Using Argument Visualization to Enhance e-Participation in the Legislation Formation Process

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Abstract. Most public policy problems are 'wicked', being characterised by high complexity, many heterogeneous views and conflicts among various stakeholders. Therefore citizens interested to participate in such debates in order to be sufficiently informed should study large amounts of relevant material, such as reports, laws, committees' minutes, etc., which are in legalistic or in other specialist languages, or very often their substance is hidden in political rhetoric, putting barriers to a meaningful participation. In this paper we present the results of the research we have conducted for addressing this problem through the use of 'Computer Supported Argument Visualization' (CSAV) methods for supporting and enhancing e-participation in the legislation formation process. This approach has been implemented in a pilot e-participation project and then evaluated using both quantitative and qualitative methods based on the 'Technology Acceptance Model' (TAM), with positive results. Based on the conclusions of this evaluation an enrichment of the IBIS framework has been developed for improving the visualization of legal documents.

Keywords: e-participation evaluation, argument visualization, legislation formation process, public policy debate

1 Introduction

Many countries all over the world attempt to extend citizens' participation in public policies formulation and politics in general through the use of Information and Communication Technologies (ICT) at three levels: for supporting i) the provision of relevant information to the citizens, ii) the consultation with them and also iii) their active participation [1],[2],[3],[4]. It is widely recognized that the above two higher levels of e-participation, aiming at the consultation with the citizens and their active participation, have as basic precondition the first level of sufficient relevant information provision to them. The quality of e-participation, and also of 'off-line' participation and in general of all political debates as well, relies critically on how

informed the participating citizens are on the problem under discussion and the opinions that have been previously expressed on it.

However, public policy problems are 'wicked' [5], being characterised by high complexity, many heterogeneous views and conflicts among various stakeholders. Therefore citizens interested to participate in such debates, in order to be sufficiently informed and make a meaningful contribution, should study large amounts of relevant material, such as reports, plans, laws, committees' minutes, etc., which are in legalistic or in other specialist languages, or very often their substance is hidden in political rhetoric. This is putting barriers to public participation (both 'on-line' and 'off-line'), since most citizens today do not have enough time for such extensive study, and also some of them lack the required familiarity and education. The use of Computer Supported Argument Visualisation' (CSAV) [6] may result in a reduction of these barriers to e-participation, however it has been only to a limited extent explored [7], [8], [9], so further research is required in this direction.

The research presented in this paper has been part of the LEX-IS project ('Enabling Participation of the Youth in the Public Debate of Legislation among Parliaments, Citizens and Businesses in the European Union') (www.lex-is.eu) of the 'eParticipation' Preparatory Action of the European Commission [10].

This paper consists of seven sections. In section 2 the background is briefly described, while in section 3 the development of a comprehensive approach to the use of CSAV in the legislation formation process for supporting and enhancing e-participation in it is described. Then in sections 4 and 5 are presented a pilot implementation of this approach and its evaluation. In section 6 is described a proposed enrichment of the IBIS framework for the visualization of legal documents, and some final conclusions are outlined.

2 Background

Computer Supported Argument Visualization (CSAV) is the compact representation in a diagrammatic form of the arguments contained in textual documents or debates, using a set of interconnected nodes of various types. It was introduced by [11] Wingmore, who proposed a 'chart method' 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. Toulmin [12], building on Wingmore's work, developed a model (language) for formulation and analysis of arguments, which was a sound foundation for many subsequent developments and applications. The introduction and 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 areas, such as education, products design, analysis of environmental impacts, commerce, research, etc. [6]. CSAV can be very useful for solving a class of problems termed by Rittel & Weber [5] as 'wicked', in contrast to the 'tame' problems; wicked problems are characterised by many stakeholders with a different problem views, values and concerns, and also they lack mathematically 'optimal' solutions and pre-defined algorithms for calculating them, having only 'better' and 'worse' solutions, the former

having more positive arguments in favour them than the latter. Kunz and Rittel [13] suggest that wicked problems are most effectively countered by argumentation among stakeholders, and propose for this purpose the use 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*'. They are based on a simple but powerful framework for the representation of such problems, whose main elements are 'questions' (issues-problems to be addressed), 'ideas' (possible answers-solutions to questions-problems) and 'arguments' (evidence or viewpoints that support or object to ideas) [13],[14],[15].

Most public policy problems belong to this class of wicked problems, being characterised by high complexity, many heterogeneous views and conflicts among various stakeholders; these characteristics, in combination with the legalistic or specialist languages of the relevant government documents (e.g. reports, plans, laws, committees' minutes, etc.), make most public policy problems and the political debates on them difficult to understand by the 'simple citizen'. This has a negative impact on the quantity and quality of the political debates on them, putting barriers to both 'on-line' and 'off-line' public participation. However, limited research has been conducted on how we can use CSAV methods for conveying political information to the citizens concerning the substantial points and arguments of important political debates and documents in an easily and quickly understandable form, and how useful such an approach is for citizens. According to Renton & Macintosh [8] 'The use of argument visualization in a political context is still in its infancy'. Renton [7] investigates the use of CSAV in order to clarify to the public complex political issues, taking the minutes of two debates from the Scottish Parliament (concerning the introduction of the 'Terrestrial Trunk Radio Masts' (TETRA), and the 'Antisocial Behaviour'), converting them into arguments visualizations and then having them evaluated through one structured and two unstructured qualitative interviews. Renton & Macintosh [8] deal with how CSAV can be used to encourage debate and deliberation by citizens on public issues, in a manner that an electronic 'policy memory' can be formed; they demonstrate their approach (consisting of overview maps, dialogue maps and argument maps) through the creation of a set of maps representing the discussion that took place in the Scottish Parliament concerning the 'Smoking in Public Spaces' policy. Ohl [9] describes the application of CSAV for the diagrammatic representation of citizens' submissions in a public discourse on a draft South East Queensland Regional Plan, aiming to promote government transparency and accountability. It should be noted that all these three investigations of the exploitation of CSAV in the area of politics have been based on the abovementioned IBIS framework and used the 'Compendium' tool (http://compendium.open.ac.uk/institute/). From the above review of relevant literature it is concluded that further research is required for formulating appropriate ways and practices of using CSAV in the area of politics, for evaluating its usefulness in this respect and for identifying advantages, disadvantages and possible improvements of practices and tools.

3 Research Methodology

In order to develop a comprehensive approach to the use of CSAV in the legislation formation process for supporting and enhancing e-participation, and also 'off-line' participation as well, and in general the whole political debate on proposed new legislation, we adopted the following methodology:
- Initially we analyzed the process of legislation formulation in the Greek Parliament, the stages it includes and its main documents.
- Based on this analysis, we designed our approach concerning the documents for which visualizations should be constructed.
- Then we designed our approach concerning the most appropriate framework and tool to be used for these visualizations.
- As a next step we proceeded to a pilot 'real-life' implementation of the above approach for a bill under discussion in the Greek Parliament.
- Then we evaluated this pilot implementation using both quantitative and qualitative methods.
- Finally based on the conclusions of this evaluation we made the required improvements in our approach.

In particular, in order to understand and analyze the process, stages and documents of legislation formation we conducted interviews with three experienced officials of the Greek Parliament. Additionally we studied carefully and analyzed the justification reports and the main content (articles) of five laws from five different Ministries, which have been proposed to us by the above three officials of the Greek Parliament as representative ones; furthermore, we studied carefully and analyzed the minutes of the sessions of the competent Parliamentary committees in which these laws were discussed, and also of the corresponding plenary sessions. As such for each bill under discussion visualizations should be constructed for:
a) The justification report of the bill, representing the main reasons that necessitate the proposed law and the basic directions and solutions it provides,
b) The content of the bill, representing the issues settled by its articles, and the particular settlements provided,
c) The opinions and positions of each of the stakeholders' representatives and the experts invited in the competent Parliamentary committee (as recorder in its minutes), representing the main strengths, weaknesses and suggestions mentioned.
d) The positions of each of the parties' main speakers in the competent Parliamentary committee (as recorder in its minutes), representing the main strengths, weaknesses and suggestions mentioned.

Additionally, it is useful to construct an 'overview map' as well, as a starting point for the user, which includes nodes representing the above visualizations, and also the corresponding textual documents, providing hyperlinks to them.
For these visualizations we decided to use the IBIS framework [14],[15], as implemented by the 'Compendium' tool (http://compendium.open.ac.uk/institute/) as it is mature, having been used extensively in the past for arguments visualization in several different areas, including the area of politics [7],[8],[9], as mentioned in section 2, and it provides a simple but powerful typology of nodes for the representation of wicked problems.

4 A Pilot Implementation

A pilot implementation of the above visualization approach was made, as part of a Greek e-participation pilot of the LEX-IS project (www.lex-is.eu), which involved an e-consultation concerning the bill on the 'Contract of Voluntary Cohabitation', which regulates the matter of the formal voluntary co-habitation of two persons. This law formalizes and regulates an existing social situation: many couples, especially among the younger age groups, are reluctant to proceed directly to marriage, and choose to live together for long periods of times; 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 need to be regulated. Before the beginning of this e-consultation we constructed the visualizations mentioned in the previous section for this bill on the 'Contract of Voluntary Cohabitation', which were provided to the participants, together with the corresponding textual documents, as basic reference material; from these visualizations some representative ones are shown below.

The initial overview map is shown in Figure 1. It includes four map nodes, representing the visualizations of the bill justification report, the bill content, the experts' opinions and the parties' positions on it (arranged horizontally in chronological order), which are hyperlinked to the corresponding visualizations; also, it includes four reference nodes hyperlinked to the corresponding textual documents.

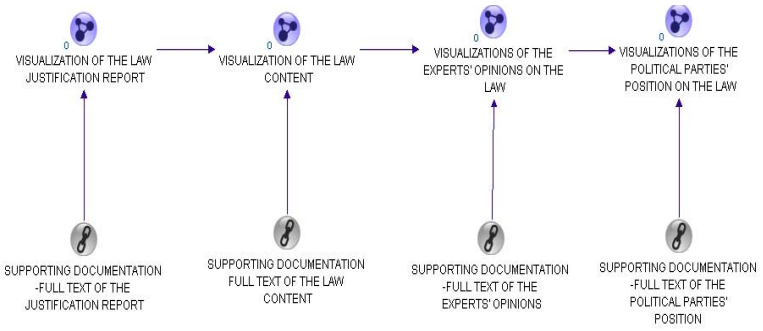

Fig. 1. Overview map

The visualization of the justification report is shown in Figure 2. It includes three of the types of nodes supported by the tool, with an adaptation of their meaning: note/information nodes (adapted as 'clarification' nodes), question nodes (adapted as 'problem-need' nodes) and idea nodes (adapted as 'solution' nodes). It is structured in four layers. The first layer includes (as clarification nodes) the reasons that create the need to legally regulate the voluntary cohabitation, which is modelled through a problem-need node in the second layer. The third layer represents this bill (proposed law) on the 'Contract of Voluntary Cohabitation' as the basic solution for this need, while the fourth layer includes the general directions of the law and the particular solutions it provides (modelled through solution nodes), and also a clarification on it, further elaborated by two more clarifications (all modelled as clarification nodes).

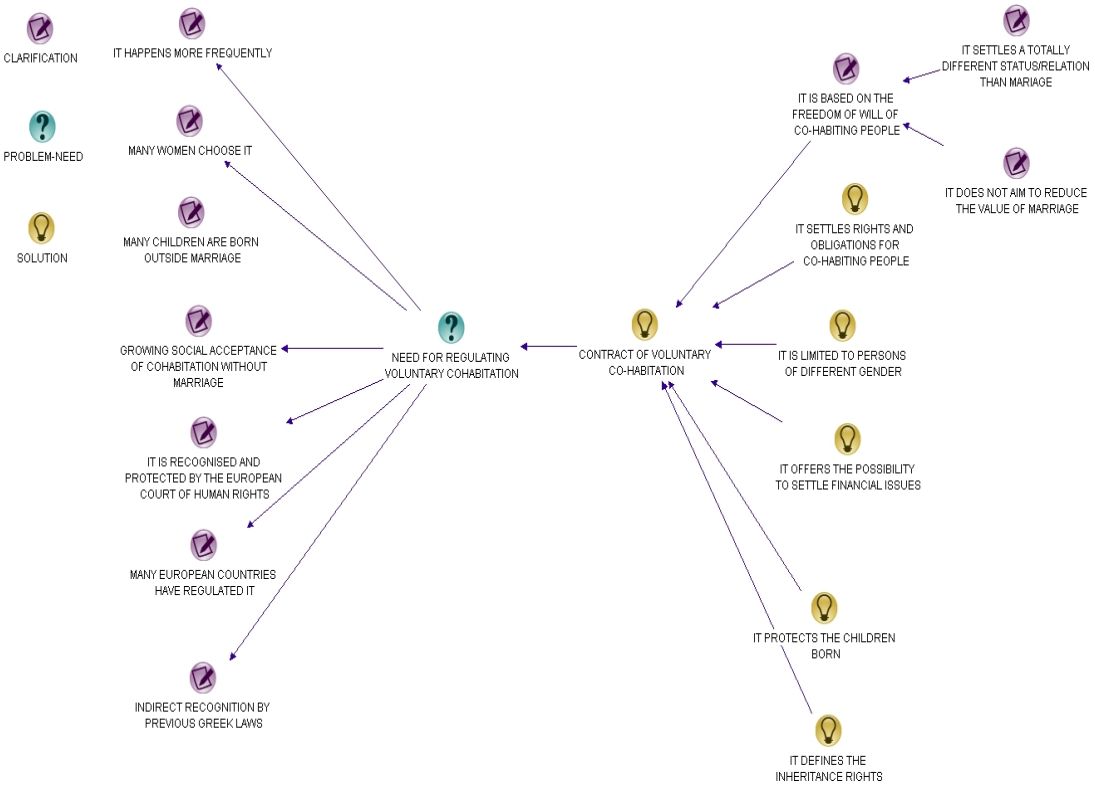

Fig. 2. Visualization of the justification report

The visualization of the content of the bill that we constructed was quite lengthy, so we decided to break it into: i) one high level visualization, which shows the main issues regulated by the articles of the law (as issue nodes) (Figure 3), and also ii) one lower level visualization for the content of each article; since the law includes 13 articles, we constructed 13 visualizations of them (in Figure 4 we can see the visualization of the content of the seventh article). For the visualization of the content of the bill we used four of the types of nodes supported by the tool with an adaptation of their meaning: question nodes (adapted as 'issue' nodes), idea nodes (adapted as 'settlement' nodes), note/information nodes (adapted as 'clarification' nodes) and map nodes (in the high level visualization, for providing hyperlinks to the lower level visualizations of the articles).

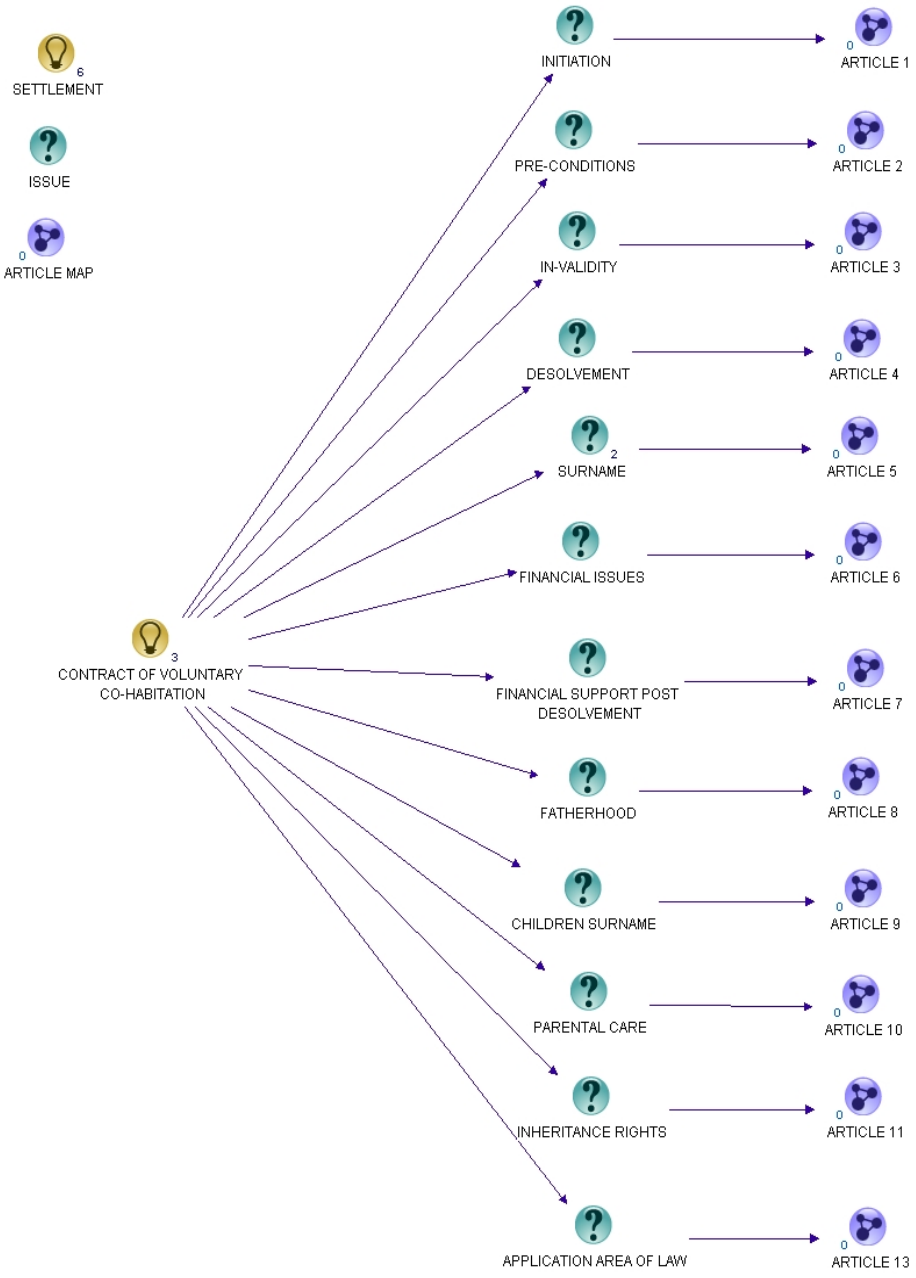

Fig. 3. High level visualization of the content of the bill

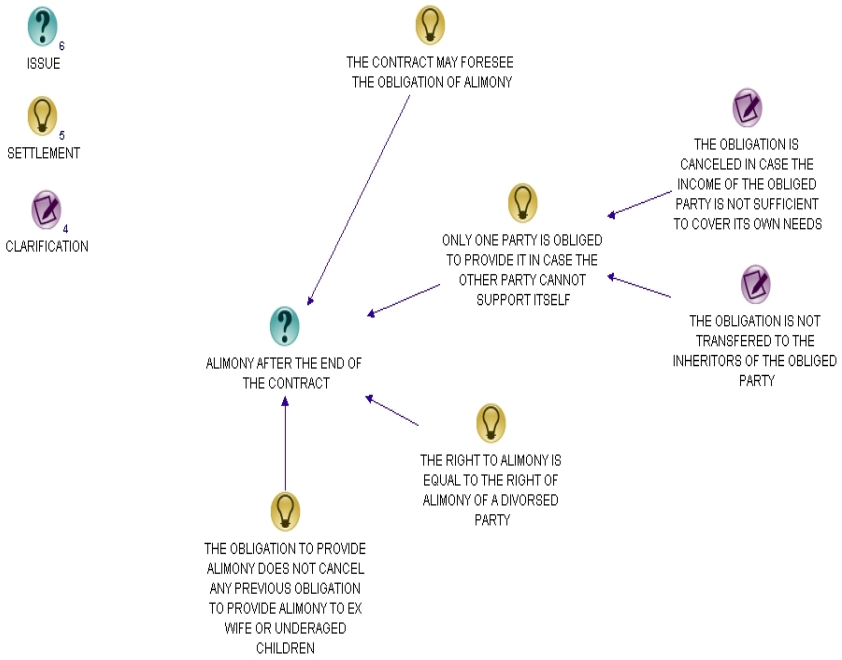

Fig. 4. Lower level visualization of the content of the seventh article of the bill

The visualization of the opinion of one expert invited by the competent Parliamentary committee is shown in Figure 5. It includes four of the types of nodes supported by the tool, with an adaptation of their meaning: one idea node (adapted as 'settlement' node) representing the whole bill, one contra-argument node (adapted as 'negative point' node), note/information nodes (adapted as 'clarification' nodes), and one question node (adapted as 'issue' node). We can see that this expert mentioned one main weakness of this bill (modelled as a negative point node), elaborating it through three clarifications (modelled as clarification nodes), which poses one basic issue (modelled as an issue node).

Finally in Figure 6 we can see the visualization of the position on this bill of a political party. It includes four of the types of nodes supported by the tool, with an adaptation of their meaning: one idea node (adapted as 'settlement' node) representing the whole bill, contra-argument nodes (adapted as 'negative point' nodes), note/information nodes (adapted as 'clarification' nodes), and one question node (adapted as 'issue' node). We can see that this political party mentioned four main weaknesses of this bill (modelled as a negative point nodes), and elaborated two of them it through clarifications (modelled as clarification nodes); also they raised one issue (modelled as an issue node) associated with one of the weaknesses

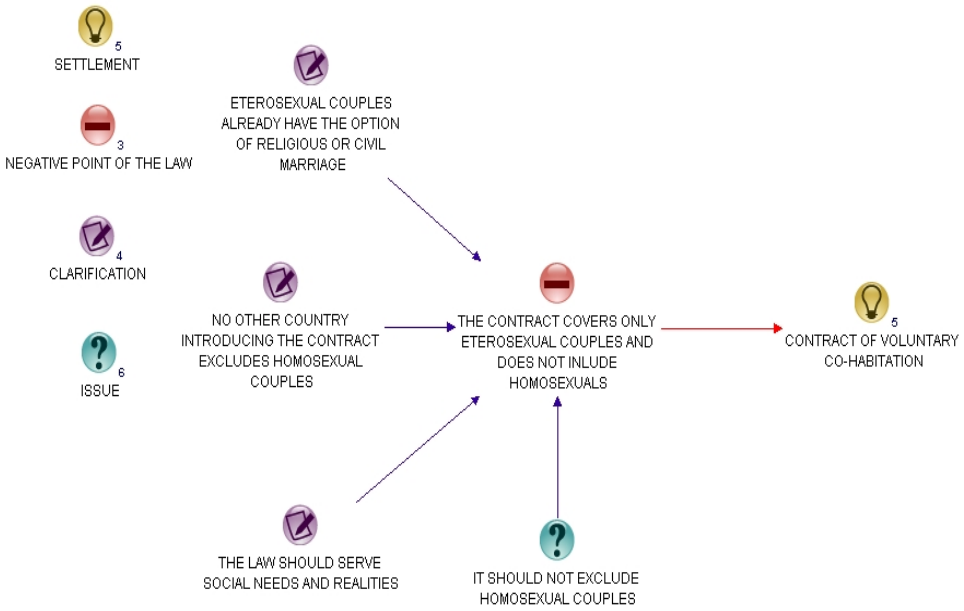

Fig. 5. Visualization of the opinion of an expert

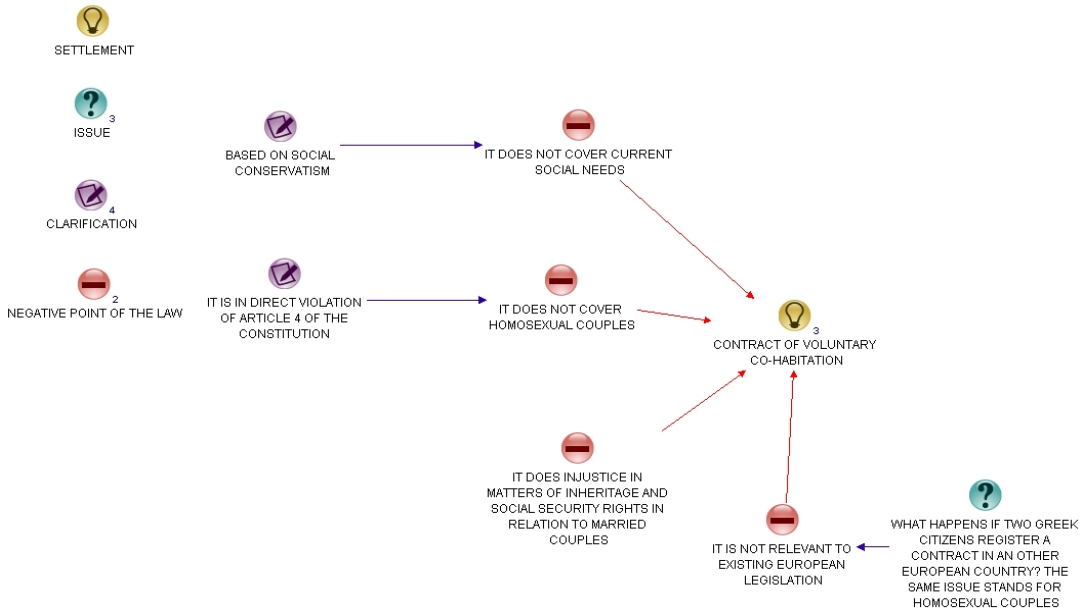

Fig. 6. Visualization of the position of a political party

5 Evaluation

The above pilot implementation of the proposed approach to the use of CSAV in the legislative process has been evaluated using both quantitative and qualitative methods, based on the 'Technology Acceptance Model' (TAM) [16],[17]. According to TAM, the main determinants of the attitude towards using an IS of its potential or real users are:
- its perceived usefulness (PU), defined as the extent to which users believe that using this IS will enhance their performance in a particular task,
- and its perceived ease of use (PEU), defined as the extent to which users believe that using the system will be free of effort.

In this direction in the participants' questionnaire we designed for the quantitative evaluation of this LEX-IS project e-participation pilot we included questions assessing the perceived ease of use and the usefulness of the visualizations. Also, in the in-depth semi-structured discussion we conducted for the qualitative evaluation of the same e-participation pilot one of the topics was the visualizations (with main sub-topics their ease of use, usefulness and proposed improvements).

Quantitative evaluation: The abovementioned quantitative evaluation questionnaire was returned by 27 out of the 79 registered participants in this e-participation pilot (34% response rate). In the following Table 1 we can see for each of the visualizations' evaluation questions the relative frequencies of answers (in the second column) and the average rating of the respondents (in the third column).

Table 1. Relative frequencies of answers and average ratings of the respondents in visualizations' evaluation questions

QUESTION	Relative frequencies of answers	average rating
Did you use the visualizations of the articles of the law, the expert reports and the party positions, provided in the platform?	1 (never): 4% 2 (once): 52% 3 (two-three times): 28% 4 (several times): 16%	2.56
Was it easy for you to understand the visualizations?	1 (not at all): 4% 2 (a little): 0% 3 (rather easy): 40% 4 (easy): 24% 5 (very easy): 32%	3.80
Were the visualizations sufficiently understandable, or did you feel the need to access the reference text in order to understand them?	1 (not at all): 4% 2 (moderately und.): 76% 3 (very understandable): 20%	2.16
To what extent did the visualization of the justification report of the bill help you to understand its content in a short time frame?	1 (not at all): 4% 2 (a little): 8% 3 (moderately): 44% 4 (much): 28% 5 (very much): 16%	3.44

To what extent did the visualization of the articles of the bill help you to understand their content in a short time frame?	1 (not at all): 4% 2 (a little): 8% 3 (moderately): 44% 4 (much): 16% 5 (very much): 28%	3.56
To what extent did the visualization of experts' opinions and parties' positions on the bill help you to understand their content in a short time frame?	1 (not at all): 4% 2 (a little): 12% 3 (moderately): 24% 4 (much): 20% 5 (very much): 40%	3.80

The first question concerns the extent of use of the visualizations. We remark that most of the respondents used the visualizations once, probably before the beginning of the e-consultation (52%), while a significant percentage of them used the visualizations more than one (44% = 28% two-three times + 16% several times). The next two questions concern the 'ease of use' of the visualizations. We remark that most of the respondents find the visualizations rather easy (40%), easy (24%) or very easy to understand (32%) (with an average rating of 3.80), and also moderately understandable (76%) or very understandable (20%) (closer to the former with an average rating of 2.16). Therefore the respondents believe that the visualizations, though not very easy, can be understood with a reasonable effort. The final three questions concern the 'usefulness' of the visualizations. We remark that the respondents on average find that the visualizations help them to a moderate to large extent to understand the justification report (average rating 3.44), the content (articles) of the bill (average rating 3.56) and also experts' opinions and parties' positions on the bill (average rating 3.80). We can see that the visualizations were more useful for understanding in a short time the opinions of experts and the positions of parties on the bill, than the content (articles) and the justification report of it, since the latter are both in a more legalistic and compact language, so they are more difficult to visualize and understand.

Qualitative evaluation: Additionally, a qualitative in-depth discussion of about four hours duration about this e-participation pilot was held in a focus-group, consisting of four participants in the pilot, a Legal Expert, a Lawyer Assistant to the Member of the Parliament (MP) who was the main speaker of the governing party for the bill, and one Official of the Parliament. The whole discussion was initially tape-recorded, and later transcribed. In this section are summarized the opinions expressed about the visualizations.

All the persons who participated in this discussion accepted that the visualizations were understandable to a rather good extent, after some first learning period of familiarization with the symbols of the nodes. However, it was mentioned that they would be easier to understand if all of them were read in the same direction (e.g. from left to right, harmonized with the direction of reading books), which should be clearly indicated. The visualizations of the opinions of the experts and the positions of the parties were more understandable and useful (since the corresponding textual documents were quite lengthy), than the visualisations of the content (articles) of the bill and its justification report. As main advantages of visualizations are regarded the

time efficiencies created for the participants who did not have the time to go through all the lengthy relevant textual documents provided. It was also mentioned that the visualizations 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 and also understand better their stance in the final balloting on the bill. A weakness of the visualizations of the articles of the bill came from the opinion of the Legal Expert involved in this focus-group discussion; in particular, she argued that in the visualization of the articles all the types of settlements included were represented by a single type of node ('settlement node'), though there are different kinds of legal rules, such as prohibitive, imperative, permitting and presumptions [18],[19], which should be represented by different types of nodes. Also, in these visualizations of the articles the sequence of reading these 'settlement' nodes should be indicated, and follow their sequence of the corresponding settlements in the text of the bill, since some of them were associated with previous ones.

6 Improvements and Conclusions

Based on the conclusions of the evaluation we proceeded to an improvement of our approach to the visualization of the bills' articles. In particular, we enriched the typology of nodes provided by the IBIS framework and the Compendium tool, by refining the 'settlement' type, taking into account the classification of rules proposed by jurisprudence [18],[19], into the following five types:

a) Prohibitive Rule: They are rules through which it is imposed to abstain from a particular behavior or exclude the coming of a certain outcome. This prohibition is usually accompanied with ratifications (e.g. invalidity, forfeiture of a right, obligation of reimbursement) 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 are 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 are 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 are 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) Settlement: With this type will be modeled rules defined in bills' articles, which do

not belong to any of the above four types

In Figure 7 we can see the visualization of the content of the seventh article of this bill using the proposed enriched typology of nodes, which has been designed using the 'Visio' tool (its initial visualization appears in Figure 4).

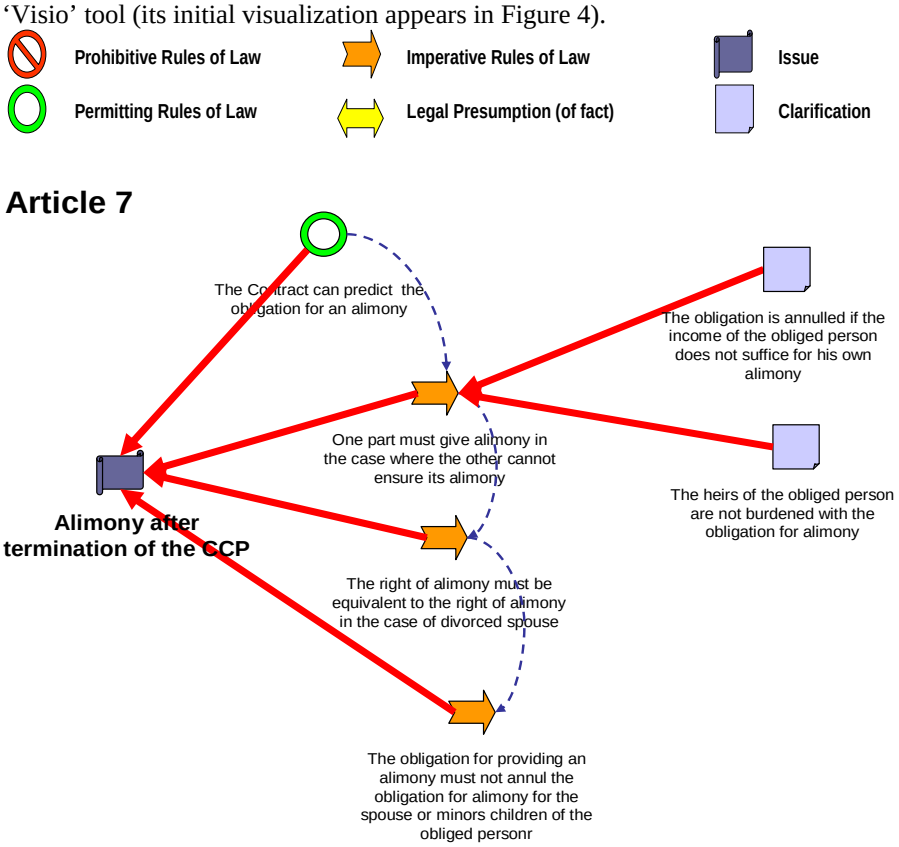

Fig. 7. Lower level visualization of the content of the seventh article of the bill

In the previous sections has been described a comprehensive approach to the use of CSAV in the legislative process, aiming to support and enhance e-participation in it, which has been designed based on the analysis of this process, its main stages and documents. Furthermore, a pilot implementation of this approach has been presented, which has been made as part of a pilot e-participation project in the Greek Parliament concerning the bill on the 'Contract of Voluntary Cohabitation'; it has been followed by a quantitative and qualitative evaluation, based on the 'Technology Acceptance Model' (TAM). From this evaluation it has been concluded that such visualizations are understandable to a rather good extent, after some familiarization period required; they can significantly help citizens to understand more easily and quickly the basic documents of the legislative process, enabling them to participate in it in a more meaningful manner. Our findings provide evidence of a high potential of CSAV in the area of politics, which can contribute to higher citizens participation in it, both from quantitative and qualitative perspective. Further research is required towards

exploring and exploiting this potential of CSAV, covering different countries and cultures, types of laws, citizens' groups and tools.

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