

POLICY-RELATED KNOWLEDGE MANAGEMENT IN PARLIAMENTS BASED ON AN EXTENSION OF IBIS FRAMEWORK

Euripides Loukis, Department of Information & Telecommunication Systems, University of the Aegean, Samos, Greece
eloukis@aegean.gr

Yannis Charalabidis, Department of Information & Telecommunication Systems, University of the Aegean, Samos, Greece
yannisx@aegean.gr

Alexandros Xenakis, Department of Information & Telecommunication Systems, University of the Aegean, Samos, Greece
a.xenakis@aegean.gr

Abstract

In Parliaments there are huge amounts of knowledge concerning public policies for addressing social problems and needs, which is however contained in numerous long textual documents (e.g. drafts, laws, justification reports, discussions' minutes, experts' reports), and it cannot be exploited to a good extent. Its full exploitation necessitates an appropriate structured representation of it. In this paper, initially we analysed the legislation formulation process of the Greek Parliament and its main documents from a public policy perspective, focusing on the knowledge they contain on social problems and needs, and on public interventions (e.g. regulations, programmes, services provision, infrastructure building) for addressing them. Based on the conclusions drawn from this analysis we developed a methodology for the codification, representation and management of the policy related knowledge of Parliaments, which is founded on a well established product of CSAV research, the Issue-Based Information Systems (IBIS) framework. A first application of this methodology has been made for the whole set of documents produced for the Law on the 'Contracts of Voluntary Cohabitation' passed by the Greek Parliament. It was then evaluated using both quantitative and qualitative techniques based on the 'Technology Acceptance Model' (TAM). The evaluation concluded that the above representation/codification includes to a good extent the substantial elements of the policy related knowledge contained in the Parliamentary documents, and it is understandable by the users. At the same time it revealed weaknesses that lead us to the development of an extension of the IBIS framework in order to achieve a better representation of this knowledge.

Keywords: *public policy, knowledge management, parliament, issue-based information systems (IBIS), computer-supported arguments visualization (CSAV)*

1 INTRODUCTION

In Parliaments there are huge amounts of knowledge concerning public policies for addressing social problems and needs. It concerns on one hand problems and needs of modern societies that need government intervention (e.g. their particular characteristics, connections between them, main issues posed), and on the other hand possible interventions for addressing them (e.g. regulations, programmes, services provision, infrastructure building) and also advantages and disadvantages of the latter. This knowledge is created during the legislation formulation process through aggregation of knowledge and perspectives of many and diverse actors participating in it, such as Members of Parliament (MPs), Government Agencies, trade unions, professional associations, experts, etc.; so it is extensive, rich, multi-dimensional and multi-perspective, including views from both the state and the society. However, this valuable knowledge is contained in many long textual Parliamentary documents (e.g. drafts, laws, justification reports, discussions' minutes, experts' reports), so it cannot be exploited

to a good extent. The current textual form of this knowledge is not appropriate for performing the four ‘classical’ knowledge creation and exploitation processes proposed by Nonaka (1994): knowledge externalization (= conversion of tacit knowledge into explicit), combination (= combination of different sources of explicit knowledge), internalization (= conversion of explicit knowledge into tacit) and socialization (= transfer of tacit knowledge from one person to another).

Previous research has focused on the legal knowledge that laws contain, dealing mainly with the construction of legal ontologies for the representation of laws from a legal perspective (Hoekstra et al, 2007; Boer et al., 2008; Sartor et al, 2011), which aim at the development of effective legal knowledge management systems to be used by legal experts (as explained in more detail in 2.1). However, the public policy related knowledge that the laws, and also the other Parliamentary documents (e.g. justification reports, minutes discussions’, reports experts) as well, contain has been neglected. This knowledge is highly useful to Government Agencies of various layers: to Ministries, as it can assist them in designing their future policies, and to lower layers of administration (e.g. Regional, Prefectural and Local Administrations), as it can assist them in enforcing the legislation effectively and proposing future improvements of it. Furthermore, it is useful to other Parliaments (e.g. of federal, state or local level, in the same country or even in a different country), in order to formulate their own policies for various social problems and needs. Also, this knowledge is useful to public policy researchers and consultants, as it can enable a deeper analysis and evaluation of previous public policies, and design of better ones for the future. Finally, it is useful for citizens interested in a better understanding of and participation in political debates, and can contribute to a more informed and meaningful public participation (both ‘off-line’ and ‘on-line’) in government policy and decision making, building on and exploiting past experience. Therefore, there are many more interested in the substance of public policies than in their legalistic details.

In general, government agencies have started realizing more and more the value of their knowledge assets, and the need of systematically managing and exploiting them, as a means of formulating better policies addressing social problems and needs, delivering better services to citizens and enterprise and finally achieving higher efficiency and effectiveness (Wiig, 2002; Sourouni et al, 2008). For this purpose it is necessary to use more intensively methodologies from the knowledge management domain (e.g. Nonaka, 1994; Nonaka and Takeuchi, 1995; Cohendet and Steinmueller, 2000; Tiwana, 2002; Nonaka and Peltokorpi, 2006; Dwivedi et al., 2011) with appropriate ICT support. The codification of knowledge has been for long time recognised as a major approach to knowledge management, which is widely used in many knowledge intensive industries (Hansen et al., 1999; Scheepers et al., 2004); in this approach critical knowledge of a firm is codified and stored in databases, where it can be searched, accessed and used by all interested employees.

In this paper is described a methodology for public policy related knowledge management in Parliaments. It is based on the codification and representation of the public policy related knowledge produced in all the stages of legislation formulation process in the Parliaments and stored in the corresponding parliamentary documents, using Computer-Supported Arguments Visualization (CSAV) frameworks methodologies (a brief review of them is provided in 2.2), and in particular the Issue-Based Information Systems (IBIS) framework. The objective of the proposed methodology is to enable an interested user to search and access easily the existing public policy related knowledge in the Parliament on a particular question (e.g. concerning a social problem or need, the main issues it poses, policies for addressing them, advantages and disadvantages of each of them, etc.). Also, a first application of this methodology is described concerning the codification and representation of the policy related knowledge contained in the whole set of documents produced during the discussion of the Law on the ‘Contracts of Voluntary Cohabitation’ passed by the Greek Parliament. This application was evaluated using both quantitative and qualitative techniques based on the well established ‘Technology Acceptance Model’ (TAM) (Davis, 1989; Davis et al., 1989; Venkatesh et al., 2003), and this lead to positive assessments in general, but also to the identification of weaknesses that made it necessary to develop an extension of IBIS framework in order to achieve a better representation of this knowledge. The research presented in this paper has been conducted as part of European projects LEXIS (‘Enabling Participation of the Youth in the Public Debate of Legislation among Parliaments, Citizens and Businesses in the European Union - <http://www.lex-is.eu/>’) and

NOMAD ('Policy Formulation and Validation through non moderated crowdsourcing' - <http://www.nomad-project.eu/>), which were partially funded by e-participation research programs of the European Commission

This paper is organized in 8 sections. In the following section 2 the theoretical background is outlined, while in section 3 the sources of policy related knowledge in the Greek Parliament are identified and analysed. The proposed methodology is presented in section 4, and a pilot application of it is described in section 5. Then in section 6 the evaluation is presented, while in section 7 is described the resulting extension of the IBIS framework. Finally the conclusions are summarized in section 8.

2 BACKGROUND

The 'quality' of the management of the policy related knowledge of Parliaments, and the degree of its exploitation, relies critically on the quality of the codification/representation of this knowledge; this should include all the substantial policy related elements of this knowledge, but not unnecessary details (e.g. legalistic ones). It must therefore be based on sound theoretical foundations, which define what elements this codification/representation should include. For this reason initially we searched the literature in order to find theoretical foundations for conducting the codification/representation of this knowledge; in this direction initially we reviewed the literature on legal ontologies, and then the literature on CSAV.

2.1 Legal Ontologies

Ontologies constitute abstract conceptual models of particular domains, which identify the kinds of entities existing in a particular domain and the kinds of relations among them, being acceptable a group of people dealing with this domain (Fensel, 2004; Visser and Bench-Capon, 1998). According to Uschold and Gruninger (1996), ontologies are of critical importance for knowledge acquisition, representation and exchange. Valente (2005) proposes five main roles of legal ontologies: (a) organize and structure information; (b) reasoning and problem solving; (c) se-mantic indexing and search; (d) semantics integration and interoperation; and (e) understanding the domain.

Previous research has developed many legal ontologies, in order to support mainly the development of effective legal knowledge management systems (to be used by legal experts), and also legal reasoning. McCarty (1989) developed the 'Language for Legal Discourse' in order to be used as a general representation language for legal knowledge; the basic components of this language are 'atomic formulae' (predicate relations used to express factual assertions), 'rules' (connections of atomic formulae with logical connectives) and 'modalities' (time, events, actions and deontic expressions). A formalism for the representation of legal knowledge has been proposed by Stamper (1991, 1996), which includes three main ontological concepts: the 'agents' (organisms who gain knowledge, regulate and modify the world by means of actions), the 'behavioural invariants' (features remaining invariant over some time) and the 'realizations' (agents realise situations, which are denoted by behavioural invariants, by performing actions). Valente (1995) developed a 'Functional Ontology of Law', which distinguishes six types of legal knowledge necessary for legal reasoning: 'normative knowledge' (defining standards of social behaviour), 'world knowledge' (describing the world being regulated), 'responsibility knowledge' (concerning extension or restriction of responsibilities of agents), 'reactive knowledge' (concerning sanctions for actions violating norms), 'meta-legal knowledge' (concerning legal knowledge) and 'creative knowledge' (concerning the creation of previously non-existent legal entities). Van Kralingen (1995) and Visser (1995) dealt with the use of legal ontologies for developing legal knowledge systems and in this direction they developed a legal domain ontology, which consists of i) a 'legal ontology' (with generic components usable in any legal sub-domain); it includes three basic entities: 'norms' (general rules, standards and principles of behaviour that subjects of Law have to comply with), 'acts' (dynamic aspects which effect changes in the state of the world) and 'concept descriptions' (meanings of the concepts found in the domain); and ii) a 'statute-specific ontology' (with components that concern the particular legal sub-domain we are dealing with). Also, in the ESTRELLA Project of the European Union (www.estrellaproject.org) has

been developed the ‘Legal Knowledge Interchange Format’ (LKIF) legal language-ontology for representing legal knowledge in order to support modelling of legal domains and to facilitate interchange between legal knowledge-based systems (Hoekstra et al., 2007; Boer et al., 2008; Gordon, 2010). It provides a direct support for representing three types of legal knowledge, which have been recognized as being most indispensable to law and legal reasoning: terminological knowledge, legal rules and normative statements. LKIF consists of a number of ‘modules’, each of them including a cluster of related concepts; its main modules are ‘norm’, ‘expression’, ‘process’, ‘action’, ‘role’, ‘place’, ‘time’ and ‘mereology’. Sartor et al. (2008) reviews several European projects in the domain of ‘legal technologies’ aiming at the development of various kinds of computational models for representing laws and in general legal knowledge, and distinguish in this research five streams, which focus on modelling of legal documents, norms, concepts, cases and interactions respectively. Sartor et al. (2011) argue that legal ontologies have ‘come of age’ and are critical for representing, processing and retrieving legal information; also, they reference many legal ontologies, differing in terms of granularity (domain-specific vs. core), degree of formality (highly axiomatised vs. lexical or language-oriented) and methodology of development (top–down vs. bottom–up and middle-out).

By examining these legal ontologies we concluded that they are characterized by a purely legal orientation, focusing on the legal elements and details of legal texts, since they have been created mainly for supporting the development of legal knowledge systems and legal reasoning, in order to be used by with legal experts. They lack public policy orientation (i.e. focus on problems, solutions, advantages and disadvantages), so they are not suitable to be used for the codification/representation of the public policy related knowledge of Parliaments. For this reason we also reviewed previous research on CSAV, as it has developed frameworks and methodologies for arguments visual representation that might be useful for the purposes of our study.

2.2 Computer-Supported Arguments Visualization (CSAV)

Considerable research has been conducted on the visualization of arguments, aiming at the development of frameworks and methodologies for the structured representation in a diagrammatic form of the arguments contained in textual documents or expressed in discussions. In this section we review briefly the most important arguments visualization frameworks; for each of them have been developed methodologies for their usage, and for most of them software tools as well. Wingmore (1913) proposed an ‘evidence chart’ methodology for representing in a simplified diagrammatic form the extensive material of legal cases, which assists in gaining a better understanding of the substantial elements and reaching conclusions; his charts show how different kinds of evidence (such as ‘Testimonial Assertions’ or ‘Circumstances’) are connected in order to support or challenge various ‘Propositions’. Toulmin (1958) analysed the logical structure of arguments, and based on this developed a model (language) for the visual representation of arguments, which includes five components: arguments usually comprise facts or observations (‘Datum’), which through logical steps (‘Warrant’, which can be supported by a ‘Backing’) lead to consequent assertions (‘Claim’), though exceptions (‘Rebuttal’) can be also be added to them. This model, and in general Toulmin’s analysis of the logical structure of arguments, was a sound foundation for many subsequent developments and applications.

Another interesting and widely applicable arguments visualization framework has been developed for the representation of the arguments expressed in a class of complex problems termed by Rittel & Weber (1973) as ‘wicked’, in contrast to the simpler ‘tame’ problems. Wicked problems are characterised by high complexity, multiple perspectives, many stakeholders with different concerns and also different views and perceptions of the problem, lack of clear methods for finding the best solution and stopping rules, and lack of absolute solution, so they have only ‘better’ and ‘worse’ solutions, the former having more advantages and less disadvantages than the latter. Kunz and Rittel (1979) suggest that wicked problems are most effectively countered by argumentation among stakeholders, in which each stakeholder group can express the particular issues and perspectives of the problem they regard as significant, possible actions for addressing them and also their advantages and disadvantages. In the same paper they also proposed the use for this purpose of ‘Issue Based Information Systems’ (IBIS), which aim to *‘stimulate a more scrutinized style of reasoning which*

more explicitly reveals the arguments. It should help identify the proper questions, to develop the scope of positions in response to them, and assist in generating dispute'. These IBIS are based on a simple but powerful framework for the representation of wicked problems, whose main elements are 'questions' (issues-problems to be addressed), 'ideas' (possible answers-solutions to questions-problems) and also 'pro-arguments' and 'contra-arguments' (evidence or viewpoints that support or object to ideas) (Kunz & Rittel, 1979; Conklin & Begeman, 1989; Gordon & Richter, 2002; Conclin, 2003).

The introduction and wide penetration of computers gave a boost to argument visualization, leading to the development of the CSAV domain, and also to the expansion of its practical application in various domains, such as education, products design, analysis of environmental impacts, commerce, research, etc. (Kirschner, Buckingham Shum & Carr, 2003). Many software tools have been developed for supporting arguments visualization; a good review of them is provided by Benn and Macintosh (2011). Most of them are based to some extent on the IBIS framework, such as the gIBIS (Conklin & Begeman, 1989; Conclin, 2003), the Compendium (Selvin et al., 2001; Selvin et al. 2005), the Deliberatorium (Klein & Iandoli, 2008), the CopeIt! (Karacapilidis et al., 2009) and the Debategraph (Tambouris et al., 2011). Some other software tools are based on different arguments visualization frameworks. Araucaria (Reed and Rowe, 2004; Rowe) is a tool for diagramming arguments, which consist of 'conclusions', 'premises' and 'refutations', and then for analyzing them using various argumentation schemes, such as the ones proposed by Walton (1996), in order to identify the 'critical questions' that have to be answered for evaluating each particular argument, examining its strength and identifying possible logical weaknesses. A similar simpler framework of visualizing arguments as consisting of interconnected 'premises' and 'conclusions' is adopted by the Carneades tool (Gordon and Walton, 2006; Gordon, 2010), which offers also extensive additional capabilities for constructing and evaluating arguments. The same framework is used by the Argunet tool (Betz et al., 2006) for visualizing arguments, which also allows interconnections among arguments that correspond to either 'support' or 'attack' relations. More recently the Cohere arguments visualization tool (Buckingham Shum, 2008) was developed based on the basic philosophy and features of web 2.0. It allows a first broad visualization of the main 'ideas' expressed in a debate and their 'connections'; then it enables proceeding to a more detailed visualization, through a characterization of each idea and each connection, using either user-defined typologies, or some predefined typologies, which include the ones proposed by IBIS framework.

Most public policy design problems (e.g. development of plans, programs, regulations, legislation) belong to the abovementioned class of wicked problems, since they are characterised by high complexity, and have multiple stakeholders with heterogeneous views and concerns, as initially observed by Rittel & Weber (1973). For this reason the IBIS framework, proposing questions, ideas, pro-arguments and contra-arguments as the main elements for arguments representation-visualization, seems to be a reasonable theoretical foundation – probably with some adaptations and extensions - for the representation of the public policy related knowledge of Parliaments.

It should be emphasized that the IBIS framework has already been used successfully for the visualization of the main arguments in policy-related debates. Renton (2006) used IBIS in order to present in a compact and clear manner to the public complex political issues and arguments raised in Parliamentary debates. For this purpose he took the minutes of two debates from the Scottish Parliament concerning the introduction of the 'Terrestrial Trunk Radio Masts' (TETRA) and the 'Antisocial Behaviour', converted them into argument maps based on the IBIS framework using the Compendium tool and then had them evaluated through qualitative interviews with members of the Scottish Civic Forum with positive results. Ohl (2008) describes the application of IBIS for the diagrammatic representation of citizens' opinions expressed in a public discourse on a draft South East Queensland Regional Plan, which aims to promote government transparency and accountability. For this purpose using the Compendium tool he constructed an initial 'index map' visualizing the basic issues and questions posed by Queensland State Government, each of them being linked to a particular map visualizing citizens' opinions on it (for open questions), or showing relative frequencies of citizens' responses (for closed questions). Buckingham Shum and Okada (2008) used IBIS for extracting from a corpus of sources (e.g articles) and visualizing the main arguments of the debate on

the invasion of Iraq. Initially, for each source using the Compendium tool a map of its arguments (issues, solutions, pro- and contra-arguments) was constructed. In a second phase ‘gestalt maps’ were constructed that connect the article maps, based on thematic tagging the nodes of them, which provides interesting synthetic views on important themes. Tambouris et al. (2011) describe the use of the Debategraph tool, which is based on IBIS framework, for visualizing the arguments of a debate on climate change. The evaluation of this visualization by experts and policy makers lead to the conclusion that it has a good potential as a means of provision of structured and compact information from government agencies to citizens on public policies in various stages of their lifecycle (e.g. agenda setting, policy development, policy implementation), and also as a means of efficient communication and collaboration among government agencies on public policy formulation. This previous successful application of IBIS for the visualization of arguments in policy-related debates provides an additional indication of the suitability of IBIS as a foundation for the representation of policy related knowledge created in Parliaments.

3 SOURCES OF PUBLIC POLICY RELATED KNOWLEDGE IN PARLIAMENTS

Initially we focused on the identification and analysis of sources of knowledge on public policies in legislation formation process in Parliaments. For this purpose we conducted interviews with three experienced officials of the Greek Parliament, who described to us the stages of the legislation formulation process, their actors and activities, and also the main documents they produce. These documents are: the justification report of the law, its main text (including its articles), the minutes of its discussion in the pertinent parliamentary committee, and finally the minutes of its final discussion in a plenary session. Then we studied carefully and analyzed these documents. In particular, initially we studied justification reports and the main texts (articles) of five Laws from five different ministries, which have been proposed to us by the above three officials of the Greek Parliament as being representative ones. Furthermore, we studied carefully and analyzed the minutes of the corresponding sessions of the pertinent parliamentary committees and also of the plenary sessions in which these laws were discussed.

From the above interviews it was concluded that the legislation formation process in the Greek Parliament consists of five stages:

- i) Initial drafting of the bill and the justification report in the pertinent Ministry, and then submission of them to the Parliament.
- ii) The Scientific Unit of the Parliament proceeds to an initial examination of the bill; it examines mainly whether it violates any of the articles of the Constitutional Law, and whether it has any problems from a legal viewpoint.
- iii) The Ministry of Finance assesses the additional costs that the application of this bill will generate.
- iv) The bill is then discussed in the pertinent parliamentary committee (in one or more sessions), in which initially invited representatives of the main stakeholders and experts, and then Members of Parliament (MPs) from all parties, express their positions and opinions on it.
- v) Finally the bill is discussed in one or more plenary sessions of Parliament, and at the end of this discussion the MPs vote whether the bill will be approved (passed) and become a Law or rejected.

From the analysis of the above stages and the parliamentary documents produced by them it was concluded that significant amounts of public policy related knowledge is created in stages (i), (iv) and (v). In particular, in the first stage of the drafting of the initial Bill in the pertinent Ministry participate experienced public servants, representatives of the main stakeholders (e.g. trade unions, professional associations, municipalities, etc.), and also domain experts (e.g. University Professors), who contribute significant amounts of knowledge they possess on the theme of the Bill (i.e. issues, proposed interventions, advantages and disadvantages of them, etc.); this knowledge is ‘filtered’ by the Ministry, and part of it (according to the decisions made by the Ministry as to the orientations and the content of the bill) is recorded in the justification report and in the content (articles) of the bill. From the analysis of the justification reports of the five examined laws a common structure has been

identified in them. Initially, in the first paragraphs they include and clarify a number of reasons (e.g. social problems and needs, new realities and trends at national or/and international level, economic events, evolutions in the values of society and in general various contextual factors) which necessitate the creation and application of the proposed law; then, in the following paragraphs are briefly mentioned the general directions of the law and the interventions/solutions it provides concerning its basic theme (e.g. it settles rights and obligations to one or more groups, it protects the environment, it increases employment opportunities for some groups, etc.). Similarly from the analysis of the content (articles) of these five bills we saw that they are also characterized by a common structure. They are all structured as sequences of articles, each of them settling a particular issue/dimension of the main theme of the bill; each article includes a number of settlements on the corresponding issue (i.e. solutions or ways of addressing it), and also further clarifications for some of these settlements.

In the fourth stage of the discussion of the bill in the pertinent parliamentary committee there is an extensive discussion between MPs of all parties appointed to participate in it, who have a good experience in the corresponding public policy domain; also, are invited representatives of the main stakeholders (e.g. trade unions, associations, municipalities, etc.), which are affected by the bill under discussion, and domain experts (e.g. University Professors), in order to express their opinions and positions on the bill. This knowledge is recorded in the minutes of the corresponding sessions of this committee. From the analysis of these minutes we remarked that though they have a much lower degree of structure than the justification reports and the content (articles) of the bills, some common structure can be identified. In particular, all participants mention mainly some advantages and disadvantages of the bill under discussion, and provide clarifications and explanations for them. Additionally some participants make proposals for additional settlements or changes of existing settlements included in the bill; it should be noted that most of these proposals are associated to disadvantages that the particular participant has previously mentioned. Finally in the fifth stage of the discussion of the bill in one or more plenary sessions of the Parliament there is an extensive discussion between MPs of all parties. The position of each party is initially expressed by one MP, who is responsible for this bill on behalf of the party, and then follow speeches of other MPs from all parties on the Bill. These speeches of the MPs in the plenary sessions have a similar structure with the ones in the Parliamentary committees: they include advantages and disadvantages of the bill, and proposals for additional settlements or changes, usually corresponding to some of the disadvantages mentioned.

In conclusion, the analysis of the legislation formation process in the Greek Parliament and the documents it produces reveal the creation of not only legal knowledge, but also of valuable knowledge from a public policy perspective. This knowledge is extensive, rich, multi-dimensional and multi-perspective, as it includes views many different and diverse actors (public servants, MPs, trade unions, associations, municipalities) on the main issues posed concerning the subject of the law, interventions for addressing them, and also advantages and disadvantages of the latter. Another interesting conclusion from this analysis is that the main elements of this knowledge correspond to some extent to the ones proposed by the IBIS framework (issues and problems correspond to ‘questions’, policy interventions correspond to ‘ideas’, advantages correspond to ‘pro-arguments’, and disadvantages to ‘contra-arguments’).

4 A METHODOLOGY OF PARLIAMENTS’ POLICY-RELATED KNOWLEDGE MANAGEMENT

The proposed methodology for the management and exploitation of the above extensive and valuable knowledge of Parliaments on public policies for addressing important problems and needs of society is based on the codification/representation of this knowledge, which is contained in the abovementioned basic parliamentary documents, based on the IBIS framework. In particular, it includes for each bill discussed in the Parliament the codification/representation of the policy-related knowledge contained in each of its basic documents, i.e.

- i) the justification report of the bill,
- ii) the content of the bill (articles),
- iii) the minutes of the discussion of the bill in the pertinent parliamentary committee,
- iv) and the minutes of the final discussion of the bill in plenary sessions of the Parliament,

in the form of one set of interconnected questions (corresponding to issues and problems mentioned), ideas (corresponding to solutions and settlements mentioned for the above issues and problems) and pro- and contra-arguments (corresponding to advantages and disadvantages mentioned for the above solutions and settlements) for each document. According to the IBIS framework each question can be connected to several ideas, and each idea can be connected to several pro- and contra-arguments. This codification/representation can be stored in a simple relational database with two basic tables: one for storing questions, ideas and pro- and contra-arguments (creating one record for each of them), and one for storing the connections among them. The above methodology can be applied to several Parliaments, both at country-level, and at local-level (i.e. Regional and Municipal Councils, which include elected representatives of citizens who make important policy decision concerning local problems and needs, so their operation and roles resemble to the ones of country-level Parliaments). The databases of these Parliaments can be connected (e.g. through Internet) in a 'star architecture' to central server (Figure 1). A typical user will be able to query this server concerning solutions for a particular social problem or need (e.g. regulations, programmes, services provision, infrastructure building), or advantages and disadvantages of a particular solution, etc.; this query will be sent by the central server to the databases of all the interconnected Parliaments, and the results from all these queries will be sent to the central server, which will then send them all to the user.

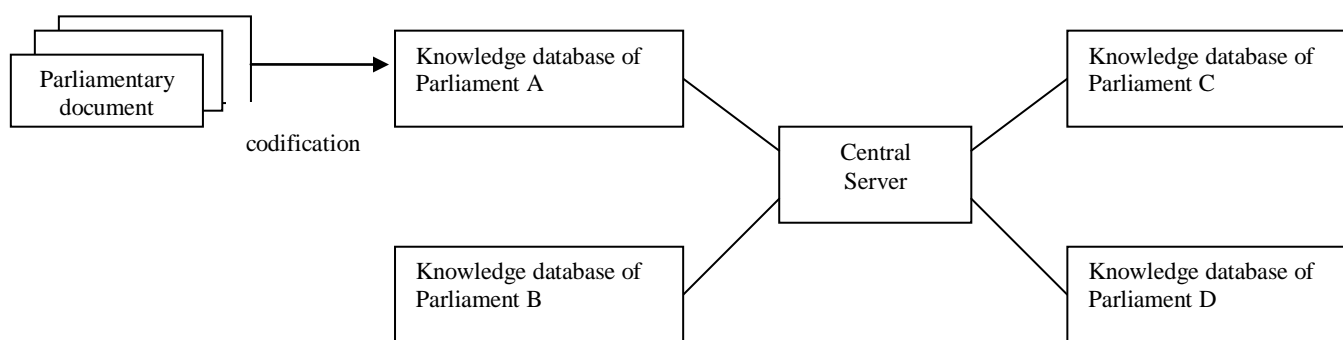


Figure 1. Star architecture for the application of the proposed methodology

For the above knowledge codification/representation we can use one of the existing IBIS-based CSAV tools, such as the 'Compendium' tool (<http://compendium.open.ac.uk/institute/>) that we used in the pilot application described in the following section 5, since they provide extensive capabilities for creating such a knowledge representation of a Parliamentary document (i.e. entering its main knowledge elements and the connections among them) easily and quickly through a graphic user interface, and also allow its visual presentation to the users, which can provide useful insights.

The above methodology enables a much better management and exploitation of the valuable public policies related knowledge that Parliaments possess. It can support and facilitate the abovementioned four 'classical' knowledge creation and exploitation processes proposed by Nonaka (1994):

- knowledge externalization (enabling much higher degree of conversion of tacit knowledge on public policies into explicit, structured and directly usable knowledge),
- knowledge combination (having codified knowledge in this structured form it is much easier to combine knowledge from different sources and stages of the legislation formulation process, and also from different Parliaments, both country-level and local-level),
- knowledge internalization (this codified form of knowledge is much easier to be embodied into the tacit knowledge of interested persons, such as MPs, employees of Government Agencies, etc.),
- and knowledge socialization (tacit knowledge of different persons, e.g. public servants, MPs, trade unionists, members of professional associations, experts, etc., is converted in into explicit, structured and directly understandable form, so it is easier to become tacit knowledge of other persons).

However, in the evaluation of the pilot application of the proposed methodology it will be assessed to what extent the elements/nodes typology provided by the IBIS framework (questions, ideas, pro-arguments and contra-arguments) is sufficient for the representation of all the substantial elements of this policy-related knowledge, and if not the required adaptations and extensions that need to be made.

5 A PILOT APPLICATION

We made a pilot application of the above methodology for the codification/representation of the policy related knowledge contained in the whole set of documents produced during the formation process of the Law on the ‘Contracts of Voluntary Cohabitation’ passed by the Greek Parliament. This controversial Law regulated the matter of the formal voluntary co-habitation of two persons. It formalized a social situation existing for long time in Greece: many couples, especially among the younger age groups, are reluctant to proceed directly to marriage, and choose to live together for long periods of time; during that time many of them have children, share living expenses and buy property, just to mention some of their most important common actions, and these needed to be regulated. The codification/representation of the policy-related knowledge contained in the justification report of this Law is shown in Figure 2.

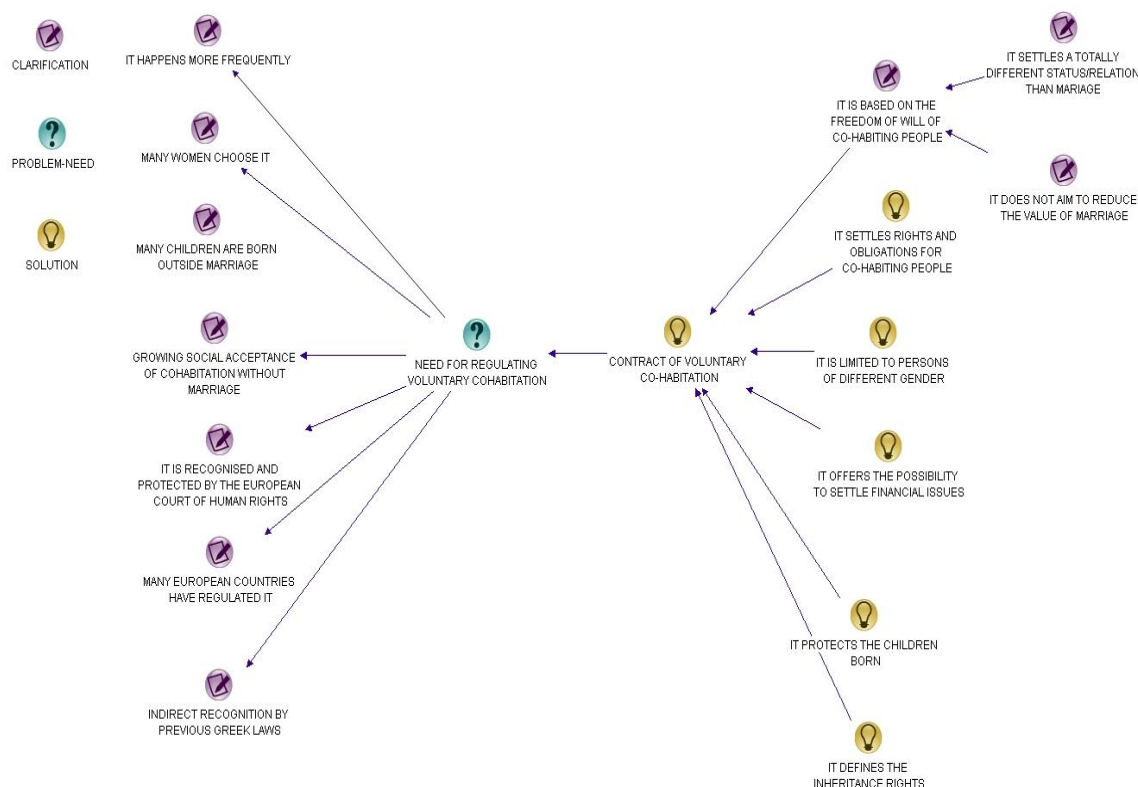


Figure 2. Codification/representation of the policy-related knowledge contained in the justification report

We can see that it includes two of the element types provided by the IBIS framework, which however needed an adaptation of their meaning: question elements (adapted as ‘problem-need’ elements) and idea elements (adapted as ‘solution’ elements); also it includes one additional element type provided by the Compendium tool: note/information elements (adapted as ‘clarification’ elements). It is structured in four layers. The first layer includes the reasons (modelled as clarification elements) that create the need to legally regulate the voluntary cohabitation, which is modelled through a problem-need element in the second layer. The third layer represents this bill concerning the ‘Contracts of Voluntary Cohabitation’ as the basic solution for addressing this need, while the fourth layer includes the general directions of the Law and the particular solutions it provides (modelled through solution elements), and also a clarification on it, further elaborated by two more clarifications (all modelled as clarification elements).

The codification/representation of the policy-related knowledge contained in the main text of the Law that we constructed was quite lengthy, so we decided to break it into: i) one ‘high level’ knowledge codification/representation, which shows the main issues regulated by the articles of the Law (as issue elements) (Figure 3), and also ii) one ‘lower level’ knowledge codification/representation for the content of each article; since the bill includes 13 articles, we constructed 13 corresponding knowledge

lower level codifications/representation them (in Figure 4 we can see the one constructed for the 7th article of the Law concerning the issue of alimony after the end of a ‘Contracts of Voluntary Cohabitation’).

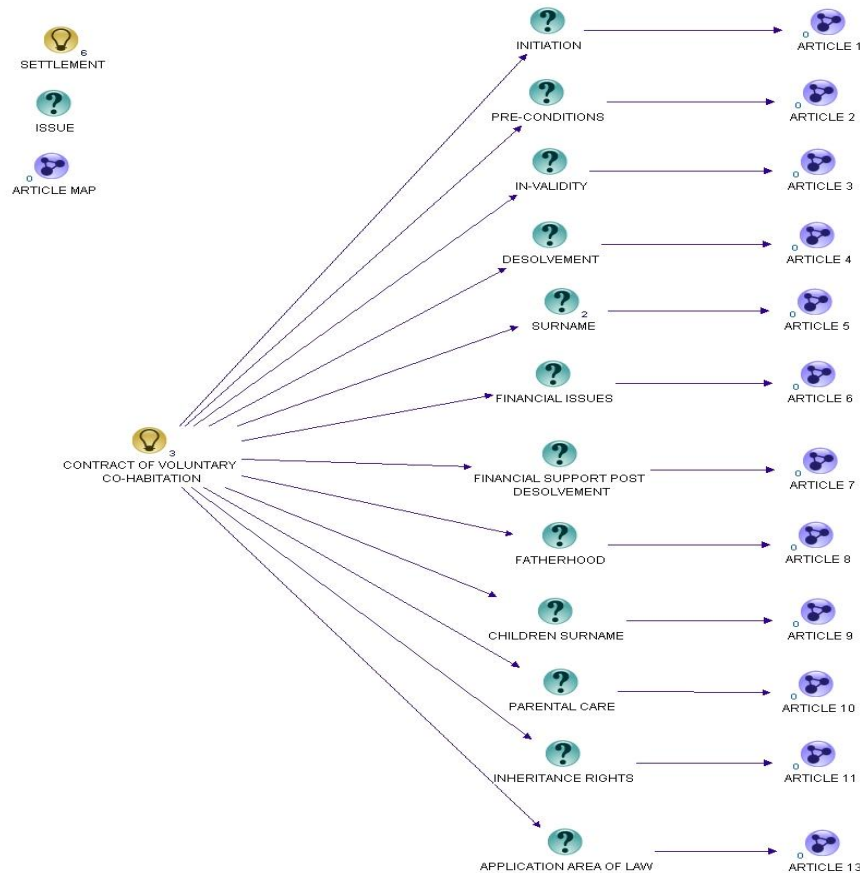


Figure 3. High level codification/representation of the policy-related knowledge contained in the Bill

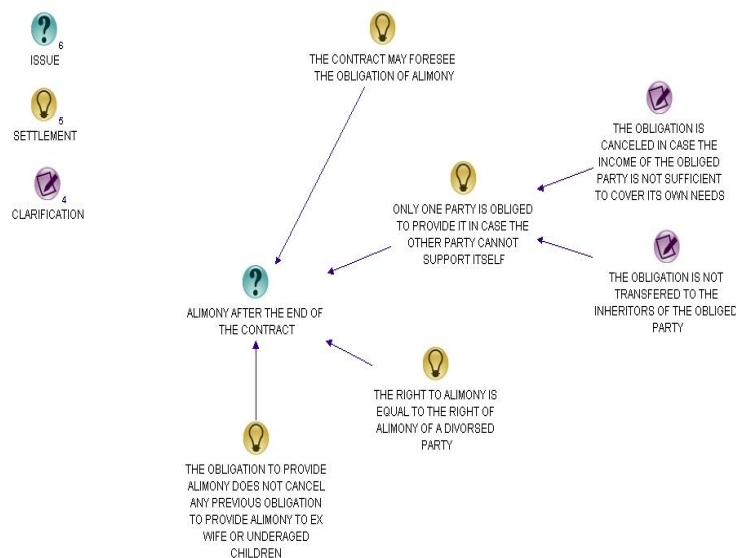


Figure 4. Codification/representation of the policy-related knowledge contained in the 7th article of the Law

As we can see from Figures 3 and 4, for the codification/representation of policy-related knowledge contained in the main text of the Law we have used again two of the element types provided by the IBIS framework, again with an adaptation of their meaning: question elements (adapted as ‘issue’

elements) and idea elements (adapted as ‘settlement’ elements); we have also used the additional note/information elements type provided by Compendium (adapted as ‘clarification’ elements).

The codification/representation of the policy-related knowledge contained in the opinion on the bill of one of the experts invited by the pertinent Parliamentary committee is shown in Figure 5. It includes three of the types of elements provided by the IBIS framework, again with an adaptation of their meaning: one idea element representing the whole bill (adapted as ‘settlement’ element), one question element (adapted as ‘issue’ element) and one contra-argument element (adapted as ‘negative point’ element); it also includes note/information elements (adapted as ‘clarification’ elements). We remark that this expert mentioned one main weakness of this bill, which poses one basic issue, and also added three clarifications on this weakness.

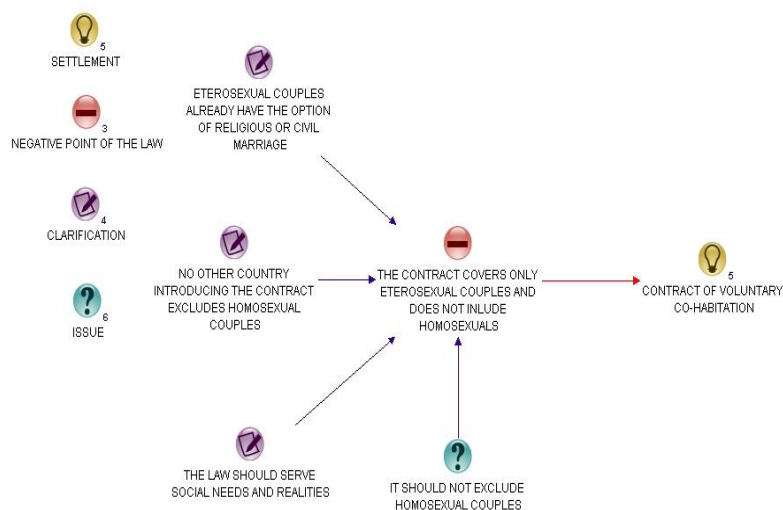


Figure 5. Codification/representation of the policy-related knowledge contained in the opinion of an expert

In Figure 6 we can see the codification/representation of the policy-related knowledge contained in the position of one political party on this bill. It includes three of the types of elements provided by the IBIS framework, with similar adaptations of their meaning: one idea element (adapted as ‘settlement’ element) representing the whole bill, contra-argument elements (adapted as ‘negative point’ elements) and one question element (adapted as ‘issue’ element); it also includes note/information elements (adapted as ‘clarification’ elements). We can see that this political party mentioned four main weaknesses of this bill, and for two of them added further clarifications, and they also raised one issue associated with one of these weaknesses.

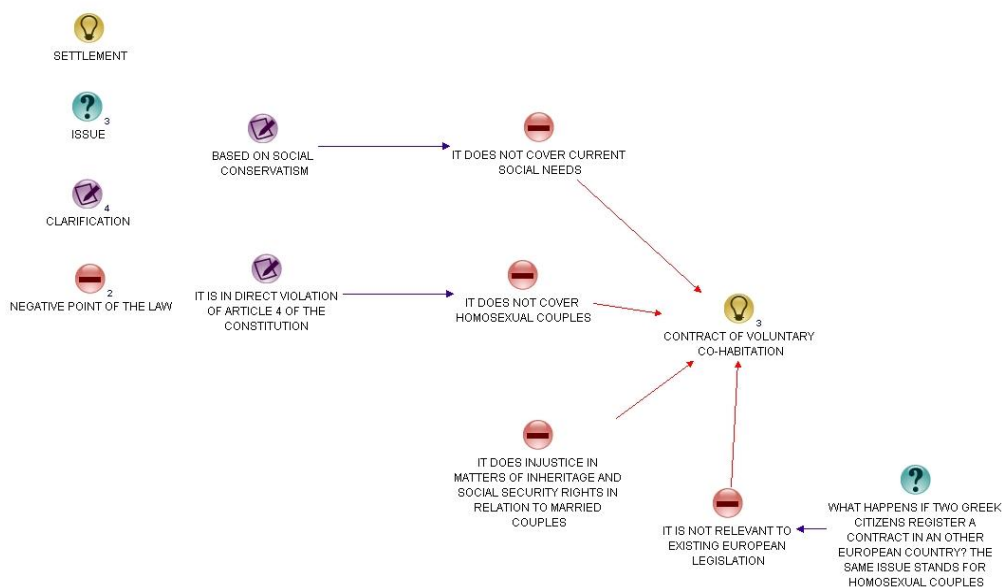


Figure 6. Codification/representation of the policy-related knowledge contained in the position of one party

In Figure 7 we can see the codification/representation of the policy-related knowledge contained in the position of another political party on the same bill.

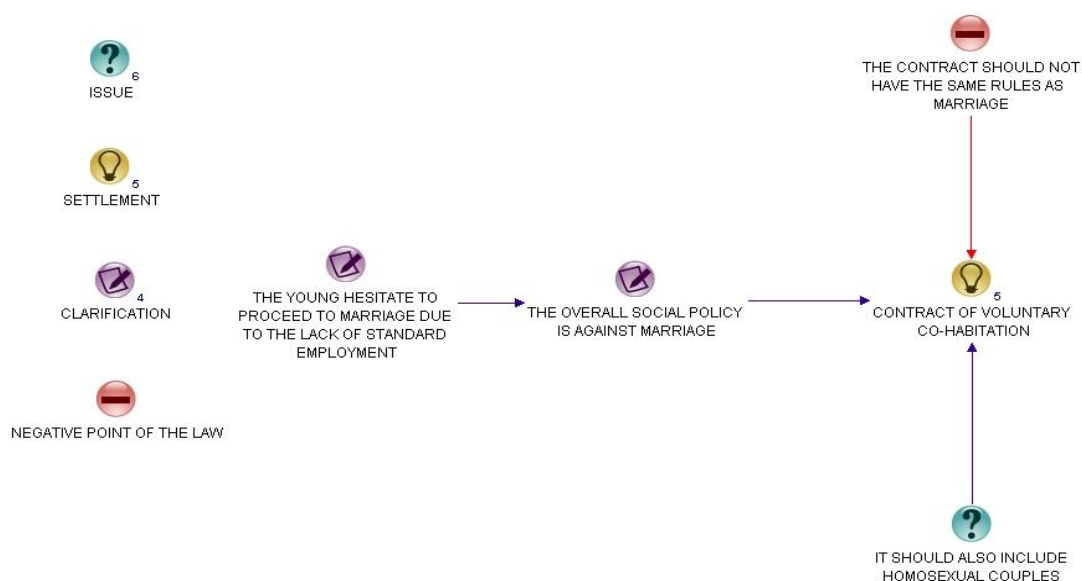


Figure 7. Codification/representation of the policy-related knowledge contained in the position of another party

By comparing Figures 6 and 7 we remark that the first party finds more weaknesses in this bill than the second one, and that they have different focuses (e.g. the first party focuses on the lack compatibility of this bill with corresponding Laws of other European countries and its practical implications, while the second focuses on the need to have in the co-habitation contracts different rules than in the traditional marriage); however, we can see that they agree on the necessity to cover in this bill the co-habitation of homosexual couples as well.

6 EVALUATION

The above pilot application of the proposed methodology has been evaluated using both quantitative and qualitative methods, based on the ‘Technology Acceptance Model’ (TAM) (Davis, 1989; Davis et al., 1989; Venkatesh et al., 2003). According to TAM, the main determinants of the attitude towards using a system of its potential or real users are its perceived ease of use and its perceived usefulness. The degree of success of this policy-related knowledge management methodology depends critically on the quality of the proposed codification/representation of this knowledge, i.e. to what extent this codification/representation include the substantial elements of the policy related knowledge of the corresponding Parliamentary documents (i.e. usefulness), and to what extent this codification/representation is understandable by the users (i.e. ease of use).

In this direction, initially we asked 25 students, a Legal Assistant to the MP who was the main speaker of the governing party for the bill, and one Official of the Greek Parliament (so 27 persons in total), to read the four basic Parliamentary documents of the Law on the ‘Contracts of Voluntary Cohabitation’ (justification report of the Law, main text (articles) of it, minutes of its discussion in the pertinent Parliamentary Committee, and minutes of its discussion in plenary sessions of the Parliament), and then to read the knowledge codifications/representations we constructed for these documents (in a visualized form, like the one of Figures 2 to 7). Then we designed a short questionnaire, so that it can be quickly filled by the above 27 persons, for conducting a quantitative evaluation; it consisted of five questions concerning: i) the ease of understanding these knowledge codifications/representations, and ii) to what extent they convey the main elements of the corresponding document (i.e. they enable understanding the main elements of its content). Finally, we conducted a qualitative evaluation, through an focus group in-depth discussion of about two hours on the above two topics (i) and (ii), in which participated four of the above students, the MP Legal Assistant, and the Official of the Parliament. In the following paragraphs we analyse the results of these evaluations

Quantitative Evaluation: The abovementioned quantitative evaluation questionnaire was returned by all 27 students. In the following Table 1 we can see the average assessments of the respondents in the five representations' evaluation questions, and also the relative frequencies of the two highest values.

QUESTION	average assessment	Relative freq. of the highest value	Relative freq. of the second highest value
Was it easy for you to understand the representations? (1 = not at all, 2 = a little, 3 = rather easy, 4 = easy, 5 = very easy)	3.80	32%	24%
Were the representations complete, enabling an understanding of the main elements of the reference text, or did you feel the need to access the text in order to understand it? (1 = not at all, 2 = moderately complete, 3 = very complete)	2.16	20%	76%
To what extent did the representation of the justification report of the Law enable you to understand the main elements of its content? (1 = not at all, 2 = a little, 3 = moderately, 4 = much, 5 = very much)	3.44	16%	28%
To what extent did the representation of the articles of the Law enable you to understand the main elements of their content ? (1 = not at all, 2 = a little, 3 = moderately, 4 = much, 5 = very much)	3.56	28%	16%
To what extent did the representation of experts' opinions and parties' positions on the bill enable you to understand the main elements of their content? (1 = not at all, 2 = a little, 3 = moderately, 4 = much, 5 = very much)	3.80	40%	20%

Table 1. Average assessments of the respondents in the five representations' evaluation questions

We can see that the respondents on average find the representations between rather easy and easy to understand (closer to the latter - average assessment 3.80). Therefore the respondents believe that the representations, though not very easy, are understandable with a reasonable effort. With respect to completeness and the extent of enabling an understanding of the main elements of the reference text without having to resort to it, the respondents find them in general between moderately complete and very complete (closer to the former - average assessment 2.16). We also examined this question for each type of Parliamentary documents. We remark that the respondents on average find that the representations enable them to a moderate to large extent to understand the main elements of the justification report of the Law (average assessment 3.44), the content (articles) of it (average assessment 3.56) and also experts' opinions and parties' positions on the bill (average assessment 3.80). The above assessments of the respondents provide some first evidence that such representations include to a good extent the substantial elements of the policy related knowledge contained in the main Parliamentary documents, so they can enable a better management and exploitation of this knowledge. At the same time the respondents find that the representations of the opinions of experts and the positions of parties on the bill include the main knowledge elements of the corresponding documents to a little higher extent than the representations of the main text (articles) and the justification report.

Qualitative evaluation: All the persons who participated in this focus group discussion accepted that the representations were understandable to a rather good extent. Also, they all agreed that the representations enabled them to understand to a good extent the main elements of the corresponding documents, without having to resort to the full text of them. It was also remarked that this holds more for the representations of the opinions of the experts and the positions of the parties, than for the representations of the content (articles) of the Law and its justification report, since the latter have a

different type of content (more legalistic) than the former. Furthermore, it was mentioned that the representations of the positions of the parties helped them to ‘filter-out’ the excessive rhetoric and the irrelevant or generic comments (not directly related to the bill under discussion), which are quite usual in such political speeches, and focus on the main points raised by them from a public policy perspective. A weakness of the visualizations of the articles of the bill came from the opinion of the MP Legal Assistant involved in this focus-group discussion. In particular, she argued that in the representations of the articles all the types of settlements included were represented using a single type of elements (as ‘settlement elements’), though in the Laws there are different types of legal rules, such as prohibitive, imperative, permitting and presumptions (Georgiadis, 1997; Lingeropoulos, 2002); also in the Laws there are often other types of settlements concerning different types of government non-regulatory interventions, such as the provision of new public services, the implementations of new programmes, or the development of new infrastructures. It was widely accepted that these different types of legal rules and government interventions should be represented by different types of elements, and this would improve substantially the quality of the representation and organization of the policy related knowledge contained in Laws’ articles, and would allow more advanced searches by the users. Finally, the Parliament Official remarked that a more extensive body of knowledge on social problems and needs, and on government interventions for addressing them, is produced during the initial drafting of the bills and their justification reports in the pertinent Ministries. In this stage a wider circle of stakeholder groups are invited in order to state the particular issues and perspectives of the problem they regard as significant, possible actions for addressing them and also their advantages and disadvantages. However, only a part of this knowledge is contained in the bill and justification report, and not the whole of it, based on the decisions made by the Ministry as to the orientations and the content of the bill. Therefore it would be very useful to perform a similar codification/representation of this knowledge as well, which would result in the construction of much more complete government policy memory.

7 AN EXTENSION OF IBIS FRAMEWORK

Based on the conclusions of the evaluation we proceeded to an improvement of our approach to the representation of the policy-related knowledge contained in Laws’ articles and justification reports. In particular, we enriched the typology of elements we use for this representation, by refining the ‘settlement’ element type, taking into account the classification of legal rules proposed by jurisprudence theory (Georgiadis, 1997; Lingeropoulos, 2002), and also the non-regulatory interventions that Laws often include, into the following eight element types:

a) Prohibitive Rule: They concern rules through which it is imposed to abstain from a particular behavior or exclude the coming of a certain outcome. Such a prohibition is usually accompanied with sanctions in the case of its violation. These rules are usually expressed using the verb “prohibit”. For instance, a minor is prohibited, without the consent of his guardian, to acknowledge the obligation or expropriation of his property.

b) Imperative Rule: They concern rules which impose a positive behaviour. These rules are usually expressed using the verbs “owes to”, or “has to”, or “must”, etc. For instance, the banks have to report some types of transactions (for which there is a suspicion of association with fraudulent activities) to the Ministry of Finance.

c) Permitting Rule: They concern rules which recognize to a person a certain authority or permit to it a certain action. These rules are usually expressed using the verbs “can”, or “has a right to”, etc. For instance, a minor who has completed his 14th year of age is able to (can) dispose, without the consent of his guardian, everything that he gains from his work or everything that he was given for his own use.

d) Legal Presumption: These concern the outcomes which the law defines that should be initially deduced as far as unknown incidents are concerned, from other known ones, in order to facilitate the judge to find out the truth or the untruth of litigants’ pleas, for which finding evidence is impossible or very difficult. For instance, a child who took birth during the marriage of his parents is initially

presumed that has got for father the man to whom his mother is married to (except evidence for the opposite is presented).

e) **Public Service**: They concern new public services that have to start being provided by government agencies in order to address social problems or needs. For instance, in order to address the problems of growing drugs' use a new relevant service has to be provided by public hospitals.

f) **Program**: They concern new programs (= sets of government actions) that have to be implemented by government agencies in order to address social problems or needs; in many countries important and high budget government programs are usually defined and regulated by Law. For instance, in order to address unemployment problems in a specific area, a program for its economic development has to be implemented.

g) **Infrastructure**: They concern new infrastructures that have to be built by government in order to address social problems or needs; similarly, in many countries Laws are passed for defining the details of building some important and high budget infrastructures by government. For instance, in order to address tourism needs in a region, a new airport has to be built there by government.

h) **Settlement**: With this type will be modeled settlements defined in bills' articles, which do not belong to any of the abovementioned types

In Figure 8 we can see the codification/representation of the policy-related knowledge of the seventh article of the Law on the 'Contracts of Voluntary Cohabitation' using the proposed enriched typology of elements (its initial representation appears in Figure 4).

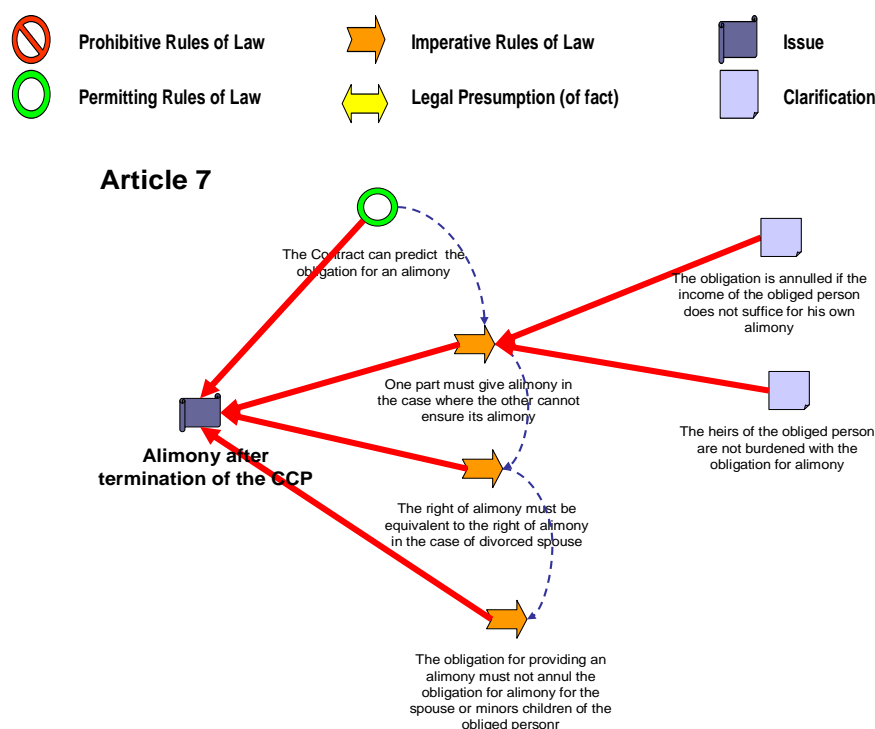


Figure 8. Codification/representation of the policy-related knowledge contained in the 7th article of the Law using the enriched typology of elements

8 CONCLUSIONS

In the previous sections of this paper has been presented a methodology for the management and exploitation of the public policy related knowledge that Parliaments possess. This knowledge concerns social needs and problems, possible government interventions (e.g. regulations, programmes, services provision, infrastructure building) for addressing them, and also advantages and disadvantages of the latter. The proposed methodology is based on the codification/representation of this public policy

related knowledge of Parliaments, which is produced during the various stages of legislation formulation, and recorded in the main Parliamentary documents (bills' justification reports, main text (articles) and also in the minutes of the relevant discussion in the competent Parliamentary committee and in plenary sessions of Parliament). This codification/representation has been initially based on a well established product of CSAV research, the IBIS framework.

The proposed methodology has been applied for the codification/representation of the public policy related knowledge contained in the whole set of documents produced during the formation process of the Law on the 'Contracts of Voluntary Cohabitation' passed by the Greek Parliament. An evaluation of it was made using both quantitative and qualitative techniques based on the TAM, which gave in general positive results. In particular, it concluded that the knowledge codifications/representations constructed include in a structured form the substantial elements of the public policy related knowledge contained in the corresponding textual Parliamentary documents to a good extent, and also are understandable with a reasonable effort. Also, we found that the types of elements provided by the IBIS framework are to a satisfactory extent sufficient, with some adaptations, for the representation of this knowledge, with the only exception of the settlement node, which was found insufficient to represent the different kinds of legal rules and other types on non-regulatory government interventions that Laws include. This lead us to develop an extension of the IBIS framework, which enables a better codification/representation of the valuable public policy related knowledge contained in the main content (articles) and the justification reports of Laws, and therefore a better management and exploitation of it.

One limitation of this study is that it has been based on a study of the legislation formation process and its main documents in the Greek Parliament. Also, the evaluation of the proposed methodology has been based on the whole set of Parliamentary documents of a single law. Therefore, further research is required for a more detailed evaluation of the proposed methodology for different types of laws, using both quantitative techniques (based on questionnaires filled by larger user groups) and qualitative techniques (based on in-depth discussions in small focus groups). Also, it is necessary to conduct similar research in Parliaments of other countries having different legislation formation processes (e.g. in federal ones) and different legal systems, and based of them develop adaptations or generalizations of this methodology. Furthermore, for the practical application of this methodology it would be quite useful to research to what extent the extraction of these knowledge codifications/representations could be performed automatically (or at least significantly supported) by processing the initial Parliamentary documents (justification reports, main texts (articles) of bills and the minutes of the relevant discussions). This presents serious problems, since the abovementioned types of knowledge elements (questions, ideas, positive and negative arguments, etc.) are rarely associated with particular words or phrases (in this case thematic ontologies and vocabularies could be possibly used for their automatic recognition). An alternative approach would be to integrate the manual production of these knowledge codifications/representations in the production process of each of the above documents. We expect that this will not add too much extra workload: the public servants who write the justification report and the main text (articles) of each new bill usually think of their main points first and then start writing the full text of them, so it will not be difficult for them to produce such knowledge codifications/representations as 'visual summaries'; also, in all the discussions taking place in the Parliament, both in the pertinent Parliamentary committee and in plenary sessions of Parliament, there is some kind of summarization of the opinions expressed by invited experts and MPs, as an assistance to the proposing Ministry, so this can be combined with the production of these knowledge codifications/representations, as 'visualizations' of these summaries. Therefore we expect it will be feasible to proceed to a large scale implementation of the proposed methodology in Parliaments.

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Euripidis Loukis is Assistant Professor of Information and Decision Support Systems at the University of Aegean, Greece. Also, he is teaching e-Government at the National Academy of Public Administration. Formerly he has been Information Systems Advisor at the Ministry to the Presidency of Government, Technical Director of the ‘Program for the Modernization of Greek Public Administration’ of the Second European Union Support Framework and Representative of Greece at the Management Committees of the Programs IDA (‘Interchange of Data between Administrations’) and ‘Telematics for Administration’ of the European Union.

Address: Department of Information and Communication Systems Engineering, University of the Aegean, Gorgyras and Palama Street, 83200 Karlovasi, Greece

Email: eloukis@aegean.gr

Yannis Charalabidis is Assistant Professor of e-Governance Information Systems at the University of Aegean, Greece. He teaches Government Service Systems, Enterprise Interoperability, Government Transformation and Citizen Participation both in the University of Aegean and in the National Technical University of Athens. Previously he has been employed for several years as an Executive Director in Singular IT Group, leading software development and company expansion in Europe, India and the US. He has also been the Coordinator or Technical Leader in numerous FP6, FP7 and National research projects in the areas of e-Business and e-Governance.

Address: Department of Information and Communication Systems Engineering, University of the Aegean, Gorgyras and Palama Street, 83200 Karlovasi, Greece

Email: yannisx@aegean.gr

Alexandros Xenakis is a Research Associate at the University of Aegean, Greece. He belongs to the new academic interdisciplinary field that results from the applications of the information society in the public and private sector. He is an economist and a political scientist, and his doctoral thesis “Electronic voting in the United Kingdom” was supervised by Professor Ann Macintosh as a member of the International Teledemocracy Centre at Napier University. His research interests are in the areas of electronic voting, public administration information systems and e-participation systems.

Address: Department of Information and Communication Systems Engineering, University of the Aegean, Gorgyras and Palama Street, 83200 Karlovasi, Greece

Email: a.xenakis@aegean.gr