voting can only happen during specific dates. The Timer Start Event indicates that this process will only start when the Advanced Voting Day has been reached. A gateway is positioned next to catch the loop that will be explained further. Figure 1 has been streamlined, collapsing the expanded sub-processes, in order to better visualize the bigger picture. Thus, the Timer Start Event is followed by a collapsed sub-process “Prepare Polling Place.”

Figure 2 illustrates the sub-process “Prepare the Polling Place” as an expanded sub-process in order to demonstrate what happens when they undertake such activity. In order to start preparing the polling place, the VDC must receive the materials to set it up. Then, they must take each of these materials and fulfil some activities. The booths must have a table and writing materials in them, and the list of candidates must be placed on the wall of the booth. The ballot boxes must be inspected and sealed, and their openings further covered to prevent tampering. The ballots must be stamped with the VDC seal. With these activities in parallel accomplished, a choice divergence in the path appears.

The REA (Riigikogu Election Act 2019, para. 41) states that voters may vote outside their district of residence on specific dates in specific polling stations. If this is the case, such polling stations must prepare a separate booth, ballot box, and corresponding materials. Otherwise, nothing else needs to be done. This legal specification has been illustrated by the Exclusive Gateway and the corresponding sequence of activities. After any of the branches is followed, the polling place has been prepared and this sub-process ends. The model will carry onto the next activity.

After the “Prepare the Polling Place” activity, the team must “catch” an intermediate event, i.e., wait until it is 12:00 p.m. in order to “Open the Polling Place to Voters.” As the voters come in, the VDC team processes them (i.e., asking for their ID, verifying that they are eligible to vote at this polling station, handing them the ballot, stamping the ballot, and observing that the voter inserts the ballot correctly in the ballot box). This activity is compressed in Figure 1 in order to make the whole process legible. The activity is looped until there are no more voters. A gateway follows the “Process Voter” activity, and makes sure it continues until 8:00 p.m., which is the closing time of the polling station. At

8:00 p.m. the VDC team will seal the openings of the ballot boxes and keep them safe with the voting lists and documents.

The advanced voting is undertaken for a few days, so if the period has not ended, the process loops back to the beginning (i.e., the first gateway after the Timer Start Event), and the activities are repeated on the next day of the Advanced Voting Period. However, if the period has ended, then the VDC needs to fulfil other activities. They must now wait for the Early Voting Period envelopes from other VDC and, after receiving them, they must process them. The Early Voting Period envelopes contain two main pieces of information: the voter's identity on the (outer) envelope and an additional sealed (inner) envelope with the voter's ballot. The VDC team will check the voter's identity with the voting list, in order to determine if a voter was eligible to cast a vote in this polling station. If yes, the ballot envelope will be taken into account and a notation will be made in the voting list. If no, the ballot envelope will not be taken in account. Afterwards, the VDC team must notify the SEO of the votes that were not taken into account. The voter (outer) envelopes that passed the check will be opened and the (inner) envelopes containing the ballot will be inserted in the advance voting ballot box, after which the box will be sealed once again. After all of these activities, which in total have spanned the duration of a few days, the process of advance voting ends.

Step 5: Reviewing the BPMNs with the law to make sure it has been correctly translated

There are some details that are not specified by the REA (Riigikogu Election Act 2019). The activities illustrated in Figure 2 after the Parallel Gateway (with the exception of the computers) were only mentioned but not sequenced. Thus, when designing the model, it was up to the modeler to add such activities as a linear or parallel sequence of events. Since the activities are related to different kinds of materials, and knowing that the VDC contains more than one single member, the modeling was done in parallel. This reflects the reality that one polling station clerk can set up the booths while another checks and seals the boxes, and so on. Additionally, the described Exclusive Gateway had to be illustrated because the selec-

tion of which polling stations would be accepting voters coming from other electoral districts is done closer to the electoral dates and through another mechanism, not the REA (Riigikogu Election Act 2019).

Step 6: Complementing with observations and interviews where necessary or if doubts persist

Finally, the model was prepared, and on-site observations were conducted to improve it. The REA (Riigikogu Election Act 2019) does not say anything about computers or printers. However, through our observations of and interviews with VDC clerks we realized that they actually need to set up such devices and make sure that they are operational (i.e., a power and Wi-Fi source must be available to them). As such, we have decided to include such activity in the model, even though it is not explicitly mentioned in the REA (Riigikogu Election Act 2019).

DISCUSSION

The proposed approach allows translating the complexity of the electoral law into clear graphical instructions for poll workers, distilling the message spread through the multiple pages of the dense text of an electoral law into one model. Our demonstration shows how the electoral law of Estonia could be translated into one model with clear instructions. As a starting point, we had the Riigikogu Election Act (Riigikogu Election Act 2019), comprising 86 articles, covering all activities of the electoral cycle from campaigning to complaining, for all available voting channels, for all involved actors. We distilled this electoral law into one model of how one particular voting channel, advance voting, should be delivered.

The model differentiates activities by the actors performing them, thus, condensing the message even further: poll workers could see the whole picture about which other actors are responsible for advance voting implementation, but they also could concentrate only on their own responsibilities. This allows using the model for multiple purposes: for instance, for the training of new staff, a more detailed model, showing all actors and all sub-processes could be used, while for the voting day, a compressed model showing only responsibilities

of a considered actor could instead be used. That could potentially decrease the perceived complexity of the electoral law and help the election administration deal with the electoral law with fewer resources. The model also explicitly shows the pre-conditions for the activities: a specific date and/or time, an item to be received, or any other condition(s) for starting an activity. Whenever applicable, the model asks yes/no questions, in order to navigate a poll worker to which scenario to proceed. This should potentially limit the ability for law interpretation. At the same time, a model does not substitute an electoral law, but serves as an additional means for cognition. Thus, a poll worker could do both: read the text of an electoral law and read a model.

BPMNs might be presented to poll workers in different forms: digital, printed, or even via an application, which might be particularly helpful for the navigation between different scenarios.

CONCLUSION

In this article, we present an artifact showing how BPMN could help to make the electoral law more comprehensible for election administrators and poll workers. BPMNs might be not so easy to create. Nevertheless, as soon as they are modelled, they could be understood and further used by a layperson. The question is who should be responsible for creating those models? Different countries and different contexts could ask for different approaches. If the aim is to decrease the discretion of the election administrators and poll workers, especially over the law interpretation, the delegation of the task of law modelling to a few trained public officials could be favored. However, it should be noted that such approach, besides bringing greater standardization, might result in greater centralization of the election administration.

Based on the argument of Ciaghi et al. (2011, 29), that “a graphical representation of a law can be of great advantage to those who want to understand or analyze it (e.g., citizens or jurists) as well as those who need to implement it,” a side effect of applying BPMNs to electoral laws could be an increased understanding by the wider population of how elections are organized.

Modelling electoral laws might be particularly useful for the following environments:

- decentralized countries, where electoral procedures vary significantly between the territorial units, contributing to the confusion among voters and poll workers;
- supranational and intergovernmental entities, aimed at consolidation of electoral procedures;
- new democracies and after-conflict societies to deliver elections for the first time, or after a significant break. Firstly, the electoral process is still new to all actors involved in delivery. Therefore, they will be even more interested in having support in the form of a visualized model. Secondly, mistakes and problems with election administration in such countries could result in dramatic consequences (Laanela 1999), like electoral violence or return to a non-democratic regime;
- environments where poll workers do not follow the electoral laws consistently, hence, the society might be interested in checking whether every poll worker treats voters equally;
- international election observation missions, which need to guarantee that all election observers that they deploy to a country understand the nation’s electoral processes;
- environments where the electoral processes should be reengineered due to introduction of a technology or a new voting channel, or an adjustment should happen due to some force-majeure reasons. By modelling the laws and analyzing the models, public administrators can see what actors and activities this change will affect. Such models and their analysis could help to build software requirements from the legislation, which might be particularly useful during the procurement and implementation processes;
- environments with understaffed and overtasked election administrations. Such models have potential of organizing staffing more efficiently, by clearly showing what actors are overtasked, or the delivery of which activities overlap.

Further studies might consider conducting experiments in which poll workers will be asked whether they find the benefit in having graphic process models in addition to other instructions. This could be done in three steps. First, by distributing BPMNs of the main electoral processes together with other instructions to the polling stations under the experiment. Second, by surveying poll workers under the

experiment whether they utilized BPMNs on Election Day, in what situations, and whether they see room for improvement. The survey questions should also cover the aspects of a BPMN's user-friendliness and comprehensibility, in order to be able to control if the bad design affects the usability and comprehensibility of the tool. The third step would be to calculate the costs of producing such BPMNs. At the later stage, these costs could be related to the perceived usefulness of BPMNs. The study could also assess the comprehensibility of BPMNs in comparison to electoral laws and other instructions. Here, it is critical to remember that BPMNs are considered as a complementary tool, thus, while the control group will utilize the traditional instructions distributed to poll workers (checklists, diagrams, handouts), the experimental group will receive the same package, plus BPMNs. For assessing comprehensibility, one can develop a list of situations which a poll worker can encounter on Election Day, asking poll workers to describe how they would behave. The results of the two groups will be compared.

If the experiment is conducted under direct observation, researchers can also observe if poll workers refer to BPMNs when trying to find the correct behavioral strategy for each situation, or rather to the laws, handouts, or checklists. Furthermore, the proposed approach could be applied to all types of laws, not only to electoral ones. It will be particularly useful for the laws that mention many actors and processes.

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