



Computer-supported G2G collaboration for public policy and decision-making

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Abstract

Purpose – This paper investigates whether and how G2G collaboration for policy and decision-making can be effectively supported by an appropriately developed information system.

Design/methodology/approach – The research method adopted in this paper follows the “Design Science Paradigm”, which has been extensively used in information systems research.

Findings – As resulted from the case study described in this paper, the proposed system has significant potential for supporting G2G collaboration for policy and decision-making. It can support the collaborative understanding of social problems and needs, and the development of alternative actions or solutions for them. In addition, it can support the collaborative development of detailed action plans for the selected alternative(s). During the implementation of these actions, the system can be used for the collaborative monitoring of them, the identification of implementation problems and issues, and the development of alternatives for managing them. Finally, it can be also used for the collaborative evaluation of these actions by the involved public organizations, as well as the citizens and groups who are their recipients.

Practical implications – Enhanced public policy and decision-making through the use of the proposed web-based system.

Originality/value – The main contribution of this paper lies in the development of a web-based system for supporting the G2G collaboration required for public policy and decision-making in the public administration, as well as the creation, leveraging and utilization of the relevant knowledge. The proposed system allows for distributed, synchronous or asynchronous, G2G collaboration and aims at aiding the involved public organizations by providing them a series of argumentation, decision-making and knowledge management features.

Keywords Decision making, Knowledge management, Government, Greece

Paper type Research paper

1. Introduction

The concept of e-Government has recently begun to receive increasing attention, adopting new governance models that rely on the extensive usage of information

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and communication technologies (ICTs), as well as on innovative (redesigned) business processes. In this direction, massive investments are being made in most developed and developing countries, while extensive research is being conducted (Holmes, 2001; Heeks, 2002; Leitner, 2003; Traunmueller and Wimmer, 2003; Burn and Robins, 2003). However, the majority of the current research and practical applications in the area of e-Government is mainly focused on carrying out electronic transactions, i.e. on offering citizens and enterprises the capability to perform transactions with the public administration (such as declarations, applications, etc.) via electronic channels (mainly the internet) at anytime and from anywhere, without having to visit the “physical” administrative offices.

The above “early period” of e-Government has been highly influenced by the concepts of e-commerce and e-banking (Turban *et al.*, 2004). In any case, the usage of ICTs in public administration during this period is not highly innovative; the main ICT-enabled innovation in public administration has been the development of *virtual public agencies* or *electronic one-stop shops*, i.e. single access points to many related electronic transactions and services, which are required in a particular event of life of the citizens or enterprises (“life event” approach) or by a particular group of citizens or enterprises (“target group” approach), while they are offered (or managed) by several different public organizations (Lenk, 1998; Wimmer, 2002; Leitner, 2003). For the above reasons, it has been constantly emphasized in the relevant literature that it is necessary to exploit the huge innovation potential of ICTs in the public administration to a much larger extent, in order to redesign and support the diversity of e-Government functions, thus heading for a “second generation” of more advanced and innovative e-Government applications (Lenk and Traunmüller, 2002; Traunmueller and Wimmer, 2003, 2004). Among the most critical functions of public administration that need to be supported in such a direction are:

- the design, implementation, monitoring and evaluation of public policies at all levels, such as highest-level public policy directions, legislation, action plans, development programs, etc.
- the high-level decision-making concerning complex social problems, such as granting of licenses and permissions with high social impact, managing severe environmental problems, etc.

The above high-level functions are of critical importance for the public administration, because they shape the context of all its lower level activities, which are associated with the production and delivery of public services to the citizens and enterprises. In other words, they are of critical importance for the whole society, having a significant impact on its well-being and development.

Generally speaking, public policy and decision-making are highly difficult and complicated tasks, characterized by not well-structured data and processes. Owing to the globalization of modern economy, social problems tend to become more and more multidimensional, while they often cross the borders of a region or even a country. Therefore, the related issues have to be addressed through close collaboration among many public organizations from various administrative layers and, very often, from different countries (e.g. central government organizations, regional administrations, prefectures, municipalities, local development organizations, employment organizations, social security organizations, education organizations, environmental

organizations, etc.). In addition, the participation of citizens, enterprises and their associations in such tasks is often required.

At the same time, there is no public organization possessing all the required competence, information and knowledge for managing the problem; instead, there are many public organizations and stakeholders involved, which possess only pieces of them. To efficiently address the problem, these pieces should be properly synthesized. Towards this aim, the exploitation of the capabilities of ICTs in supporting the required Government-to-Government (G2G) collaboration among all the parties involved in public policy and decision-making issues is of significant importance as far as efficiency, effectiveness and creativity are concerned.

The abovementioned G2G collaboration is critical for the creation, leveraging and utilization of knowledge in public administration. There is no doubt that one of the most important advantages of modern organizations in today's complex political, economic, social and technological environment is their ability to leverage and utilize their knowledge (Prahalad and Hamel, 1990). Such knowledge resides in an evolving set of organizational assets, such as the employees, the structure, the culture and the processes of the organization. Employee knowledge, and particularly tacit knowledge, has been identified to be the dominant one, which is decisive at all levels and has to be fully exploited (Nonaka, 1994). Such an exploitation refers to the transformation of tacit knowledge to codified information, which is considered as a critical process for organizational performance and success (Cohendet and Steinmueller, 2000). For the above reasons, we argue that it is necessary to adopt a *knowledge-based public policy and decision-making view* in the development of the supporting technologies (Holsapple and Whinston, 1996). According to this view, public policies and decisions should be considered as pieces of descriptive or procedural knowledge referring to an action commitment. Moreover, the public policy and decision-making process should be viewed as a collaborative production of new knowledge, such as evidence justifying or challenging an alternative or practices to be followed (or avoided), thus providing a refined understanding of the problem.

Taking into account the above requirements, this paper investigates whether and how G2G collaboration for policy and decision-making can be effectively supported by an appropriately developed information system. The research method we have adopted for this purpose follows the "Design Science Paradigm", which has been extensively used in information systems research (Markus *et al.*, 2002; Hevner *et al.*, 2004)[1]. Having followed this paradigm, our main contribution lies in the development of a web-based system for supporting the G2G collaboration required for public policy and decision-making in the public administration, as well as the creation, leveraging and utilization of the relevant knowledge. The proposed system allows for distributed (synchronous or asynchronous) G2G collaboration and aims at aiding the involved public organizations by providing them a series of argumentation, decision-making and knowledge management features.

More specifically, the research method followed consists of three steps:

- (1) understanding the nature of G2G collaboration for public policy and decision-making and analysis of the relevant requirements;
- (2) design and implementation of a web-based system for supporting the G2G collaboration for public policy and decision-making, according to the conclusions drawn in the first step;

- (3) evaluation of the system through an important real public policy problem, according to the well established and widely used technology acceptance model (TAM) (Davis, 1986, 1989; Davis *et al.*, 1989; Legris *et al.*, 2003; Lim, 2003).

The remainder of the paper is structured as follows: Section 2 discusses background issues concerning G2G collaboration for public policy and decision-making. Section 3 presents the features and functionality of the proposed system, while Section 4 describes its application in a real public policy problem. Finally, Section 5 discusses results obtained through the evaluation of the proposed system, while Section 6 draws conclusions.

2. Background issues

As mentioned above, it is clearly emphasized in the relevant literature that e-Government should not be limited to just enabling e-transactions of citizens and enterprises with public administration; instead, it should also aim at “higher level targets”, such as supporting the whole lifecycle of public policies and promoting the application of the “Good Governance Principles” shown in Table I (Leitner, 2003; Lenk and Traunmüller, 2001, 2002; Holmes, 2001).

In particular, the public policy lifecycle consists of the following phases, which should be efficiently supported by the appropriate ICTs.

- Environmental scanning and early identification of social problems and needs.
- Design of appropriate public policies for managing the problems and meeting the needs of citizens and enterprises.
- Elaboration of these public policies and development of action plans, programs and legislation.
- Implementation of the above public policies, action plans, programs and legislation, as well as production of the corresponding public services to citizens and enterprises with participation and coordination of all competent public organizations involved.
- Delivery of these public services to citizens and enterprises via integrated front offices.
- Evaluation of the public services by the recipient citizens and enterprises.

Good governance principle	Role of e-government
Participative democracy in policy making	Enables the active involvement of all stakeholders in policy making
Coherence in policy drawing	Allows for better policy coordination among ministerial departments, public agencies and layers of government
Consistency, effectiveness and efficiency in policy implementation	Facilitates cooperative – networked implementation in an easier, quicker and cheaper way
Transparency and openness of the whole policy process	Makes information accessible at a very low cost

Table I.
“Good Governance Principles” and e-Government impact in the public policies lifecycle

- Modification of the design and implementation of these services, according to the conclusions of the evaluation of the previous phase (whenever it is necessary, return to phases 3 or 4).

In the most critical public policy areas (such as economic development, environment, etc.), the management of the above lifecycle usually requires extensive G2G collaboration among numerous public organizations involved, due to the following reasons:

- The administrative systems of most countries are quite complicated, characterized by many administrative layers and a complex distribution of government tasks and competencies among numerous public organizations. In particular, in most countries there are four administrative layers, namely the layers of *Municipalities*, *Prefectures*, *Regions* and *Central Government*, while in some countries there is also a fifth one, that is the *Federal Government*. There are also many public agencies supervised by the public organizations of these administrative layers, e.g. local development agencies, environment agencies, etc. The coordination and collaboration among these administrative layers is quite difficult and complex.
- The existing international institutions, e.g. the European Union, add some more administrative layers, which very often should also participate in the above public policy lifecycle. The European Union, after its recent enlargement, consists of 25 member-states, therefore, quite extensive G2G collaboration will be required in order to achieve consensus among them, as far as design and implementation of common policies in various important public policy areas are concerned.
- The social problems today tend to become more multidimensional and cross many regions or even countries. The continuously growing international economic cooperation and interdependence gives rise to new complex problems of international nature. For instance, problems of economic recession in one country tend to expand to other cooperating countries as well.

Referring especially to the European Union, recent studies conclude that various types of G2G collaboration are required, such as “horizontal collaboration” (among public organizations of the same administrative layer), “vertical collaboration” (among public organizations of different administrative layers), or even collaboration among public organizations and non-government organizations, public-private partnerships, etc. (Leitner, 2003).

In any of the above G2G collaboration types, each of the public organizations involved possesses a small, but valuable, piece of information, experience, knowledge and competence about the problem or issue under consideration. It is also very often that they have different values, interests and expectations. Effective and efficient collaboration is of critical importance in these situations. However, geographical distance and time/budget limitations do not allow this collaboration to be tight enough, thus resulting in the design of suboptimal or even ineffective public policies and programs, developed without the necessary wide participation and contribution of all competent and knowledgeable parties.

The development of legislation and the public decision-making concerning difficult and complex social problems have similar characteristics: a high level of participation and close collaboration among the numerous stakeholders involved is required, but

very often this cannot be achieved due to distance, time and budget limitations. It should be also noted that in some phases of the public policy lifecycle mentioned above (usually in the initial and the final ones), not only public organizations but also citizens, enterprises and their associations participate as well.

In any case, problems to be addressed through G2G collaboration lack a unique, agreed-upon formulation or well-developed plans of action. Closure is often forced by political or social constraints, while such problems could not be solved by formal models or methodologies. Instead, an argumentative practical reasoning approach is the appropriate solution (Girle *et al.*, 2003); as argued in Buckingham Shum (2003), an *open-ended, dialectic process of collaboratively defining and debating issues* is a powerful way of discovering the structure of such problems. The above is in accordance with both the “Good Governance Principles” and the phases of the public policy lifecycle mentioned above. What actually happens in the context under consideration is that all parties involved initially identify the main problems and issues (concerning the particular social problem or need), and then propose possible actions and solutions. Next, for each of these actions and solutions, they articulate advantages and disadvantages according to their views and perceptions, while finally they express (directly or indirectly) preferences, which reflect their values, interests and expectations. Thus, public policy and decision-making processes have both a *rationality-related dimension* and a *socio-political dimension*, which should be appropriately tackled.

All the above advocate for maximum exploitation of the capabilities of modern ICTs towards supporting and facilitating G2G collaboration issues such as the required wide participation and interaction, argumentative discourse among all the parties involved, and appropriate synthesis of diverse inputs and interests. In this direction, Groupware and Computer Supported Collaborative Work (CSCW) advances have to be exploited and enhanced (Munkvold, 2003a; Churchill *et al.*, 2001; Beaudouin-Lafon, 1999; Lococo and Yen, 1998). The related tools and solutions are usually classified according to whether they support participants at the same place (collocated) or at different places (remote), and also whether the participants cooperate at the same time (synchronously) or at different times (asynchronously). The related tools and methods actually constitute the basic enablers of the “virtual teams” (so-called “communities of practice”), i.e. teams whose members are geographically remote and collaborate mainly via electronic channels for achieving a predefined common objective (Munkvold, 2003b; Prasad and Akhilesh, 2002; Lurey and Raisinghani, 2001; Furst *et al.*, 1999; Jackson, 1999; May and Carter, 2001; McDonough *et al.*, 2001). The members of a virtual team can belong either to the same organization or even to different cooperating organizations. However, as emphasized in the relevant literature, the effectiveness of a virtual team requires appropriate management and depends not only on the appropriateness of its technological infrastructure, but also on many other non-technical factors, such as the organizational context, the team design, the team synergy and the team processes.

We argue that proper adaptations and enhancements of the existing CSCW tools and solutions are needed, which have to incorporate the peculiarities and special needs of public administration, in order to support G2G collaboration. However, as noted above, public administration currently uses e-collaboration capabilities only to a small extent. Moreover, the small number of groupware tools used today in the public administration offer only limited and basic functionalities. For instance, we mention

here Communication and Information Resource Center Administration (CIRCA, www.eurodyn.com), the basic Groupware tool of the European Commission, which is used for supporting numerous European Union committees and workgroups (consisting of representatives from the member-states, European Commission Services and Agencies). The main orientation of the services provided by CIRCA (namely, information service, electronic library service, members directory service, meetings announcement and agenda service, newsgroups service, e-mail service and search service) is to support the “physical meetings” of the above workgroups (most of them meet every 1-2 months) and the exchange of information and documents between these meetings. However, from an extensive analysis of the requirements for electronic support of G2G collaboration, which has been conducted in the European public administration as part of the ICTE-PAN Project[2], it was concluded that more advanced electronic collaboration capabilities are required (Loukis and Kokolakis, 2003, 2004). The most important of them is the electronic support of structured argumentative discourse and interaction among remote workgroup members.

3. Supporting G2G collaboration

3.1 Collaboration through argumentative discourse

The representation and facilitation of argumentative discourses in diverse collaborative settings have been the subject of interest for quite a long time. Many interesting systems have been developed so far, based on alternative models of argumentation structuring. For instance, *QuestMap*[3], which is based on *gIBIS* hypertext groupware tool (Conklin and Begeman, 1989), can capture the key issues and ideas during meetings and attempts to create a shared understanding by placing all messages, documents and reference material for a project on a “whiteboard”. *Euclid* (Smolensky *et al.*, 1987) provides a graphical representation language for generic argumentation, whereas *Janus* (Fischer *et al.*, 1989) is based on acts of critiquing existing knowledge in order to foster the understanding of design knowledge. Questions, Options and Criteria (QOC), based on a representation model of the rationale of reasoning in a decision-making process, allows users to represent and integrate rationale of varying degrees of stability, at different stages in a design process (Shum *et al.*, 1993). *Sibyl* (Lee, 1990) provides services for the management of dependency, uncertainty, viewpoints and precedents.

More recent approaches pay particular attention to the visualization of argumentation in various collaborative settings. As argued in Kirschner *et al.* (2003), visualization of argumentation can facilitate problem solving in many ways, such as in explicating and sharing representations among the actors, in maintaining focus on the overall process, as well as in maintaining consistency and in increasing plausibility and accuracy. A representative approach of this stream of research is *Compendium*, which was first developed to aid cross-functional business process redesign teams, and resulted to the implementation of the *Visual Explorer* and *Mifflin* software tools (Selvin, 2003). In the same line, argument visualization tools such as *Araucaria* (www.computing.dundee.ac.uk/staff/creed/research/araucaria.html), *Athena* (Rolf and Magnusson, 2002), *Reason!Able* (van Gelder and Bulka, 2000) and *Belvédère* (Suthers, 2001) have been developed and tested in diverse collaborative and educational sense-making contexts.

Generally speaking, the above systems provide a cognitive argumentation environment that stimulates reflection and discussion among participants. However, issues related to temporal and spatial distances are not fully addressed; these systems

do not exploit any network infrastructure, thus users can work in an asynchronous way only through a human mediator who receives their contributions and appropriately deploys them to the system. Similar criticism holds for the display of each collaboration instance to all parties involved. As argued in van Gelder (2003), “packages in the current generation of argument visualization software are fairly basic, and still have numerous usability problems”. Most important, this category of systems do not integrate any reasoning mechanisms to (semi)automate the underlying decision-making processes required in a G2G collaboration setting.

Increasing interest has been also developed in implementing web-based conferencing systems, such as *AltaVista Forum Center*, *Open Meeting* and *NetForum*. Such systems exploit the platform-independent communication framework of the web, as well as its associated facilities for data representation, transmission and access. They usually provide means for discussion structuring and user administration tools, while the more sophisticated ones allow for sharing of documents, online calendars, embedded e-mail and chat tools, etc. Discussion is structured via a variety of links, such as simple responses or different comment types (e.g. qualify, agree, example in *Open Meeting*) to a previous message.

This second category of systems meets the requirements that are related to the spatial and temporal distances between members of a team. However, it merely provides threaded discussion forums, where messages are linked passively; this usually leads to an unsorted collection of vaguely associated comments. As pointed out by the developers of *Open Meeting*, “there is a lack of consensus seeking abilities and decision-making methods” (Hurwitz and Mallery, 1995). Moreover, as in the previous category of systems, issues related to the appropriate storage of knowledge in order to be exploited in future collaboration settings are not addressed. In any case, both the above categories do not appropriately handle the peculiarities and special needs of G2G collaboration for public policy and decision-making.

3.2 *The proposed solution*

To address the above requirements, we have implemented a web-based system that supports the G2G collaboration required for public policy and decision-making by facilitating the creation, leveraging and utilization of the relevant knowledge. We have followed an argumentative reasoning approach, which complies with both the “Good Governance Principles” and the phases of the public policy lifecycle mentioned in Section 2. The overall framework of our approach extends the one conceived in the development of the *Hermes* system (Karacapilidis and Papadias, 2001), by providing additional knowledge management and decision-making features (Figure 1).

Discourses about complex problems in the public sector are considered as social processes and, as such, they result in the formation of groups whose knowledge is clustered around specific views of the problem. Following an integrated approach, our system provides public organizations engaged in such a discourse with the appropriate means to collaborate towards the solution of diverse issues. In addition to providing a platform for group reflection and capturing of organizational memory, our approach augments teamwork in terms of knowledge elicitation, sharing and construction, thus enhancing the quality of the overall process. This is due to its structured language for conversation and its mechanism for evaluation of alternatives. Taking into account the input provided by the individual public organizations, the system constructs

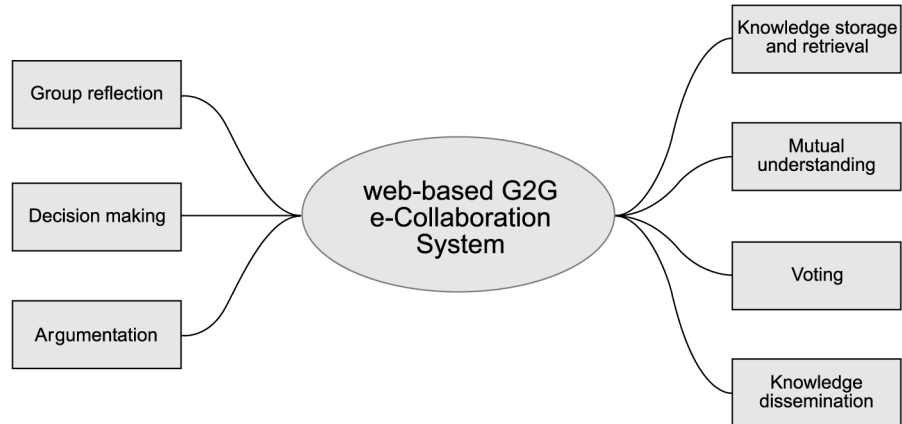


Figure 1.
Features supported in the
proposed system

an illustrative discourse-based knowledge graph that is composed of the ideas expressed so far, as well as their supporting documents. Moreover, through the integrated decision support mechanisms, discussants are continuously informed about the status of each discourse item asserted so far and reflect further on them according to their beliefs and interests on the outcome of the discussion. In addition, our approach aids group sense-making and mutual understanding through the collaborative identification and evaluation of diverse opinions. Such an evaluation can be performed through either argumentative discussion or voting.

Furthermore, our system provides a shared web-based workspace for storing and retrieving the messages and documents of the participants, using the widely accepted XML document format. Exploitation of the web platform renders, among others, low operational cost and easy access to the system. The knowledge base of the system maintains all the above items (messages and documents), which may be considered, appropriately processed and transformed, or even re-used in future discussions. Storage of documents and messages being asserted in an ongoing discussion takes place in an automatic way that is upon their insertion in the knowledge graph. On the other hand, retrieval of knowledge is performed through appropriate interfaces, which aid users explore the contents of the knowledge base and exploit previously stored or generated knowledge for their current needs. In such a way, our approach builds a “collective memory” of a public sector community.

The basic discourse elements in our system are *issues*, *alternatives*, *positions*, and *preferences*. In particular, issues correspond to problems to be solved, decisions to be made, or goals to be achieved. They are brought up by users representing a public organization and are open to dispute (the root entity of a discourse-based knowledge graph has to be an issue). For each issue, the users may propose alternatives (i.e. solutions to the problem under consideration) that correspond to potential choices. Nested issues, in cases where some alternatives need to be grouped together, are also allowed. Positions are asserted in order to support the selection of a specific course of action (alternative), or avert the users’ interest from it by expressing some objection. A position may also refer to another (previously asserted) position, thus arguing in favor or against it. Finally, preferences provide individuals with a qualitative way to weigh

reasons for and against the selection of a certain course of action. A preference is a tuple of the form (*position, relation, position*), where the relation can be “more important than” or “of equal importance to” or “less important than”. The use of preferences results in the assignment of various levels of importance to the alternatives in hand. Like the other discourse elements, they are subject to further argumentative discussion.

The above four types of elements enable the users of the system, who typically represent public organizations or other parties involved in a public policy or decision-making discourse, to contribute their knowledge on the particular social problem or need (by entering issues, alternatives and positions) and also to express their relevant values, interests and expectations (by entering positions and preferences). In such a way, the system supports both the rationality-related dimension and the socio-political dimension of the public policy and decision-making process. Moreover, the system continuously processes the elements entered by the users (by triggering its reasoning mechanisms each time a new element is entered in the graph), thus facilitating users to become aware of the elements for which there is (or there is not) sufficient (positive or negative) evidence, and accordingly conduct the discussion in order to reach consensus.

The features and functionalities of the proposed system, as well as its applicability in supporting G2G collaboration for public policy and decision-making, are presented in more detail in the following section through an illustrative application.

4. The case of establishment of non-state universities in Greece

A real-life application of the system, for one of the most important, difficult and widely discussed public policy issues in Greece was organized. The case concerned the establishment or not of non-state universities. Today in Greece, all universities are “state” ones, being established and supervised by the Ministry of National Education. According to the Greek Constitutional Law, the higher education should be provided only by the State, and not by any private-sector enterprises. However, it has been proposed by some politicians and private companies that this status should be changed; initially, new “state universities” should be established, not by the Ministry of Education, but by other public sector organizations, such as big municipalities, chambers of industry and commerce, the Church, etc. It has been also proposed that, as a next step, the Constitutional Law should be amended, so that it will allow higher education to be provided by private-sector companies as well. However, there are many parties and citizens who strongly object to the establishment of private universities. In this public policy issue many public organizations are involved (the Ministry of National Education, the Universities, the big Municipalities, the Chambers of Industry and Commerce, the Church, etc.), therefore, extensive G2G consultation and collaboration is required among them concerning this issue. In addition, there exist private sector stakeholders involved, namely the owners of various existing private non-university level educational institutions, who would be interested to establish private universities (mainly in cooperation with foreign universities), if the related Constitutional Law amendment will be made. From the above, one can easily conclude that the public policy issue under consideration is quite complicated, while diverse arguments both in favor and against all the proposed alternatives should be expected. At the same time, it is of critical importance for numerous young people in Greece and their families.

Four groups of users participated in this application, each one representing a significant stakeholder in the issue: the Ministry of National Educational (with three persons), the University Professors (with four persons), the Chambers of Industry and Commerce interested in establishing non-profit universities (with three persons) and owners of existing private educational institutions (with four persons). Participants were geographically dispersed and had access to the system via an internet connection and their favorite web browser. They had all a good familiarity with using computers and internet, while they had all previously participated (at least once) in an unstructured electronic forum on the internet. They were trained by postgraduate students, who visited them in their own locations and introduced them in the basic functionality of the system. This training took on average less than an hour.

An instance of the argumentative discourse developed during their collaboration is shown in Figure 2 (we asked participants to carry out this experiment in English)[4]. As shown, our approach maps the overall collaboration process to a discourse-based knowledge graph with a hierarchical structure. Each entry in the graph corresponds to an argumentation element (i.e. issue, alternative, position or preference). Each element is accompanied by an icon that indicates the element type. There are also icons for folding/unfolding purposes, thus enabling users to concentrate on a specific graph's

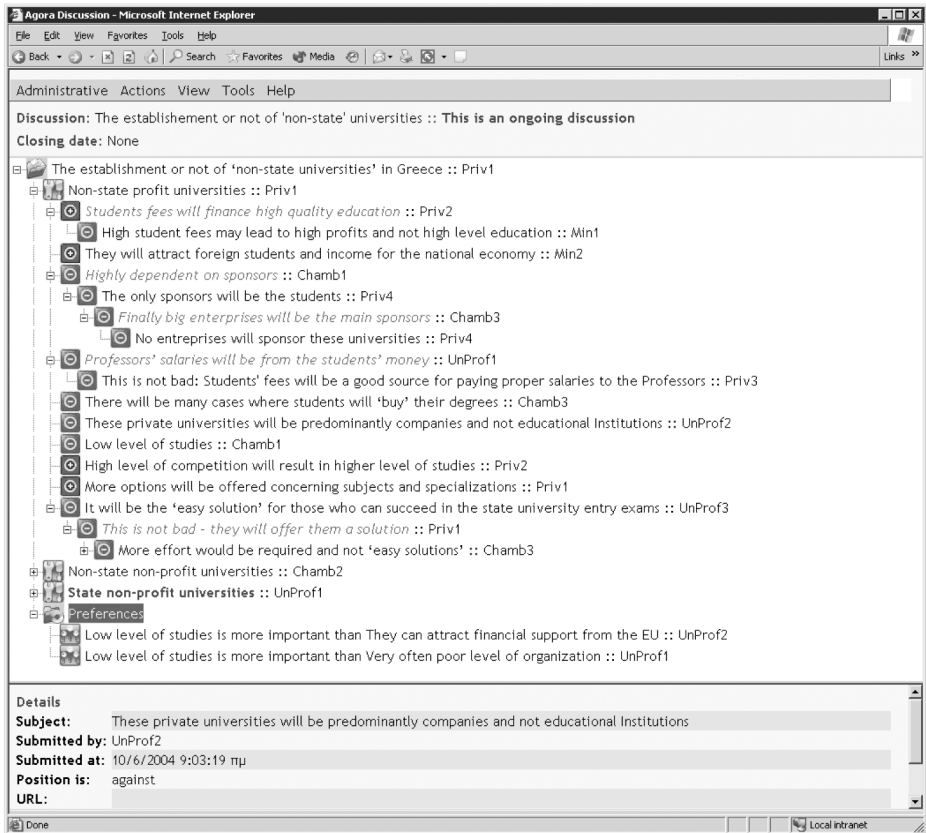


Figure 2.
An instance of the
argumentative discourse

part; this is particularly useful in graphs of considerable length and complexity. Each entry in the graph may contain the username of the user who submitted it and the date of submission (alternative forms in the appearance of each entry can be obtained through options provided under the View menu).

In the application discussed in this paper, the usernames used declare the type of the group the participant belongs to; for instance, the usernames Min1, Min2 and Min3 correspond to users representing the Ministry of National Education, the ones starting with UnProf the group of University Professors, and so on). The system may also support “anonymous discourse”, by not revealing the name of the user who entered an element. According to the relevant literature (Beaudouin-Lafon, 1999; Lococo and Yen, 1998), such an approach may be useful in cases where more freedom in ideas generation is sought; also, it often allows users to evaluate each entry more impartially, without taking into account the hierarchical position, the social status and the other characteristics of the user who contributed it. The lower pane of the window shown in Figure 2 provides more details about a selected entry of the discussion graph (users can select an entry by clicking on it).

In our case (Figure 2), the overall issue under discussion is “The establishment or not of non-State Universities in Greece”, while three alternatives, namely “Non-state profit universities”, “Non-state non-profit universities” and “State non-profit universities”, have been asserted so far by the users Priv1, Chamb2 and UnProf1, respectively. The users (discussants) have argued about them extensively, by expressing positions speaking in favor or against them. For instance, “They will attract foreign students and income for the national economy” is a position (asserted by Min2) that argues in favor of the first alternative, while “Highly dependent on sponsors” is a position (asserted by Chamb1) that argues against it. All graph entries are subject to multi-level argumentation. For instance, “Easy solutions are disastrous” has been asserted by UnProf4 to further validate the “More effort would be required and not easy solutions” position (asserted by Chamb3), while “No enterprises will sponsor these universities” to challenge the “Finally big enterprises will be the main sponsors”.

As noted in the previous section, users may also assert preferences about the already expressed positions. As shown in the bottom of the main pane of Figure 2, users UnProf2 and UnProf1 have expressed two preferences concerning the relative importance between the position “Low level of studies” and two others (namely, “They can attract financial support from the EU”, and “Very often (there is a) poor level of organization”), arguing that the first position is (for them) of bigger importance. Users may also express their arguments in favor or against a preference. Figure 2 also shows the full information provided in the lower pane of the basic interface of the system. This comprises details about the user who submitted the selected discussion element, its submission date, any comments that the user may have inserted, as well as links (URLs) to related web pages and documents that the user may have uploaded to the system in order to justify this element and aid his/her peers in their contemplation.

Further to the argumentation-based structuring of a discourse, the system integrates a *reasoning mechanism* that determines the status of each discussion entry, the ultimate aim being to keep users aware of the discourse outcome. More specifically, alternatives, positions and preferences of a graph have an *activation label* (it can be “active” or “inactive”) indicating their current status (inactive entries appear in red italics font). This label is calculated according to the argumentation underneath and

the type of evidence specified for them. Activation in our system is a recursive procedure; a change of the activation label of an element is propagated upwards in the discussion graph. Depending on the status of positions and preferences, the mechanism goes through a scoring procedure for the alternatives of the issue[5]. At each discussion instance, the system informs users about what is the most prominent (according to the underlying argumentation) alternative solution (this is shown in blue bold font). In the instances shown in Figures 2 and 3 (all items asserted under the first alternative are shown in Figure 3, while items under the second and third alternatives are unfolded – the opposite holds for Figure 2), “State non-profit universities” is the better justified solution so far. However, this may change upon the type of the future argumentation. In other words, each time an alternative is affected during the discussion, the issue it belongs to is updated, since another alternative solution may be indicated by the system.

Positions, preferences and alternatives may be also evaluated by voting. In such a case, the “majority rule” is used in order to decide whether the item is active or inactive (that is, whether it should be taken into account in the overall evaluation of the issue under consideration). In order for an item to become subject to voting, the user who has

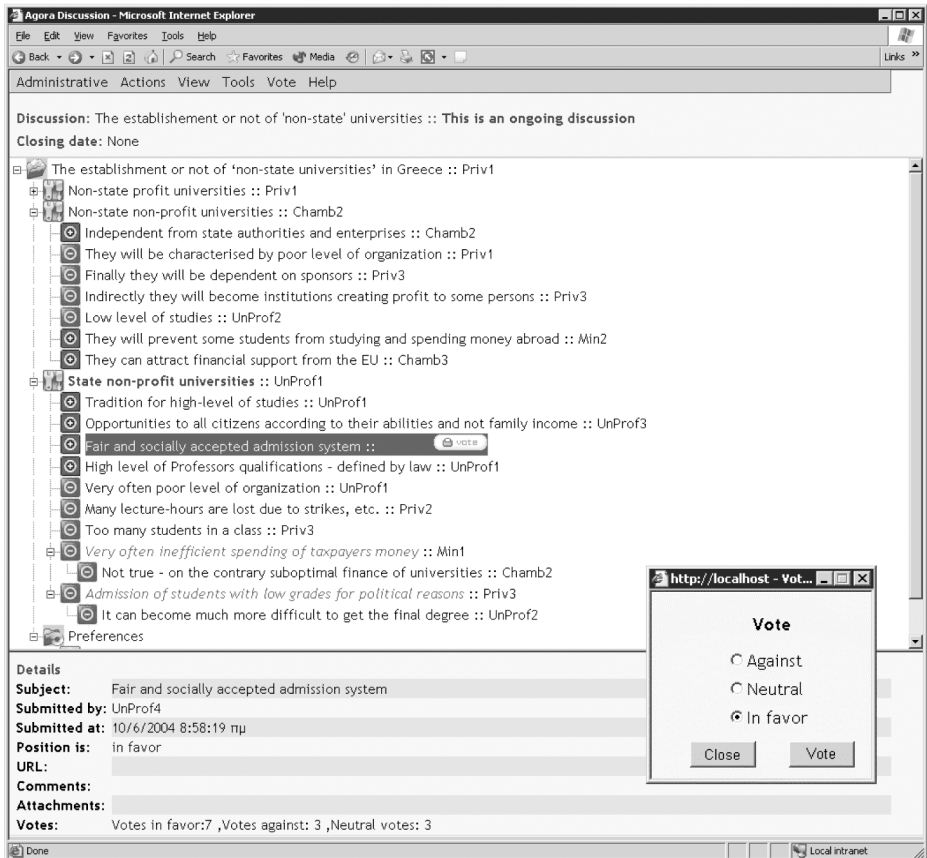


Figure 3. Another instance of the argumentative discourse and the voting option

asserted should take the appropriate action (the related option appears under the Vote menu). When an item is subject to voting, an indicative icon appears at the end of it. Any user may then vote about the validity of the item, having the options “in favor”, “neutral”, and “against” (the related option also appears under the Vote menu, and the small window of Figure 3 pops up). Such a case is shown in the discussion instance of Figure 3, for the position “Fair and socially accepted admission system”, asserted by UnProf4. As one can see in the lower pane of the figure, 13 (out of 14) users have voted so far, while the results are seven votes in favor, three votes against, and three neutral votes.

The system also integrates *e-mailing and electronic messaging features* (options provided under the Tools menu) to further facilitate the communication among users before one asserts an argumentation element in the graph. The insertion of all types of entries in the graph is performed through appropriately designed interfaces deployed upon the user’s selection under the Actions menu. Such functions include the *opening of an issue*, *insertion of a new alternative* (to an issue), *insertion of a new position* (in favor or against an existing position, preference or alternative), and *insertion of a new preference* (to an existing issue). Editing features are also provided.

The user interface for adding a new alternative to an existing issue is shown in the bottom left part of Figure 4. As shown, users can give a *subject* (title) of the new alternative, but also provide more details about their assertion through the *URL* (related web addresses) and *comments* (free text) panes. Moreover, they can attach multimedia documents to their discourse items. The user interface for adding a new position is shown in the top left part of Figure 4. The father element can be an alternative, another position, or a preference. In addition to the “Add a new alternative” interface, users have to specify here the type of link (*in favor* or *against*) and the proof standard they prefer (depending on the discussion context, this option may be inactivated; that is, the same proof standard is used for all positions). The top right part of Figure 4 shows the user interface for adding a new preference to an issue. The interface provides users with the means to consider all valid combinations of positions, thus preventing them from making errors in expressing a preference. The relation type menu includes the preference relations “more (less) important than” and “equally important to”. Finally, the user interface for adding a new issue is shown in the bottom right part of Figure 4.

5. Discussion and evaluation

The proposed system was thoroughly evaluated through the above case. More specifically, we gathered quantitative and qualitative data through the following actions:

- observation of the whole electronic argumentation, paying particular attention to its gradual development;
- free discussion (over the phone, immediately at the end of the argumentation) with all participants about their impressions and the difficulties they encountered using the proposed system;
- analysis of the final discourse tree after the end of the argumentation;
- analysis of the answers given by all participants to a structured questionnaire that was handed to them after the end of this experience.

The figure displays four screenshots of web-based user interfaces for adding new elements to a system. Each interface is shown in a Microsoft Internet Explorer browser window.

- Add new position:** The 'In' field contains 'Independent from state authorities and enterprises'. The 'Subject' field is empty. The 'Position is' field has radio buttons for 'in favor' (selected) and 'against'. The 'Proof standard' field has a dropdown menu with 'Preponderance of Evidence' selected. The 'URL' and 'Comments' fields are empty. The 'Add attachments' section has two 'File' input fields, each with a 'Browse...' button. At the bottom are 'Submit Position', 'Clear', and 'Cancel' buttons.
- Add new preference:** The 'In' field contains 'Independent from state authorities and enterprises'. The 'Subject' field has a dropdown menu with 'is more important than' selected. The 'URL' and 'Comments' fields are empty. The 'Add attachments' section has two 'File' input fields, each with a 'Browse...' button. At the bottom are 'Submit preference', 'Clear', and 'Close' buttons.
- Add new alternative:** The 'In Issue' field contains 'The establishment or not of 'non-state universities' in Greece'. The 'Subject' field is empty. The 'URL' and 'Comments' fields are empty. The 'Add attachments' section has two 'File' input fields, each with a 'Browse...' button. At the bottom are 'Submit Alternative', 'Clear', and 'Cancel' buttons.
- Add new Issue:** The 'In issue' field contains 'The establishment or not of 'non-state universities' in Greece'. The 'Subject' field is empty. The 'URL' and 'Comments' fields are empty. The 'Add attachments' section has two 'File' input fields, each with a 'Browse...' button. At the bottom are 'Submit Issue', 'Clear', and 'Cancel' buttons.

Figure 4.
User interfaces

As far as the first action is concerned, we were continuously monitoring the basic screen of the system (Figures 2 and 3) during the whole duration of the electronic argumentation, observing one by one the actions of the participants and the argumentation elements entered. In this way, we observed in detail the gradual development of the discourse-based graph. The main remark was that participants were initially making a few mistakes: some of the elements inserted by them were not correctly associated with the right “father” element. In all these cases, participants were getting immediately aware of the mistake (without any hint from us), and they were correcting it by deleting the corresponding element and entering it again with the correct association. However, after some time, they became familiar with the argumentation elements and the related associations, and such mistakes stopped to occur.

In the free discussion that took place by phone at the end of the electronic argumentation, all participants admitted that their overall impression from the system was positive. As main advantages of the system, they mentioned that: it is easy to learn its basic functionality (e.g. the basic menus and commands), it organizes the discussion efficiently (“it helps you organise your thoughts better and make more focused contributions”), while it stimulates creativity and further discussion among participants (“the contributions of the others help you think of more ideas and arguments”). On the other hand, as main difficulties encountered, they mentioned that it is difficult to get quickly acquainted with the system, and with electronic argumentation in general, as far as the right association of elements is concerned

(“we probably had to go through a longer presentation of the system and the overall electronic argumentation procedure”). They also pointed out that the overall process is quite demanding and requires a high level of concentration and mental effort, and that it is often difficult to express a discussion element in a few words only (similarly, that it is also difficult to fully understand the meaning of a discussion element that has been expressed by another participant in a few words). However, they admitted that the last two difficulties appear, to some degree, in a face-to-face discussion as well. From the above, it was concluded that participants found the system useful and managed to learn its basic functionality after only a short training, but they had difficulties in getting acquainted with participating in an electronic argumentation, which is quite different from the usual (physical) argumentation conducted in face-to-face meetings.

The analysis of the complete discourse-based graph (see Appendix) was based on the calculation of a number of indices that quantify the elements entered by the participants, as well as the associations among these elements. More specifically, we calculated the following indices:

- total number of elements of the discourse tree;
- number of elements per type (i.e. number of issues, alternatives, positions and preferences) and per level (first level elements, second level elements, etc.); and
- percentage of the elements associated with an element entered by a different participant, as a measure of interaction among participants.

In total, 41 elements were asserted: three alternatives, 36 positions (12 positive and 24 negative ones) and two preferences. Twenty-six of the positions were of first level (i.e. directly associated with one of the proposed alternatives), while the remaining ten were of higher levels (i.e. associated with another position), up to the fourth level. Therefore, we conclude that the discussion was extensive, productive and of considerable depth. Also, 26 out of these 41 elements (63 percent) were associated with a “father” element asserted by another participant. Therefore, we observe that a high level of interaction among participants took place in this electronic collaboration, since about two thirds of the expressed elements were based on and inspired from an element expressed by another user.

Finally, as mentioned above, participants were asked to fill in a structured questionnaire consisting of two parts with 14 questions in total. The design of this questionnaire was based on the TAM, proposed by Davis in his Doctoral Dissertation (Davis, 1986). TAM aims at explaining and predicting information systems acceptance and usage (Davis, 1989; Davis *et al.*, 1989) and has been extensively used and elaborated since its introduction (Legris *et al.*, 2003; Lim, 2003; Amoako-Gyampah and Salam, 2004). According to TAM, the *perceived usefulness* (PU) and the *perceived ease of use* (PEU) of an information system are the main determinants of the attitude of users towards using it, while this attitude of the users is the main determinant both of their behavioral intention to use the system and also of the actual system usage by them. PU is defined as “the extent to which a person believes that using the system will enhance his/her job performance”, while PEU as “the extent to which a person believes that using the system will be free of effort”. The effects of all external variables associated with the system (such as system characteristics, functionality, interface, development process, users training, etc.) on the intended or actual system usage are mediated by PU and PEU.

Concerning information systems evaluation, the practical implication of TAM is that, in order for the evaluation to be effective and highly correlated with actual system use, it has to focus on the determinants of PU and PEU. In this direction, taking into account that the usefulness of our system depends on how well it structures the discussion and stimulates interaction and discussion among participants, we selected these two characteristics as main determinants of its PU. Also, taking into account that the effort of the users for using the system depends initially on how easy it is to learn the system and get acquainted with it, and then how easy it is to use it for participating in electronic argumentation, we selected these two characteristics as main determinants of the PEU of our system. For this reason, the first part of the questionnaire included one question for each of the above four characteristics. Participants were asked to rate the extent they agree (or not) that the system has a particular characteristic according to the five-level scale (*strongly agree, agree, neutral, disagree, strongly disagree*). Also based on TAM, the first part of the questionnaire included two additional questions concerning the general attitude towards using the system (asking whether the system is enjoyable or not) and the participants' intention to use it again.

Results obtained from this first part of the questionnaire are summarized in Table II. As shown, all participants were positive or neutral (while 64.3 percent of them agreed or strongly agreed) that the system has the two PU determinant characteristics; this is in agreement with what participants told us in the free discussion after the end of the electronic argumentation, and confirms that participants found the system very useful. Also, we remark that all participants were positive or neutral (while 79 percent agreed or strongly agreed) that it was easy to use the system. However, 57 percent agreed or strongly agreed that it is easy to learn the system, while 21.5 percent were neutral, and 21.5 percent disagreed. Taking into account what the participants told us in the free discussion, these results reflect the difficulty the participants had in getting acquainted with participating in an electronic argumentation experiment, basically due to the short training they had. Concerning the general attitude towards using the system, 93 percent were positive or neutral (while 64.3 percent of them agreed or strongly agreed) that the system is enjoyable, while all participants were positive or neutral (57 percent of them agreed or strongly agreed) when expressing their intention to use the system again in the future. These results are quite encouraging, taking into account the short experience the participants had with the system (less than one hour training and one hour duration of the electronic argumentation).

Since the main difficulties mentioned by the participants in the free discussion concerned PEU (and not PU), the second part of the questionnaire included eight

Characteristic	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Organizes the discussion efficiently	2	7	5	0	0
Stimulates discussion	1	8	5	0	0
Easy to learn	1	7	3	3	0
Easy to use	5	6	3	0	0
Enjoyable	1	8	4	1	0
I would like to use it again	2	6	6	0	0

Table II.
Evaluation
results – Part A

questions focused on this very issue. Participants were asked to rate to what extent they agree (or not) that the system has eight PEU-related characteristics in the three-level scale (*agree, neutral, disagree*). These eight characteristics concern four different dimensions of PEU, namely:

- (1) how easy it was to find, understand and use the available options;
- (2) how easy it was to use the system’s interfaces and navigate through the system;
- (3) how easy it was to understand the content of the electronic argumentation; and
- (4) whether, during the whole duration of the electronic argumentation, what they had done so far and what they had to do next was clear to them.

Results obtained from this second part of the questionnaire are shown in Table III. We remark that while all participants agreed or were neutral that it is easy to find, understand and use the available options and interfaces (with only some problems concerning the consistency of the navigation), some of them had difficulties in understanding the electronic argumentation content itself, as well as in understanding what they had done at certain argumentation instances and what they had to do next. In any case, with the exception of the “it is easy to find out the available options” issue, the percentage of the positive answers (*agree*) given was in the range 43-71 percent (71 percent for the “functions, menus and icons are easy to understand” issue, and 52 percent on average). These findings confirm the abovementioned conclusion that participants did not have difficulties in learning how to use the functionality of the system; instead, they had some difficulties in getting acquainted with the “nature” of electronic argumentation, which takes place in a very different way from the one they were familiar with.

6. Conclusions

The basic issue this paper deals with is whether and how G2G collaboration for policy and decision-making can be effectively supported by an appropriately developed information system. Having studied the nature of the G2G collaboration for public policy and decision-making, and analyzed the relevant requirements, we have developed a web-based system that can support the G2G collaboration required for the design, implementation, monitoring and evaluation of public policies, programs and services. Our approach enables all the involved parties to identify the basic problems and issues, propose alternatives and contemplate about their strengths and weaknesses.

Characteristic	Agree	Neutral	Disagree
It is easy to find out the available options	5	9	0
The functions, menus and icons are easy to understand	10	4	0
The navigation is consistent	6	7	1
The interfaces are easy to read and use	8	6	0
The content is easily understandable	6	6	2
The presentation is informative	7	5	2
What you had achieved was clear	6	7	1
What you had to do was clear	8	5	1

Table III.
Evaluation results –
Part B

The proposed system was used in an electronic argumentation session, concerning an important real public policy problem, and evaluated by the 14 users who participated in it. The evaluation of the system followed the well established and widely used TAM. From this evaluation, it was concluded that participants found the system to be useful, while it was easy to learn how to use its basic functionality. Also, their general attitude towards using the system was positive, which makes them want to use it again in similar discussions and contexts. However, they had some difficulties in getting acquainted with an argumentation session carried out via internet. They observed that such an experiment is quite different from the usual “physical” argumentation they were familiar with, which takes place in face-to-face meetings.

We argue that electronic argumentation is more demanding than the “physical” one, in that it requires participants to express each new element they want to assert concisely (short text), and then to associate it with one of the already asserted (by the same or another participant) elements. Moreover, each participant has to comprehend the concisely expressed elements that have been asserted by the other participants. However, it was revealed that the above difficulties were due to the short training the participants had, the short duration of the whole experiment, as well as the fact that the electronic argumentation conducted was synchronous. In case that the electronic argumentation was asynchronous and/or spread over a longer period, we expect that it would have been easier for the participants. A longer training period would also be a remedy for these difficulties.

Generally speaking, our first conclusions concerning the issue this paper deals with are positive: the proposed system seems to have significant potential for supporting G2G collaboration for policy and decision-making. It can support the collaborative understanding of social problems and needs (elicitation of basic issues), and the development of alternative actions or solutions for them. In addition, it can support the collaborative development of detailed action plans for the selected alternative(s). During the execution of these actions, the system can be used for the collaborative monitoring of them, the identification of implementation problems and issues, and the development of solutions to face them. Finally, it can be also used for the collaborative evaluation of these actions by the involved public organizations, as well as the citizens and groups who are their recipients. Therefore, it can support all the seven phases of the public policy lifecycle, which have been described in Section 2.

As far as the “Good Governance Principles” (shown in Table I) are concerned, the proposed system can effectively promote their application. It can enable the active e-participation of all stakeholders (citizens, enterprises, associations, etc.) in policy making. Also, it can support a better policy coordination among ministerial departments, public agencies and layers of government. The same holds for the cooperative implementation of the policies in an easier, quicker and cheaper way. Finally, it can contribute to the transparency and openness of the whole public policy making and implementation process, by making the relevant information accessible at a very low cost.

Future research directions concern a more extensive evaluation of the system through diverse real application settings. This input will be further considered towards improving the functionality of the system, as well as towards the potential integration of additional features.

Notes

1. According to Hevner *et al.* (2004), “the design-science paradigm seeks to extend the boundaries of human and organizational capabilities by creating new and innovative artifacts”, which should then be rigorously evaluated using “well-executed evaluation methods”.
2. Project ICTE-PAN (Methodologies and Tools for Building Intelligent Collaboration and Transaction Environments for Public Administration Networks, IST-2001-35120), EU IST Program.
3. QuestMap is a trademark of GDSS Inc. (Conklin, 2003).
4. It should be noted here that due to the length of the discussion, its fully unfolded version does not fit in one screen of the system’s basic interface (called “Discussion Graph”). For the interested reader, a textual version of the full discussion is shown in the Appendix of this paper.
5. A more technical presentation of issues related to the reasoning and scoring mechanisms of the system can be found in Karacapilidis and Papadias (2001).

References

- Amoako-Gyampah, K. and Salam, A.F. (2004), “An extension of the technology acceptance model in an ERP implementation environment”, *Information and Management*, Vol. 41, pp. 731-45.
- Beaudouin-Lafon, M. (1999), *Computer Supported Collaborative Work*, Wiley, New York, NY.
- Buckingham Shum, S. (2003), “The roots of computer supported argument visualization”, in Kirschner, P., Buckingham Shum, S. and Carr, C. (Eds), *Visualizing Argumentation: Software Tools for Collaborative and Educational Sense-Making*, Springer, London, pp. 3-24.
- Burn, J. and Robins, G. (2003), “Moving towards e-government: a case study of organisational change processes”, *Logistics Information Management*, Vol. 16 No. 1, pp. 25-35.
- Churchill, E.F., Snowdon, D.N. and Munro, A.J. (2001), *Collaborative Virtual Environments – Digital Places and Spaces for Virtual Interaction*, Springer, London.
- Cohendet, P. and Steinmueller, W.E. (2000), “The codification of knowledge: a conceptual and empirical exploration”, *Industrial and Corporate Change*, Vol. 9 No. 2, pp. 195-209.
- Conklin, J. (2003), “Dialog mapping: reflections on an industrial strength case study”, in Kirschner, P., Buckingham Shum, S. and Carr, C. (Eds), *Visualizing Argumentation: Software Tools for Collaborative and Educational Sense-Making*, Springer, London, pp. 117-36.
- Conklin, J. and Begeman, M. (1989), “gIBIS: a tool for all reasons”, *Journal of the American Society for Information Science*, Vol. 40 No. 3, pp. 200-13.
- Davis, F.D. (1986), “A technology acceptance model for empirically testing new end-user information systems: theory and results”, Doctoral Dissertation, Sloan School of Management, Massachusetts Institute of Technology, MA.
- Davis, F.D. (1989), “Perceived usefulness perceived ease of use and user acceptance of information technology”, *MIS Quarterly*, Vol. 13 No. 3, pp. 319-40.
- Davis, F.D., Bagozzi, R.P. and Warshaw, P.R. (1989), “User acceptance of computer technology: a comparison of two theoretical models”, *Management Science*, Vol. 35 No. 8, pp. 982-1003.
- Fischer, G., McCall, R. and Morch, A. (1989), “JANUS: integrating hypertext with a knowledge-based design environment”, *Proceedings of the Hypertext’89 Conference*, ACM Press, New York, NY, pp. 105-17.
- Furst, S., Blackburn, R. and Rosen, B. (1999), “Virtual team effectiveness: a proposed research agenda”, *Information Systems Journal*, Vol. 9, pp. 249-69.
- Girle, R., Hitchcock, D., McBurney, P. and Verheij, B. (2003), “Decision support for practical reasoning: a theoretical and computational perspective”, in Reed, C. and Norman, T.J.

- (Eds), *Argumentation Machines: New Frontiers in Argument and Computation*, Kluwer Academic Publishers, Dordrecht, pp. 55-83.
- Heeks, R. (2002), *Reinventing Government in the Information Age: International Practice in IT-Enabled Public Sector Reform*, 2nd ed., Routledge, New York, NY.
- Hevner, A.R., March, S.T., Park, J. and Ram, S. (2004), "Design science in information systems research", *MIS Quarterly*, Vol. 28 No. 1, pp. 75-105.
- Holmes, D. (2001), *EGov: eBusiness Strategies for Government*, Nicholas Brealey Publishing, London.
- Holsapple, C.W. and Whinston, A.B. (1996), *Decision Support Systems: A Knowledge-Based Approach*, West Publishing Company, St Paul, MN.
- Hurwitz, R. and Mallery, J.C. (1995), "The open meeting: a web-based system for conferencing and collaboration", *Proceedings of the 4th International World Wide Web Conference*, Boston, MA, available at: www.ai.mit.edu/projects/iip/doc/open-meeting/paper.html (accessed 13 June 2004).
- Jackson, P. (1999), "[Organizational change and virtual teams](#)", *Information Systems Journal*, Vol. 9, pp. 313-32.
- Karacapilidis, N. and Papadias, D. (2001), "Computer supported argumentation and collaborative decision-making: the HERMES system", *Information Systems*, Vol. 26 No. 4, pp. 259-77.
- Kirschner, P., Buckingham Shum, S. and Carr, C. (2003), *Visualizing Argumentation: Software Tools for Collaborative and Educational Sense-Making*, Springer, London.
- Lee, J. (1990), "SIBYL: a tool for managing group decision rationale", *Proceedings of the CSCW'90 Conference*, ACM Press, New York, NY, pp. 79-92.
- Legris, P., Ingham, J. and Collette, P. (2003), "[Why do people use information technology: a critical review of the technology acceptance model](#)", *Information and Management*, Vol. 40, pp. 191-204.
- Leitner, C. (2003), "E-government in Europe: the state of affairs", *Proceedings of the e-Government 2003 Conference*, Como, 7-8 July.
- Lenk, K. (1998), "Reform opportunities missed: will the innovative potential of information systems in public administration remain dormant forever?", *Information, Communication and Society*, Vol. 1, pp. 163-81.
- Lenk, K. and Traummüller, R. (2001), "Broadening the concept of electronic government", in Prins, J.E.J. (Ed.), *Designing e-Government*, Kluwer, Amsterdam, pp. 63-74.
- Lenk, K. and Traummüller, R. (2002), "Electronic government: where are we heading?", in Traummüller, R. and Lenk, K. (Eds), *Electronic Government – Proceedings of the 1st International Conference (EGOV-2002)*, Aix-en-Provence, 2-6 September, pp. 1-9.
- Lim, J. (2003), "[A conceptual framework on the adoption of negotiation support systems](#)", *Information and Software Technology*, Vol. 45, pp. 469-77.
- Lococo, A. and Yen, D. (1998), "Groupware: computer supported collaboration", *Telematics and Informatics*, Vol. 15, pp. 85-101.
- Loukis, E. and Kokolakis, S. (2003), "Computer supported collaboration in the public sector: the ICTE-PAN project", *Proceedings of the eGov-2003 International Conference: From E-Government to E-Governance*, 2739, Prague, 1-5 September.
- Loukis, E. and Kokolakis, S. (2004), "An architecture for a flexible public sector collaborative environment based on business process modelling", *Electronic Journal of e-Commerce Tools and Applications*, Vol. 1 No. 3.

-
- Lurey, J. and Raisinghani, M. (2001), "[An empirical study of best practices in virtual teams](#)", *Information and Management*, Vol. 38, pp. 523-44.
- McDonough, E.F., Kahn, K. and Barczak, G. (2001), "[An investigation of the use of global, virtual and collocated new product development teams](#)", *Journal of Product Innovation Management*, Vol. 18, pp. 110-20.
- Markus, M.L., Majchrzak, A. and Gasser, L. (2002), "A design theory for systems that support emergent knowledge processes", *MIS Quarterly*, Vol. 26 No. 3, pp. 179-212.
- May, A. and Carter, C. (2001), "[A case study of virtual team working in the European automotive industry](#)", *International Journal of Industrial Ergonomics*, Vol. 27, pp. 171-86.
- Munkvold, B. (2003a), "Collaboration technology: overview and current trends", in Munkvold, B. (Ed.), *Implementing Collaboration Technologies in Industry*, Springer, London.
- Munkvold, B. (2003b), "Implementation of collaboration technologies: a review of the literature", in Munkvold, B. (Ed.), *Implementing Collaboration Technologies in Industry*, Springer, London.
- Nonaka, I. (1994), "A dynamic theory of organizational knowledge creation", *Organization Science*, Vol. 5 No. 1, pp. 14-37.
- Prahalad, C.K. and Hamel, G. (1990), "[The core competence of the corporation](#)", *Harvard Business Review*, Vol. 68 No. 3, pp. 79-91.
- Prasad, K. and Akhilesh, K. (2002), "[Global virtual teams: what impacts their design and performance](#)", *Team Performance Management*, Vol. 8 Nos 5/6, pp. 102-12.
- Rolf, B. and Magnusson, C. (2002), "Developing the art of argumentation. A software approach", *Proceedings of the 5th International Conference on Argumentation*, Amsterdam.
- Selvin, A. (2003), "Fostering collective intelligence: helping groups use visualized argumentation", in Kirschner, P., Buckingham Shum, S. and Carr, C. (Eds), *Visualizing Argumentation: Software Tools for Collaborative and Educational Sense-Making*, Springer, London, pp. 137-63.
- Shum, S., MacLean, A., Forder, J. and Hammond, N. (1993), "Summarising the evolution of design concepts within a design rationale framework", *Adjunct Proceedings of InterCHI'93: ACM/IFIP Conference on Human Factors in Computing Systems*, Amsterdam, pp. 43-4.
- Smolensky, P., Fox, B., King, R. and Lewis, C. (1987), "Computer-aided reasoned discourse, or how to argue with a computer", in Guindon, R. (Ed.), *Cognitive Science and its Applications for Human-Computer Interaction*, Erlbaum, Hillsdale, NJ, pp. 109-62.
- Suthers, D. (2001), "Towards a systematic study of representational guidance for collaborative learning discourse", *Journal of Universal Computer Sciences*, Vol. 7, pp. 254-77.
- Traunmueller, R. and Wimmer, M. (2003), "E-Government at a decisive moment: sketching a roadmap to excellence", *Proceedings of eGov-2003 International Conference: From E-Government to E-Governance*, 2739, Prague, 1-5 September.
- Traunmueller, R. and Wimmer, M. (2004), "E-government: the challenges ahead", *Proceedings of eGov-2004 International Conference*, 3183, Zaragoza, 30 August-3 September.
- Turban, E., King, D., Lee, J., Warkentin, M. and Chung, H. (2004), *Electronic Commerce 2004: A Managerial Perspective*, Prentice-Hall, Upper Saddle River, NJ.
- van Gelder, T. (2003), "Enhancing deliberation through computer supported argument visualization", in Kirschner, P., Buckingham Shum, S. and Carr, C. (Eds), *Visualizing Argumentation: Software Tools for Collaborative and Educational Sense-Making*, Springer, London, pp. 97-115.

- van Gelder, T.J. and Bulka, A. (2000), *Reason!Able (Version 1.1)*, The Reason Group, Melbourne, available at: www.goreason.com
- Wimmer, M. (2002), "A European perspective towards online one-stop government: the eGov project", *Electronic Commerce Research and Applications*, Vol. 1, pp. 92-103.

Appendix. The complete discussion

Issue: The establishment or not of 'non-state universities' (Priv1)

Alt: Non-state profit universities (Priv1)

- Pos+: Students fees will finance high quality education (Priv2)
 - Pos-: High student fees may lead to high profits and not high level education (Min1)
- Pos+: They will attract foreign students and income for the national economy (Min2)
- Pos-: Highly dependent on sponsors (Chamb1)
 - Pos-: The only sponsors will be the students (Priv4)
 - Pos-: Finally big enterprises will be the main sponsors (Chamb3)
 - Pos-: No enterprises will sponsor these universities (Priv4)
- Pos-: Professors' salaries will be from the students' money (UnProf1)
 - Pos-: This is not bad: students' fees will be a good source for paying proper salaries to the Professors (Priv3)
- Pos-: There will be many cases where students will 'buy' their degrees (Chamb3)
- Pos-: These private universities will be predominantly companies and not educational Institutions (UnProf2)
- Pos-: Low level of studies (Chamb1)
- Pos+: High level of competition will result in higher level of studies (Priv2)
- Pos+: More options will be offered concerning subjects and specializations (Priv1)
- Pos-: It will be the 'easy solution' for those who can succeed in the state university entry exams (UnProf3)
 - Pos-: This is not bad - they will offer them a solution (Priv1)
 - Pos-: More effort would be required and not 'easy solutions' (Chamb3)
 - Pos+: 'Easy solutions' are disastrous (UnProf4)

Alt: Non-state non-profit universities (Chamb2)

- Pos+: Independent from state authorities and enterprises (Chamb2)
- Pos-: They will be characterised by poor level of organization (Priv1)
- Pos-: Finally they will be dependent on sponsors (Priv3)
- Pos-: Indirectly they will become institutions creating profit to some persons (Priv3)
- Pos-: Low level of studies (UnProf2)
- Pos+: They will prevent some students from studying and spending money abroad (Min2)
- Pos+: They can attract financial support from the EU (Chamb3)

Alt: State non-profit universities (UnProf1)

- Pos+: Tradition for high-level of studies (UnProf1)
- Pos+: Opportunities to all citizens according to their abilities and not family income (UnProf3)
- Pos+: Fair and socially accepted admission system (UnProf4)
- Pos+: High level of Professors qualifications - defined by law (UnProf1)
- Pos-: Very often poor level of organization (UnProf1)
- Pos-: Many lecture-hours are lost due to strikes, etc. (Priv2)
- Pos-: Too many students in a class (Priv3)
 - Pos-: Very often inefficient spending of taxpayers money (Min1)
 - Pos-: Not true - on the contrary suboptimal finance of universities (Chamb2)
 - Pos-: Admission of students with low grades for political reasons (Priv3)
 - Pos-: It can become much more difficult to get the final degree (UnProf2)

Preferences:

- Low level of studies *is more important than* they can attract financial support from the EU (UnProf2)
- Low level of studies *is more important than* Very often poor level of organization (UnProf1)