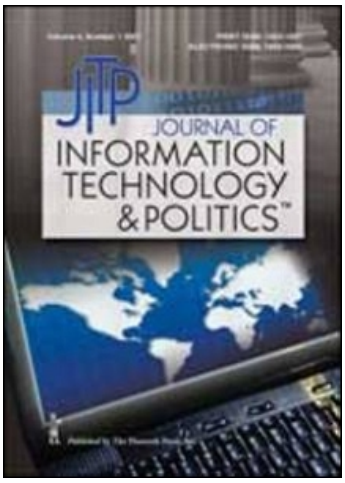

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Providing Argument Support for E-Participation

Ann Macintosh [a]; Thomas F. Gordon [b]; Alastair Renton [c]
[a] Centre for Digital Citizenship at the Institute of Communications Studies, University of Leeds, UK [b] FOKUS, Berlin, Germany [c] Teledemocracy Centre, Napier University, Edinburgh, UK

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WORKBENCH NOTES

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Ann Macintosh
Thomas F. Gordon
Alastair Renton

ABSTRACT. As governments seek to consult their citizens over matters of policy, it becomes increasingly important for citizens to receive relevant information in a medium that they can use, and will want to use, in forming their opinion upon consultative issues. In e-participation, there is a clear requirement to understand how technology can support informed debate on issues, but there are two main obstacles in achieving this. The first is that the deliberation is often on complex issues, and therefore typically there are many arguments and counter arguments to consider, which, when presented in linear text, can be confusing for the public at large. Second, it is not obvious that many people actually have the necessary critical thinking skills to deliberate on issues. Argumentation systems have been used successfully in the domains of law and education, where they have been developed in response to a need for innovative and effective ways of teaching critical thinking, presenting and defending a point of view, and providing complex information in an organized and easily accessible fashion. Their use in the political domain is only just emerging. The purpose of this article is to make clear how e-participation can gain from the use of argumentation systems.

KEYWORDS. Argumentation systems, digital democracy, e-participation, information and communication technology, online deliberation, public participation

Professor Ann Macintosh is Professor of Digital Governance and co-director of the Centre for Digital Citizenship at the Institute of Communications Studies, the University of Leeds in the UK. Her work in digital governance has been both applied and conceptual; the aim has been not simply to develop applications using new media, but to understand their role in the complex infrastructures that support e-government. This has led to work on conceptualizing e-government that has influenced research and policy-making in the UK, Europe, and elsewhere.

Dr. Thomas F. Gordon is from Fraunhofer FOKUS in Berlin, Germany. He is a computer scientist and lawyer conducting applied computer science research on argumentation technology and related topics, including computational dialectics, mediation systems, artificial intelligence and law, and legal knowledge systems, with the goal of providing support tools for argumentation, especially in the context of governance.

Dr. Alastair Renton is from the Teledemocracy Centre at Napier University in Edinburgh in the UK. He originally studied philosophy and wrote a defense of materialism for a PhD at Edinburgh University. His software engineering MSc dissertation investigated the relevance of argument visualization techniques to political debates.

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Address correspondence to: Professor Ann Macintosh, Centre for Digital Citizenship, The Institute of Communications Studies, The University of Leeds, Leeds, LS2 9JT, UK (E-mail: a.macintosh@leeds.ac.uk).

This article focuses specifically on the technology side of the interface between argumentation systems and public deliberation or e-participation. However, in order to put the application of the technology into context, we first introduce the concept of public deliberation on policy issues and draw out the main characteristics of deliberative debate that the technology needs to support.

It has been argued forcibly by many political communication scientists and democratic theorists that public deliberation and discussion on political issues are critical parts of our democracy, and that we have progressed from only voting in elections to an era where reflection and informed opinion by the public at large are essential components of political decision-making (e.g., Barber, 1984; Fishkin, 1991). They argue that deliberative engagement processes deliver positive effects on public opinion. The literature provides varied reports on the conceptualization of deliberation; it can refer both to individual and to collective actions, but underlying all descriptions is a requirement for rational thinking. As such, deliberation entails an individual or group of individuals to listen to, understand, and reflect on an issue and be prepared to change his or her own point of view based on the arguments of others. Barber (1984, p. 174), while presenting the concept of strong democracy, argues that democratic discussion "entails listening no less than speaking, it is affective as well as cognitive and its internationalism draws it out of pure reflexion into the world of action." Dryzek (2006, p. 27) expands this with "Deliberation only becomes deliberative democracy to the degree it provides opportunities for participation by all those affected by a decision."

Along with this substantial research base of evidence on the need for a more deliberative style of democracy are numerous initiatives on offline, public deliberative debate on problematic situations and complex issues. One mechanism well reported on is deliberative polls (Fishkin, 1991). The objective of deliberative polling is to estimate what the public would think about certain issues if it knew more, considered more, and talked much more about them and how that would differ from what they currently think about the same issues. A recent project that asked Europeans to reflect on the issue of the enlargement of the European Union illustrates the technique (Luskin, Fishkin, Boucher, & Monceau, 2008).

If we accept, as many authors have already argued, that public deliberation and discussion on political issues are critical parts of our democracy, then there is a need to investigate what role information and communication technology can take to support such processes. Indeed the potential for technology to enhance democracy by increasing political participation has been the subject of academic debate for a number of years (e.g., Dutton, 1992).

Facilitation of online deliberation implies a need for a technology-based environment where there is support for the individual citizen to access factual information, formulate opinions based on the views of others, contribute his or her own opinion, but also provide the rationale behind his or her ideas with the necessary arguments, which in turn can be challenged (Macintosh, 2007, p. 90). However, the capacity of information and communication technology to stimulate participation has not been as significant as was originally believed (Becker & Ohlin, 2006; Lusoli, Ward, & Gibson, 2006). Simply making a comment facility or discussion forum available on the Web does not necessarily make contributions more deliberative (Schlosberg, Zavestoski, & Shulman, 2007). Indeed, in their recent study of the U.S. e-rulemaking project, these same authors argue that government agencies that seek informed public comment using the Internet need to develop new ways to facilitate deliberation (Schlosberg et al., 2007, p. 51). Elliman, Macintosh, and Irani (2007, p. 33) focus on the technological difficulties of the situation when they say:

> Democratic political participation must involve both the means to be informed and deliberative mechanisms to take part in the decision-making. Deliberative eParticipation is an information intensive process, which needs to be interactive, incremental and dynamic. It requires meaningful messages to be extracted and

represented from large assemblages of information produced by multiple stakeholders often with conflicting agendas.

Rather than accept defeat over the attempt to use technology to engage people in the policy-making process, the purpose of this article is to promote the case for exploiting the capacities of a specific type of technology, namely argumentation systems, to facilitate online public deliberation. Such systems exist outside the political domain and have been used successfully in the domains of law and education (Kirschner, Buckingham Shum, & Carr, 2003). They have been developed in response to a need for innovative and effective ways of teaching critical thinking, presenting and defending a point of view, and providing complex information in an organized and easily accessible fashion. Their function essentially is to enable people to appreciate practical problems in their entirety and then articulate a reasoned solution, which is required for deliberation. This "deliberative" component is generally ill catered for in current participation projects, which generally employ generic groupware systems, such as discussion forums and online surveys, where specific technical support for argumentation is not provided.

Argumentation systems are computer software applications for helping people to participate in various kinds of goal-directed dialogues in which arguments are exchanged. Bex, Prakken, Reed, and Walton (2003) divide argumentation support tools into two distinct types. The first type is those that contain knowledge about a problem domain and can perform reasoning to suggest solutions to the problem. The second is those they term "sense-making" systems (Kirschner et al., 2003) that impose structure on the problem, typically by using visualization techniques, as well as by supporting communication/interaction between users of the system. Since the goal of participation is to engage citizens in dialogues with government about such matters as public policy, plans, or legislation, where citizens are given an opportunity not only to offer suggestions, but also to support these suggestions with arguments, the potential of argumentation systems should be readily apparent. Such systems support and facilitate the making of practical decisions, ensuring that the decision-making process is efficient, transparent, open, fair, and rational. Not surprisingly, these issues have much in common with the goals of "good governance" and e-participation (Gordon, 2005; Malkia, Anttiroiko, & Savolainen, 2004). The theoretical subfield of computer science, which studies the foundations of argumentation systems, is young and goes by many names, such as computational models of (natural) argumentation or computational dialectics. Much work has been conducted as part of artificial intelligence, especially in the interdisciplinary field of artificial intelligence and law.

To provide substance to the claim that argumentation systems can facilitate e-participation, this article is divided into four sections. Argumentation cannot be understood or evaluated without some appreciation of the theory of argumentation. Moreover, it is a requirement of good software engineering that tools should be based on carefully considered computational models of the application domain and its tasks. Accordingly, the first two parts are devoted to the technological aspects of these systems. The first section provides a brief introduction to the theory of argumentation based on the work of Douglas Walton (2006), while the following section introduces various efforts to develop formal, computation models of argumentation. The third section aims to demonstrate how e-participation can benefit from argumentation systems. This is done by describing a number of argumentation support tools that have been used to enhance an individual's influence upon matters of policy. The final section discusses the situation to date and indicates some of the constraints and limitations of argumentation systems for e-participation.

ARGUMENTATION THEORY

An argument links a set of statements, the premises, to another statement, the conclusion. The premises provide some kind of support for the conclusion such that, if the premises are accepted, then the argument, if it is a good one, lends some weight to the conclusion. The goal

of argumentation is to determine the acceptability of claims, rather than their truth. Whereas logical consequences are necessary by virtue of their form and irrespective of their content, arguments, in contrast, are substantive and "defeasible." They are substantive because they depend not only on the form of the premises, but also their content and acceptability. They are defeasible because their conclusions are only plausible, not certain, and may be defeated in various ways by, for example, providing superior counter-arguments, or by revealing implicit premises that turn out to be untenable.

Considerable time has been spent in classifying various patterns of argument, based on an analysis of their structure and content as reconstructed from natural language texts. These patterns of argument, historically rooted in Aristotle's *Topics* (Slomkowski, 1997), have come to be called "argumentation schemes." Although they are the result of empirical case studies, they also have a normative side and have been profitably applied in research (Reed & Walton, 2001). They are a useful tool in two important respects: for guiding the reconstruction of arguments put forward by other parties, so as to open them up to critical analysis and evaluation, and for constructing fresh arguments to put forward in support of one's own claims, or to counter the arguments of others. These uses are clearly relevant to supporting deliberative participation in judging between competing policy options. Argument schemes may be domain-dependent, and consequently there is an unlimited number of such schemes. Many schemes, however, are general purpose. Walton, Reed, and Macagno (2008) have taken on the task of collecting and classifying general purpose schemes. To date, their collection contains about 96 schemes, each scheme associated with a set of "critical questions" for evaluating and challenging arguments used with the scheme. As many of these schemes are used in the presentation of policy, this work is of potential value to those involved in supporting citizen engagement. For example, one such scheme is the "argument from expert opinion," a type that is indispensable in providing an informed view; however, it is also a type that is open to abuse, such as when people pay unquestioning regard for an opinion simply by virtue of its source. Having the critical questions at hand, such as "is the expert biased?," helps segregate the valid advice from the prejudiced, and thereby supports the creation of sound and impartial policies.

"Validity" is an important factor in the evaluation of arguments. An invalid argument provides no support for its conclusion, and thereby has no weight. Yet there is a problem with defining validity. Walton's theory of argumentation takes a contextual, procedural view of argument validity: An argument is "valid" if and only if it furthers the goals of the dialogue in which it is put forward. From this perspective, the validity of an argument can depend on the state and history of the dialogue. To give a practical example, an argument in favor of some proposal made during the brainstorming phase of a deliberation might be valid during the process of selecting some of these brainstorming ideas for a more in-depth evaluation in the next phase of the deliberation, but not valid in this later phase if this particular proposal had not been selected. Thus, the theory provides sufficient fluidity to capture the essentially complex nature of political discussion, which would be an impracticable task within a classical logic framework. Doing so provides a standard by which competing arguments can be assessed when attempting to find a secure footing upon the shifting grounds of the political landscape.

Another feature of argumentation systems is dialogue types. Dialogue types in argumentation theory are normative models of communication, defined across the following dimensions: the purpose or goal of the dialogue, the roles of the participants, the speech acts available, the termination criteria, a process model, and a "protocol" for regulating this process. Whether or not an argument has been used properly depends on the type of dialogue. Walton (2006, p. 183) has developed a taxonomy of six dialogue types, of which two are of special interest to participation:

(a) Persuasion dialogues debate the truth of some statement. The proponent claims that some statement is true; this claim is challenged by the respondent. There are several subtypes of this dialogue type: in

a "dispute" dialogue, the respondent not only challenges the proponent's claim, but also claims some opposing, contradictory statement to be true. Both parties have a burden of proof for their respective claims; in a "dissent" dialogue, the respondent only doubts the proponent's claim and the proponent has the burden of proof and must produce the stronger arguments, whereas the respondent needs only to cast doubt on the proponent's claim.

(b) Deliberation dialogues are about choosing some course of action that takes into account the interests of multiple stakeholders. In a deliberation dialogue, one of the first tasks is to identify the stakeholders and their interests. They may not all be participants in the dialogue, at least not initially. As it may not be practical for every stakeholder to take part in the dialogue personally, some stakeholders may need to be represented by others.

For the sake of completeness, the other four types are information seeking, negotiation, inquiry, and eristic. Actual dialogues may be mixtures of these various types and may shift from one type to another. Thus it is important to dissect an exchange between parties to determine what types of dialogue are being used and thereby whether what is being attempted in that dialogue is likely to succeed, or whether the dialogue type is being misused.

COMPUTATIONAL MODELS OF ARGUMENTATION

The above overview of arguments and their roles provides guidelines by which computational models can be created, and thereby provides systems to support users in accomplishing tasks. Based on previous analyses of argumentation tasks (Bench-Capon, 2003; Prakken, 1995), inspired by Aristotle and other ancient Greek philosophers, it is possible to distinguish three distinct layers of tasks: the logical, the dialectical, and the rhetorical (see Figure 1).

Logical Layer

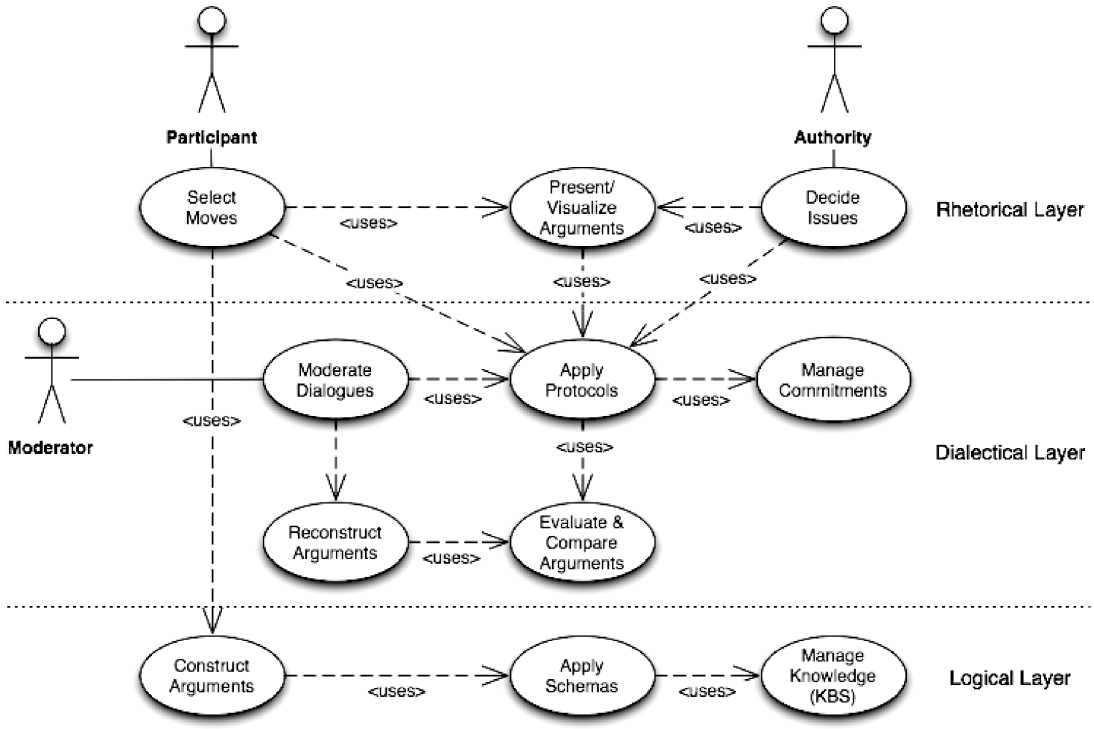
Broadly stated, the task performed in the logical layer is the construction of arguments by applying argumentation schemes to some representation of evidence, facts, or knowledge of the domain (Gordon, 2008; Prakken, 2005). The relevance to e-participation is the potential of this technology to help citizens to make effective use of knowledge bases on the semantic Web to contribute well-informed and effective arguments in deliberative proceedings. This marks the initial step along the path to providing a considered contribution to policy debate, rather than dissipating an attack by using poorly expressed objections.

Dialectical Layer

This layer is responsible for structuring, evaluating, and comparing the arguments advanced in the dialogue. The idea of developing a computer model for managing support and justification relationships between propositions goes back to research on truth and reason maintenance systems in artificial intelligence. Various researchers have built on this to develop computational models of argument (Besnard & Hunter, 2008; Dung, 1995; Gordon, Prakken, & Walton, 2007; Prakken, 2001a; Prakken & Sartor, 2006). Here, the relevance to e-participation lies in the comparison of conflicting points of view; by evaluating the arguments advanced in favor of and against a position, it will be possible to highlight where the weaknesses lie and where the responsibility lies for providing further support for a particular viewpoint. By making the relationships between arguments and claims explicit, transparent, and understandable, these tools make it easier for people to justify and explain their positions, as well as critically evaluate them.

The dialectical layer is also responsible for supporting the process of argumentation, and facilitating and guiding the dialogue, including the facilitation tasks of moderators and mediators, to help ensure that it achieves its normative goals. This includes checking

FIGURE 1. Argumentation use cases.



that the participants observe the appropriate argumentation protocol, which in turn requires keeping track of the "commitments" made, commitment being a fundamental concept handled by a model of dialogue. One of the first computational models of argumentation dialogues was the Pleadings Game (Gordon, 1995), an idealized model of the process of pleading in civil law cases in common law jurisdictions. Other computational models of dialogue followed shortly thereafter (see for example Bench-Capon, Leng, & Staniford, 1998; Hage, Leenes, & Lodder, 1994; Lodder, 2002; Prakken, 2001b; and Verheij, 1996). Since e-participation is a process, tools developed to support dialogues are clearly relevant in principle, but suitable protocols for e-participation are an open research question. Keeping track of commitments is also important for e-participation. It helps contributors to express their views consistently and avoid attempts to change or inhibit the process by changing their positions without sufficient justification.

Rhetorical Layer

This layer assists participants to protect and further their own interests by selecting arguments to put forward, presenting them clearly and persuasively—such as through the use of argument visualization techniques—and making sure their arguments take into consideration the standpoints, values, commitments, and beliefs of the audience. Apart from the topic of argument visualization, relatively little research has been done on computational models of this layer. (For related work see for example Crosswhite, Fox, Reed, Scaltsas, & Stumpf, 2003 and Gilbert, Grasso, Groarke, Gurr, & Gerlofs, 2003.) With regard to visualization, one of the first argument visualization methods was developed by Wigmore, for visualizing evidence in legal cases (Wigmore, 1940). The diagramming method Toulmin used in his *The Uses of Argument* (Toulmin, 1958) has been very influential, but the method developed by Beardsley (1950) and refined by Freeman (1991) has become the de facto standard in the humanities.

Conklin's gIBIS system (Conklin & Begeman, 1988), based on Rittel and Webber's idea of an issue-based information system (IBIS) (Rittel & Webber, 1973), was perhaps the first computational model designed for visualizing arguments. Gordon has recently developed a new method of diagramming arguments, in collaboration with Walton, that builds upon and integrates these prior methods (Gordon, 2007). The Carneades software tool, which uses a refined version of this method, is described in the next section.

This section has outlined how argumentation theory has informed the basis for constructing support systems for argumentation tasks and has pointed to where this work has a positive benefit in the process of citizen participation in policy creation, through the better appreciation and presentation of points of view. The impact on participation should be apparent: Using visualization to make clear the state of a dialogue not only focuses participants' attention on the salient points of the debate, but also allows them to see where their points belong in the overall structure of the discussion rather than being forced to work their way through volumes of text-based contributions.

AUGMENTATION TOOLS

Douglas Engelbart, inventor in the 1960s of much of today's interactive personal computing tools, draws attention to the need for tools to tackle the "complex, urgent problems" facing society. Forty years on, he has concluded that central to meeting this challenge are argumentation systems to help clarify the nature of the problems and scaffold dialogical negotiation of ways forward (Engelbart, 2003). A number of such argumentation tools have been developed as an educational resource, not only as a means of delivering information, but also as a means of teaching critical thinking skills. Since legal students are required to develop critical thinking skills and make effective use of argument, a large number of these tools have their roots in this domain, being developed as "argumentation assistants" for the legal profession. Other tools have grown within a commercial domain in response to the demands of arriving at, and presenting, strategic decisions within a large, dispersed business community.

In this section we present examples of argumentation tools that have been used in the context of policy debate, not only between citizen and government but also between institutions as well as between youth groups. We provide a general description of the system and, if possible, the URL where either the tool can be downloaded or where further information is available. We then briefly describe each tool by considering the following: the underlying argumentation model it uses, the argumentation tasks it supports, and an overview of an example e-participation scenario it has been used in. Where applicable, a short account is given of a live e-participation context in which the tool was used, along with an evaluation of its performance; some of the tools described here have yet to reach the point where extensive field-testing has been completed.

The tools are presented in chronological order of development in the following sections.

QuestMap

QuestMap was based on the gIBIS system (Conklin & Begeman, 1988; Conklin Selvin, Buckingham Shum, and Sierhuis, 2003). Originally QuestMap was developed as an organizational memory and information management tool for collaborative working within a large utilities company in California. It was the company's idea to use it to support group facilitation/deliberation. Therefore, the system supported two different types of applications—asynchronous collaborative information management and deliberation in face-to-face meetings.

It was based on the IBIS model and provided hypertext and groupware functionality, allowing the user to create argument maps and lists. QuestMap used icons, or "nodes," to represent the IBIS elements of Issues, Positions, and Arguments (supporting or contesting statements relative to a position). It was powered by a hypertext engine whose functions were accessed via an interface. The chief features were as follows: the creation of hyperlinks between maps through the copying of one node

into another map; a list display of all maps or lists in which a particular node features—clicking on a list element takes the user to the particular instance of that node; "context windows" where additional information could be added to each node—including keyword search terms; and a search engine that could produce lists of nodes containing keywords, where those lists were themselves sets of hyperlinks. A case study on its use is provided by Conklin (2003). This tool has been superseded by Compendium, which is described later in this section.

Zeno

Zeno[1] provided a Web-based discussion forum extended to support the evaluation, visualization, and navigation of complex networks of arguments (Gordon, Voss, Richter, & Märker, 2001). It also provided extensive support for moderators and mediators. A later version of Zeno was renamed Dito and included an argument diagramming tool called Diaglo. Zeno's computational model of argumentation was initially based on IBIS, but later made configurable by moderators. Zeno extended the idea of threaded discussions, in which messages are organized in an outline or tree, to the collaborative construction of more general, semantically labeled graphs. Both nodes and links can be labeled, with labels configured by the moderator. Appropriate labels can help participants to navigate through the network and to evaluate arguments. Other extensions enabled users to describe nodes in the network with metadata and to upload file attachments. Gordon and Richter (2002) describe the latest research version of the system in more detail.

Zeno was developed and piloted in a series of research projects, beginning with GeoMed (Geographical Mediation System, IE2037), which started in 1996. The goal of GeoMed was to develop and validate a Web-based groupware system to engage citizens in regional and urban planning (Schmidt-Belz, Rinner, & Gordon, 1998). In the GeoMed project, Zeno was integrated with a Web-based geographical information system (Gordon, Karacapilidis, & Voss, 1996; Gordon & Karacapilidis, 1997). The aim was to make the planning process more transparent; to encourage and monitor public participation; to help avoid or resolve conflict; and to support cooperation between planners, experts, and communities. If successful, the system would improve efficiency and economy and be less time-consuming.

The system was made available for a two-week period to members of the public as part of the proposal to create a residential area and "technology park" between the cities of Bonn and Sankt Augustin. It integrated support for sharing documents, discussing planning issues, and accessing geographical information. In its favor, the number of people using the workspace for information compared favorably with the numbers attending public meetings. Unfortunately, no one contributed to the discussion forum or provided feedback on the system to the project team. It is probable that this silence was due to a combination of the novelty of using such technology in 1997 and some difficulties with the user interface.

However, the experience provided many pointers for future work in any system designed to support group cooperation, Internet mapping, and public participation. For instance, introducing complex systems such as GeoMed into organizations will be difficult, since they will not only have to accommodate novel processes, but must do so within the constraints imposed by the legal regulations to which regional and urban planning are subject; planning issues involve people performing different roles with distinct interests to promote, but if discussion is to be of any value it has to be available to all, and contributions have to be made from all parties if the debate is to be balanced and informed; and running systems such as GeoMed in conjunction with traditional methods will lead to the administrative problems associated with using paper documents and electronic data.

A later version of Zeno served as the foundation, with a new graphical user interface, of the e-participation platform developed in another European Commission–funded project called DEMOS (Delphi Mediation Online System, IST-1999-20530), which ran from 2000–2004 and was successfully piloted in the cities of Hamburg and Bologna.

Zeno was used successfully as the e-participation platform in a number of other projects as well, mostly in Germany, including projects in the cities of Esslingen (Märker, Hagedorn, Trénel, & Gordon, 2002) and Berlin. From the Esslingen project, three areas were identified where the system provided an advantage over traditional means of conducting consultations. Information can be easily accessed by the public, thereby reducing imbalances between citizens and the planning department, and enabling the public to participate competently. Documentation of the process is greatly facilitated through the automatic archiving of computer-mediated communication, not only contributing to the transparency of the process but also assisting in the production of summaries. Communication of views via Internet discussion forums permits parallel discussion of multiple issues, thereby improving upon postal communication where the correspondent is isolated from the views of other people and detailed responses from the planners—and public hearings—where the numerous issues that arise can often be lost through the enthusiasm of individuals blinding them to the formal niceties of structured debate.

However, there were drawbacks. Ideally, the online discussions need to be moderated, and this imposes a cost in terms of time and expense. Similarly, effective consultation will require effort from the relevant government departments, and this is something they may be unable to afford. Thus, there is a sense in which use of the system should be reserved for especially controversial projects. In addition, while some participants expressed an interest in future consultations, it was felt that there needed to be some formal procedure drawn up, which would inspire confidence in the process and thereby make difficult decisions easier to accept. Without it, there was a sense that citizens' distrust of politics and public administration would continue to hamper participation.

Compendium

Compendium[2] is an argument-mapping tool that is based on the IBIS computational model (Selvin, Shum, & Sierhuis, 2001). It is a collaborative argument-diagramming tool for indexing, structuring, and visualizing argumentation dialogues. It has been used for a number of years for commercial real-time problem-solving, originally with applications that were concerned with business process redesign. The Compendium tool was designed to overcome some of the known limitations of QuestMap (described above), though it has now grown substantially in scope to include integration with other tools and open source development, and has generally become more focused toward use in research.

The system allows for considerable customization of the argument maps by the users and supports outputs in multiple document formats. Elements of a discussion are represented as "queries" and "responses," to which qualifying remarks can be attached indicating "support for" or "criticism of" that contention. Using hyperlinks, users can associate relevant documents with particular nodes to back up any references. It is also possible to partition the discussion into a series of linked maps, which has the advantage of breaking down large amounts of data into manageable portions.

Renton and Macintosh (2005, 2007) have been using the Compendium tool, as an example of an argumentation sense-making tool, to investigate how argumentation systems can be used within a political context to support e-participation. They have considered four possible e-participation scenarios and constructed the associated argument maps. These scenarios were for provision of information; support for consultation by considering an alternative way of setting out the responses to an online consultation on a published draft policy document; support for deliberation by setting out the consultation responses in the form of an inverted tree designed to allow users to see how their convictions on one issue may conflict with other beliefs; and, finally, supporting the analysis of a discussion forum where the argument map is designed to establish whether or not individual contributors had remained consistent throughout the debate, and therefore this could be used to support the analysis and evaluation of the consultation process.

Maps created using Compendium were featured in a project that investigated the potential of a range of tools and techniques for engaging young people in complex issues, in particular, radioactive waste management (Whyte, Smith, Alberts, & Macintosh, 2005). Three focus groups were encouraged to assess the tools according to ease of use, appeal, and suitability for purpose. Results from the project show support for using maps within the context of facilitated groups, where the provision of information in conjunction with the arguments and evidence "for" and "against" decisions was seen as engaging attention and supporting the activities of learning and participation (see Figure 2).

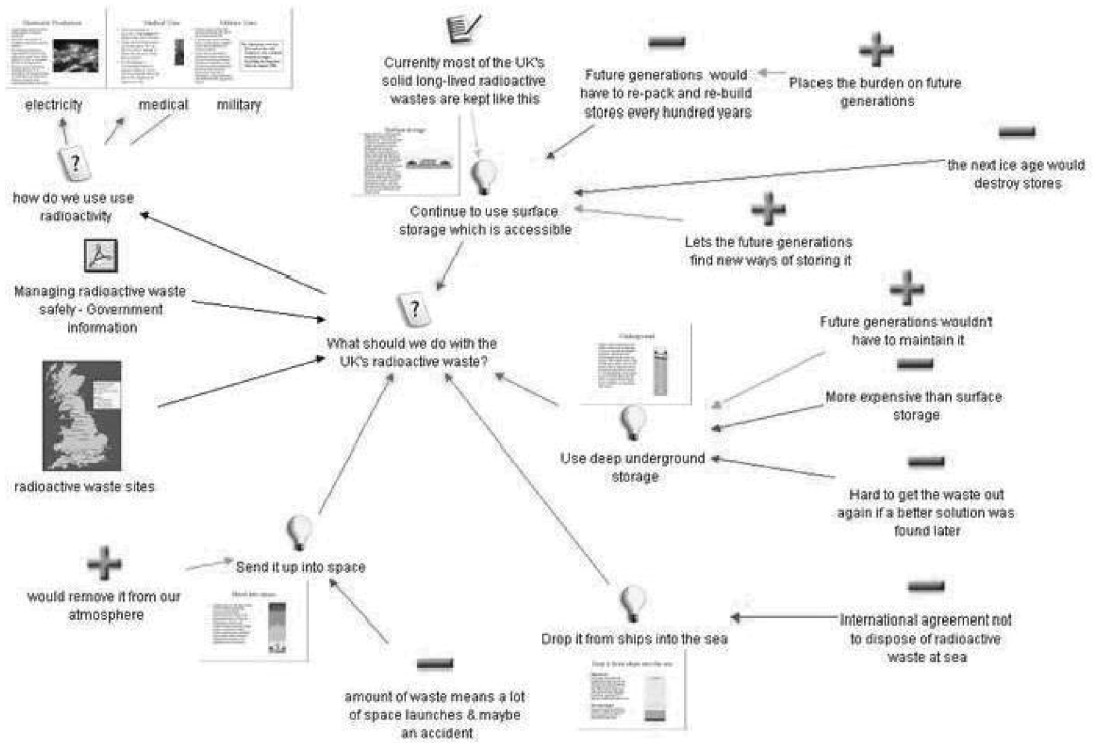
However, it was noted that the maps were less successful when drawn online by individuals outside a group setting, who would not have the benefit of a facilitator to assist in using the maps. Further, maps were seen as being useful in a face-to-face setting rather than as part of an online dialogue, where maps fail to make explicit who was responsible for any position. During the project, the mapping techniques did not directly support the exchange of views online; since the users felt that such a mapping would prove advantageous, it was suggested that the tool could be enhanced through a facilitator editing a map to reflect the progress of the online debate.

Another example of the e-participation use of Compendium is a case study of how argument mapping could support transparency and accountability in the case of a consultation on regional planning in southeast Queensland (Ohl, 2008). The consultation responses were modeled using the tool and then evaluated through surveys and stakeholder interviews.[3]

Hermes

The Hermes argumentation tool[4] was developed under the European Commission ICTE-PAN project (Karacapilidis, Loukis, & Dimopoulos, 2005) as a response to the increasingly complex

FIGURE 2. Compendium map of the radioactive waste project.

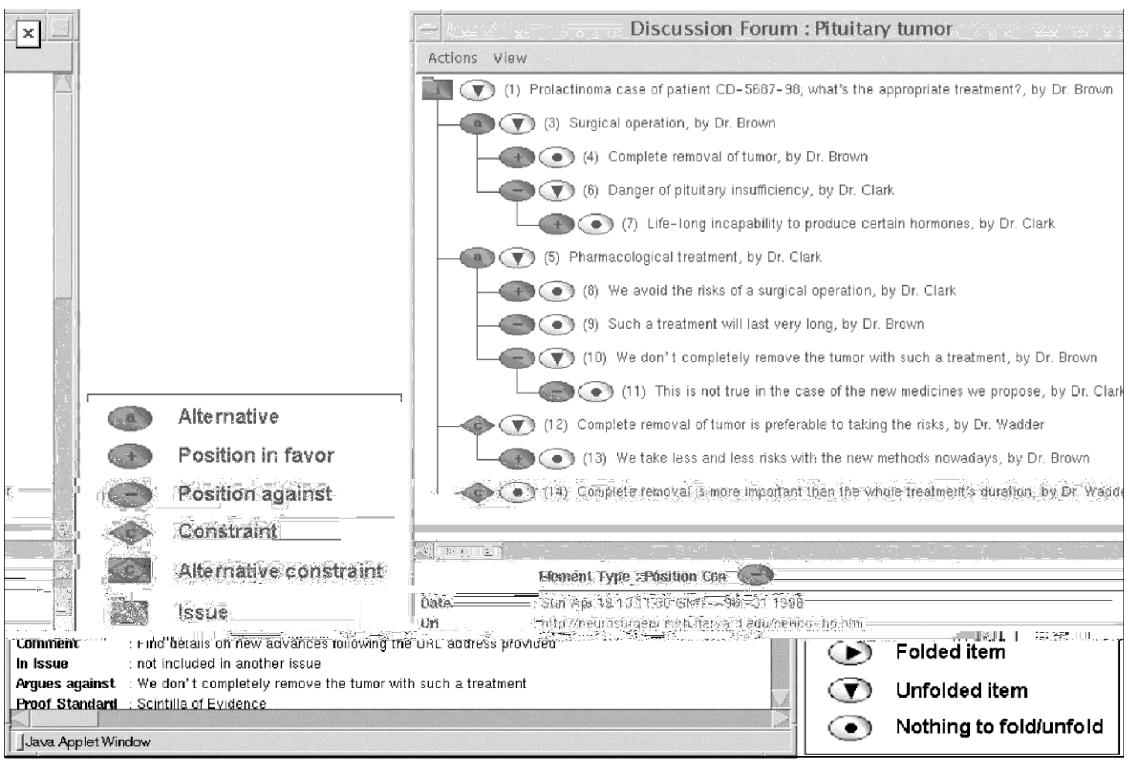


nature of public policy and decision-making. This complexity arises through the need for policy issues to receive input from many public organizations representing various administrative layers, the views of citizens and private bodies, not to mention the possibility of involving the governments of other countries. Between them, this set of stakeholders may well possess the necessary information, knowledge, and competence to manage problems, but such management requires these assets to be suitably organized; presently this organization is absent. Accordingly, Hermes is aimed at supporting online group facilitation between government agencies and is based on the theoretical foundations of argumentation frameworks, which led to the development of the Zeno system (Gordon & Karacapilidis, 1997).

The developers argue that the majority of existing collaborative argumentation support systems have been designed to support face-to-face meetings with a human facilitator, whereas what is needed for government-to-government collaboration is virtual support. The tool has a discussion forum with support for argumentation. Hermes allows for the construction of a diagram of the discourse that is composed of the ideas so far expressed during the discussion. The basic elements are "issues," which correspond to decisions to be made or targets to be met; "alternatives," which correspond to potential choices; "positions," which are assertions associated with an alternative that provide grounds for following or avoiding that choice; and "constraints," which represent preference relations. Users can input their preferences to courses of action through a "position, relation, position" tuple, where an example of a relation is "less important than" or "more important than." Hermes records the users' arguments, checks for inconsistencies among users' preferences, and automatically updates the discourse status according to all user input (see Figure 3).

Using Hermes, 14 participants representing four groups took part in a synchronous debate about the question of whether or not to allow non-state universities in Greece. Each participant

FIGURE 3. Hermes user interface showing the threaded debate.



received training and was a competent user of electronic forums. The evaluation results showed that the users felt that the basic functions of Hermes were easy to master, that it proved beneficial, and that they would be prepared to use it again in similar contexts. Although some found the situation awkward due to the unfamiliarity of engaging in arguments over the Internet rather than face-to-face, it was accepted that this would lessen once users became familiar with the system. In addition, longer training sessions and conducting the debate asynchronously would improve the users' experience. Overall, the authors concluded that Hermes made information accessible at a low cost, thereby providing a valuable contribution to the transparency of public policy making.

Parmenides

The Parmenides system (Atkinson, 2006; Atkinson, Bench-Capon, & McBurney, 2004) is an argumentation tool that uses a computational model of an argumentation scheme for practical reasoning to guide and help focus deliberation dialogues.[5] While a number of technology platforms vastly increase the opportunities for communication, such an advantage is undermined by the difficulties of utilizing the resulting quantity and diversity of contributions. Parmenides was created to facilitate engagement between government and citizens, and to address such difficulties by ensuring that communication between the parties remained clear, unambiguous, and structured in a manner to minimize misunderstandings.

Initially, a program was implemented that modeled a dialogue where an initial position could be presented with a number of counter-arguments. Evaluation of this approach highlighted the problems of allowing users such a broad range of responses; choosing the most effective form of counter-argument becomes a major task, resulting either in the user being uncertain whether he or she has selected the most appropriate attack, or in he or she becoming frustrated with the program. Accordingly, the developers concluded that user interaction with the program needed to be simplified. This is achieved in Parmenides by leading the user through a set series of moves, and, wherever possible, restricting their responses to indications of approval or disapproval. Thus, the user does not need to comprehend the argumentation model being used, nor does he or she have to make his or her position explicit during the debate; however, on some pages of the system there are opportunities for entering free text.

The system helps users to systematically address appropriate critical questions. Critical questions supported by the system reflect issues such as these:

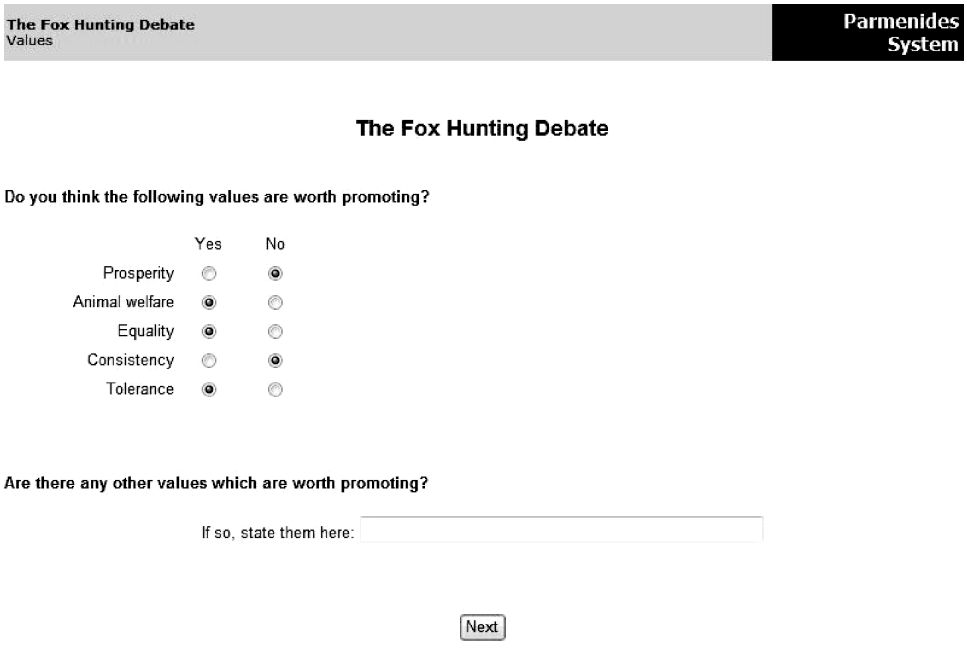
- The preconditions of actions
- Whether these preconditions are met in the current situation
- The effects of actions
- The social values promoted by these effects
- Alternative actions for achieving the same effects

Parmenides was first piloted in an online debate about the invasion of Iraq. Users were presented with a justification of the invasion in the form of a structured argument. They then had the opportunity either to accept the argument or to take part in a structured survey, in which they were given an opportunity to express their agreement or disagreement with critical questions of the kind illustrated above. The results of this survey were stored in a database and analyzed to help reveal the strengths and weaknesses of the government's rationale for invading Iraq. Such a system can provide policy-makers with insight into where their views need bolstering, as well as where they can rely upon public support.

The system has since been extended and enhanced to support further public dialogues, including debates in the UK on the banning of fox hunting (Cartwright & Atkinson, 2008). Figure 4 provides a screenshot of the user interface for this debate.

Briefly, the enhancements include the following: The system now enables debates on a variety of topics to be presented in a common format; there is a facility for administrators to create debates and add them to the system; arguments

FIGURE 4. User interface for fox hunting debate.



submitted to the system can be analyzed to gauge the level of support for positions, as well as identify which values are implicit in arguments; the system has a facility for producing user profiles derived from demographic information entered. Future developments include the improved handling of free-text input and extending the range of argument and reasoning types. Validation of the system through extensive field-testing is currently in process.

Parmenides demonstrates how computational models of argument can be used in a way that is not inhibiting to the layman because it operates behind a succession of screens that display the models in a friendly and familiar questionnaire format. Coherent and useful information is gained by the consultation without forcing the user (the general public) to become familiar with the rigorous reasoning standards underlying the computational model of argument—thereby aiming to ensure that no one is left stranded on the wrong side of the digital divide.

Carneades

Carneades[6] is an open source argumentation system under development in the European Estrella project (IST-2004-027655), which aims to help both citizens and government officials take part more effectively in dialogues for assessing claims such as those for social services such as housing or unemployment benefits. Carneades provides software components for constructing arguments from formal models of legal concepts, rules, and cases (Gordon, 2008) for evaluating and comparing arguments, for applying proof standards, and for respecting the allocation of the burden of proof (Gordon & Walton, 2006) and argument visualization (Gordon, 2007). To our knowledge, Carneades is the only system to date to support argumentation tasks at all three layers (logic, dialectic, and rhetoric) of the argumentation use-case diagram.

As with Parmenides, one of the strengths of Carneades lies in its ability to inform users about the acceptability of statements without requiring the user to have an expertise in argumentation theory, mathematics, or computer science.

Summary

To conclude, in this section we have presented a number of argumentation support

tools. Some of these focus on the visualization of arguments, and here the graphical notation and user interface are important features. Others focus on providing analysis of the situation, but typically with a more limited graphical user interface. A number of underlying argumentation models are used. In considering their relevance to e-participation, we need to consider the features needed to support informed debate to support evidence-based policy-making. The systems we have presented here allow the users to have access to various levels of information, to be able to focus on specific information, and to have the ability to organize the gathered data to construct an effective argument—all of which are required for e-participation.

CONCLUSION

In e-participation, there is a clear requirement to understand better how technology can support informed deliberation on issues (Schlosberg et al., 2007). Yet, there are two significant obstacles facing a potential participant in such a process. First, political issues are typically complex, presenting a large number of arguments and counter-arguments for consideration. These, when presented in linear text, can be confusing to the public at large. Secondly, it is not obvious that all people equally possess the necessary critical thinking skills for effectively deliberating upon such issues. Accordingly, in this article we have explored how the application of argumentation systems is adding value to e-participation methods by tackling these barriers.

Argumentation systems are computer software applications for helping people to participate in various kinds of goal-directed dialogues in which arguments are exchanged. The authors are aware that many of the systems outlined above were developed in response to issues in legal, education, and commercial domains, thus significantly distinct from the concerns of e-participation; they acknowledge that the transition to e-participation cannot be entirely seamless. In a research workshop on the application of argumentation systems to e-participation (Gordon, Macintosh, & Renton, 2006), four areas were identified where improvements should be made in order to exploit fully the benefits of argumentation systems. Very briefly, these are as follows:

(a) Developers need to strike a balance between imposing a formal structure upon contributions from the public, which some may find inhibiting, and providing a free text field, which imposes a considerable cost on consultation organizers in the task of extracting useful information.
(b) Research into getting argumentation systems to function efficiently has often been at the expense of refining the user interface; there is now an urgent need to address this imbalance by investigating what features are necessary for an interface if the system is to attract participants and encourage them to provide deliberated input.
(c) Associated with the previous point is the need to classify the various user groups and identify their unique requirements in order for the views of specific groups to be targeted more effectively.
(d) There is, as yet, very little work on establishing a suitable protocol for dialogue within online consultation practice by which the interaction of the system with the user can be guided.

However, the potential relevance of argumentation systems to e-participation should be readily apparent since the goal of e-participation is to engage citizens in dialogues with government about such matters as public policy, plans, or legislation. Argumentation plays a central role in this process, as in any public consultation where citizens are given an opportunity, not only to make suggestions, but also to support these suggestions with arguments. We have shown that argumentation systems are useful both for guiding the reconstruction of arguments put forward by other parties, so as to open them up to critical analysis and evaluation, as well as for supporting the construction ("invention") of new arguments to put forward in support of one's claims or to counter the arguments of others. Given that argument maps

use icons and arrows to represent the structure of a series of related viewpoints, thereby clarifying the issue under consideration, they have the potential to provide a readily accessible medium in which citizens can follow, and contribute to, public debates on policy issues.

As governments seek to consult their citizens over matters of policy, it becomes increasingly important for citizens to receive the relevant information in a medium that they can use, and will want to use, in forming their opinion on consultative issues. This article presented sample uses of argumentation systems to support e-participation in order to assess their potential contribution to the consultation process. Argumentation systems cover techniques for the presentation of complex information in a thematically arranged format for identifying those issues that generate a significant response, for collating consultation responses and representing them within an argument structure, and for checking on the consistency of contributions to a debate. As such, argumentation systems have a valuable contribution to make to both government and civil society.

NOTES

1. See http://zeno.berlios.de
2. See http://www.compendiuminstitute.org
3. A series of screen shots for this case study may be found on the following Web pages: http://rickonneblue.atspace.com/SEQ%20e-Consultation%20Maps.html and http://rickonneblue.atspace.com/NewSEQ%20e-Consultation%20Maps.html
4. See http://www.mech.upatras.gr/~nikos/index.html
5. See http://cgi.csc.liv.ac.uk/~katie/Parmenides1.html
6. See http://carneades.berlios.de

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