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TOWARDS A STRUCTURED ONLINE CONSULTATION TOOL

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Abstract

This paper outlines a Structured Online Consultation tool (SCT), which is a component tool in the IMPACT Project and is designed for the construction and presentation of detailed surveys which solicit feedback from the public concerning issues in public policy. The tool is underwritten by a computational model of argumentation which incorporates fine-grained, interconnected argumentation schemes. Abstracting over the arguments and their relationships, we can reason with inconsistency. As such, the tool automates reasoning about arguments and counter-arguments as indicated by the respondent, while maintaining usability by presenting the user with simple questions.

Keywords: Policy-making, consultation, argumentation.

1 INTRODUCTION

The Structured Online Consultation tool (SCT) is a component of the IMPACT Project, a European Union funded Framework 7 project in the ICT for Governance and Policy Modelling theme. The focus of the IMPACT Project is to improve public policy-making.[ii] In this paper, we first briefly outline the policy-making context of the Project and the other tools. We elaborate on the role of the SCT and introduce *Argumentation Schemes*. We give an example of how an argumentation scheme, *Practical Reasoning*, is represented in the SCT as well as how screens present information that leads the respondent to the survey to consider various aspects of the argument, so that specific points of agreement and disagreement can be registered. The tool is underwritten by a computational model of argumentation, which is briefly outlined; the justification for such a model is to enable formal, automated reasoning with respect to arguments that represent defeasible and inconsistent information to assist in the construction of the survey and with the aggregation and evaluation of responses when the survey is completed. We discuss how argumentation schemes can be analysed in a form compatible with this model of argumentation. The model itself is not presented to the user: usability is maintained by requiring the user only to answer a series of simple questions.

2 CONTEXT

Policy making is generally viewed as a cyclical, multi-stage process (Bench-Capon, 1991). Simplifying, we have the following stages:

1. *Evaluation*: policy analysts look at existing laws and regulations, considering how the laws and regulations achieve the intended goals.

2. *Agenda setting*: based on the evaluation, public administrators define areas for change or improvements, given changed circumstances or political goals.

3. *Policy formulation*: given an agenda, proposed laws or regulations (policies) are proposed and commented upon.

4. *Decision*: after consultations about the proposed policies, the draft laws and regulations are introduced into the political process (i.e., subjected to parliamentary readings, etc.).

5. *Implementation*: Once enacted, legislation is enforced.

The IMPACT Project contributes to the policy formulation stage, where laws and regulations are made available for comment to the general public as well as to a selection of stakeholders with a special interest in topics of the policy. Presuming that the policy has been formulated, we can refer to the commenting activity as *policy consultation.*

As an example of the current state of the art in policy consultation, consider the United Kingdom's Cabinet Office Public Reading website,[iii] which currently presents the Protection of Freedoms Bill; one can unfold all the parts, sections, and clauses of the whole bill. At the bottom level, the user can read and respond to a particular portion. For instance, we have a partial structure:
Part 1: Regulation of Biometric Data;

Destruction, Retention and use of Fingerprints, etc.;

Modification of rule for particular circumstances;

10. Material given voluntarily

As of the date of access, there were five responses to *Material given voluntarily*; moreover, users can respond to previous responses, giving rise to a complex threaded discussion. For instance, one respondent suggested that, after some time and if not part of an on-going investigation, individuals should be asked if they want their data destroyed and their consent withdrawn; another respondent briefly reacts to this and contributes comments on the problems of the term "consent". As a means to allow members of the public to respond to particular portions of proposed legislation, this facility seems very successful and popular. It uses a simple, accessible, and widely used interface to solicit, record, and share responses; in this regard, it is transparent, open, and inclusive.

However, such a facility has a range of limitations. It is difficult to get an overview understanding of the whole policy and the relation of responses to it. Thus, the role and impact of responses is not highlighted. There is no support for analysing the responses, which is then done "manually" by analysts of the consultation, making the contribution of the responses to the development of the policy draft obscure. Moreover, while the responses are specifically linked to parts of the legislation, the unconstrained nature of the responses means the consultation is unstructured and unsystematic. Not only does this allow inappropriate or irrelevant responses, but it may not elicit the kind of important or useful information that is the primary motivation for the consultation in the first place. Finally, the Bill itself proposes a solution to some legislative problem; comments on the Bill may discuss alternative solutions. Yet understanding the Bill or alternative solutions may rest on the *motivations* and *justifications* underlying the solutions, for example, in terms of social values that the solution promotes. Making these motivations and justifications overt would further support rational analysis and understanding of the Bill, which in turn would better represent the stakeholders' interests and objectives. Providing tools for consultations to address these limitations would positively impact on policy making.

To address such limitations, the participants in the IMPACT Project are conducting original research on and development of tools to facilitate deliberations about public policy. There are four tools:

- Argument reconstruction, which applies text analytic techniques and tools to source texts and comments on policy.
- Argument visualisation, which provides a graphical representation of elements of the initial policy and responses.
- Policy modelling, which allows users to model alternative outcomes of policies given selected choices.

- Structured consultation, which supports structured information gathering such as information about the justifications of proposed policies.

For the purposes of the IMPACT Project, the four tools, the *SCT* among them, will be integrated into the IMPACT Project toolbox, allowing other components of the toolbox access to common information data. The *SCT* will be a Rich Internet Application (RIA), which are web applications that have many of the characteristics of a desktop application, but are delivered over the internet in a browser, plug-in, sandbox, or virtual machine. In addition, the *SCT* will be implemented to adhere to the OSGi standard, which provides an environment where applications are modular bundles that are collections of classes, jars, and configuration files that declare their external dependencies and that can be remotely installed, started, stopped, updated and uninstalled without requiring a system reboot. Finally, as the *SCT* is to use data from and provide data to other IMPACT Project tools, the *SCT* will support the export and import of argumentation scheme elements in an Extensible Markup Language (XML) format, e.g. LKIF, via Application Programming Interfaces (APIs). On the project website, one can find further information about the other tools in the toolbox. Underpinning all four of the tools are formal, computational models of argumentation and policy. In the next section, we discuss aspects of the IMPACT Project, concentrating on the *Structured Online Consultation* tool (SCT), which is under development at the University of Liverpool, and argumentation

3 THE SCT AND ARGUMENTATION SCHEMES

The IMPACT Project is, as briefly outlined above, intended to provide a toolbox for policy-making consultations based on formal, computation models of argumentation. Arguments are central since, given the deliberative context of the consultation, contributors respond to some point of the proposed legislation either by arguing for or against that point, or providing alternatives (which may or may not be construed as incompatible). The arguments may take a range of forms such as giving reasons against a point, giving a definition, adding a premise, identifying anomalies, giving a counter-example, or stating conditions under which the rule is inapplicable, among others. While contributors are aware that they are deliberating, they do not usually systematically address issues raised by other contributors, much less formalise the arguments as might a logician so as to enable further reasoning over the responses. By the same token, without some formalisation, further automated processing for reasoning is infeasible. The latter is rather important given the sheer amount and complexity of information users can submit. As most contributors are not trained logicians or computer scientists, it is not reasonable to expect that they could provide systematic, formal, machine-readable arguments. A central problem which must be addressed is to bridge the "gap" between the sorts of deliberative inputs that the participants provide and the systematic, formal representations that can be used for further automated processing such as for reasoning.

The *SCT* is a tool which supports the formation of arguments bearing on policy such as found in comments on government Green Papers and White Papers; the arguments are presented in a form that is suitable for surveys which solicit feedback from the public, thus gathering data on public opinion. In other words, the surveys are straightforward for participants to read and respond to. In forming arguments, the *SCT* is underwritten by a formal model of argumentation; consequently, complex arguments on policy positions can be analysed, evaluated, and justified. We discuss some aspects of this model further below. However, participants who submit answers to the survey component of the tool do not interface *with* the formal model, but have questions generated *from* the model and presented to them in a logical sequence and in natural language. Thus, the tool allows participants to use the tool in a natural and intuitive way, yet allows the analysts to evaluate the data formally, systematically, and transparently.

There is a current prototype tool, Parmenides, which serves as a basis for development of the *SCT*; it has several subcomponents:

- A tool to create the model from which surveys are generated.
- A tool to serve surveys and gather data.

- Tools to analyse the data.

These are all related to argumentation, which we discuss next.

One of the central objectives of the *SCT* is to provide a framework in which rich networks of interconnected arguments, using a wide variety of argumentation schemes, can easily be created, surveyed, analysed, and evaluated. We briefly outline a formal theory of arguments and argumentation schemes. Arguments generally are understood as *premises* followed by a *claim* or a *conclusion*; we say that we infer the claim from the premises. In Classical Logic, given premises such as *All men are mortal*, and *Socrates is a man*, we can conclude that *Socrates is mortal*. In this argument, where the premises are true, the claim must follow. There are many such argument forms in Classical Logic, and an essential aspect is that reasoning can be done with respect to the abstract *form* of the expressions rather than the component *meanings* of the words within the sentences of argument; that is, it is not particularly relevant that we have *men*, *mortal*, or *Socrates*, since other nominals, predicates, or individuals could be used, still maintaining the same inference. However, there are other arguments in which the claim only *presumptively* or *usually* follows from the premises and where the meanings of the words within the sentences of the argument are not as easily substitutable, while maintaining the inference. Broadly, we speak of *argumentation schemes*, of which there are many sorts (Walton, Reed, and Macagno, 2008).

One example of an argumentation scheme is the so-called *Argument from Expert Opinion*, which we give an a template and then as an instantiated example:

- Premise 1: Source E is an expert in subject domain S, which contains proposition A;
- Premise 2: E asserts that A is true;
- Claim: A

In instantiating the argument, we use "made up" animals *fookens* and *footiles* so we need not introduced additional presumptions about science.

- Premise 1: Dr. Smith is an expert in evolutionary biology, which contains the proposition "Fookens evolved from footiles";
- Premise 2: Dr. Smith asserts that fookens evolved from footiles;
- Claim: Fookens evolved from footiles.

While one might, in the ordinary course of discussion, presumptively accept that the claim follows from the premises, it is not necessarily so since we can attack the argument in various ways. For example, the claim would fail to follow where it is shown that Dr. Smith is not a credible expert, or is not an expert in evolutionary biology, or that there is a dispute among evolutionary biologists about whether "Fookens evolved from footiles", or if Dr Smith made the assertion while telling his young children a bedtime story, and so on. It is also clear that the form of the argument scheme depends highly on the terms of the premises; that is, changing terms such as *expert*, *contain*, or *asserts* to *familiar with*, *could contain*, and *imagines* lead to significantly different presumptive inferences as well as ways to attack the argument.

There is a range of argumentation schemes; among those which appear in informal discussions of policy that we may consider in light of our analysis, formalise, and represent in the design for use in the *SCT*, we find:

- Argument from Credible Source
- Argument from Analogy
- Value-based Practical Reasoning
- Slippery Slope Argument

For each scheme, there are ways to analyse and criticise the premises, claim, or rule such that, if the criticisms are upheld, the presumptive claim does not follow from the premises.

4 TOWARDS STRUCTURED ONLINE SURVEYS

In developing the *SCT*, the Practical Reasoning argumentation scheme is central, since all policy proposals are based upon a justification of *what to do* on a specific issue (Atkinson and Bench-Capon, 2007). Moreover, the Practical Reasoning argumentation scheme is related to and supported by other schemes, which in turn may be supported by still other schemes, thus requiring a *network* of interrelated schemes. We give the scheme and an instantiation. This is followed by discussion of a sample of screens that follow the initial presentation of the argument, illustrating some of the interactions between the respondent and the system.
Schematically, Practical Reasoning argumentation scheme is:

- Premise 1: The current circumstances are R;
- Premise 2: Doing action A realises goal G;
- Premise 3: The goal G promotes value V;
- Claim: We should do action A.

For an example of the envisaged use of the SCT, we will consider a debate on the question of whether or not the ban on Fox Hunting in the UK should be repealed. This survey appears on the *Parmenides* website for Fox Hunting Debate, which is a prototype implementation[iv]; future, richer SCT implementations will improve upon *Parmenides*. In responding to the survey, the user is led through a series of screens of information, each screen presenting some particular aspect of the debate. The initial screen presents the argument for a particular action as proposed by the government, using the Practical Argumentation scheme. (Note that the experts, authorities and enquiries are fictional). The argument states the current situation, the goals and the values they promote, in order to argue for a particular action. It omits aspects of the anticipated situation considered to be irrelevant. For readability, we introduce the claim first, which is followed by the premises which are used to justify the claim:

> Claim: We should repeal the ban on fox hunting with hounds because:
>
> Premise 1: The current circumstances are:
> *The ban gives succour to animal rights extremists, The ban ignores the findings of a government enquiry, The ban prejudices those who enjoy hunting with dogs, Less humane methods of controlling fox population have been introduced, The ban affects the livelihoods of those who make a living from hunting.*
>
> Premise 2: Doing action A realises goals:
> *Withdraw support for animal rights extremists, Take heed of government enquiries, Improve public perception of the government, Remove the prejudice against people who enjoy fox hunting, Prevent suffering of foxes, Reduce the need for less humane methods of fox control, Create more jobs in the countryside.*
>
> Premise 3: The goals realise values:
> *Create more jobs in the countryside promotes Prosperity, Prevent suffering of foxes promotes Animal welfare, Reduce the need for less humane methods of fox control promotes Animal welfare, Remove the prejudice against people who enjoy fox hunting promotes Equality, Take heed of government enquiries promotes Consistency, Improve public perception of the government promotes Consistency, Withdraw support for animal rights extremists promotes Tolerance.*

The argumentation scheme gives us a structured presentation of the initial state of the elements of the topic which is being surveyed. This leads to subsequent screens which solicit the participants' views on particular aspects of the argument.

Over the course of the survey, the participant is asked questions about particular portions of the survey; their responses convey the extent to which the participant agrees or disagrees with the initial position. We consider several such moves.

The screen following the presentation of the initial argument asks whether each of the values are endorsed. Suppose the participant has no interest in Animal Welfare and so questions this value. The value could be justified using an argument from *Commitment*.

> *In their manifesto the current Government wrote: "We will do all in our power to ensure that both animal and human rights are respected". This commits the Government to the recognition of animal rights as a value.*

This could convince the participant to accept this value.

The next screen invites objections to the links between goals and values. Here the participant may object to the claim that withdrawing support for animal rights extremists promotes tolerance. This might be justified by:

> *Animal rights extremists are intolerant. Supporting intolerant people demotes tolerance. So withdrawing this support from intolerant people promotes tolerance.*

The participant may not be convinced by this, either because he disputes the second premise, or because he does not think the conclusion follows. Having registered his particular disagreement, he moves on.

The third screen gives the opportunity to question the goals that will be achieved. Suppose the participant does not agree that repealing the ban on hunting will create more jobs in the countryside. This might be justified by an argument from *Position to Know*.

> *The Countryside Union are in a position to know whether more jobs will be created in the countryside. The Countryside Union have stated that repeal will result in 10,000 additional jobs. So, that repeal will result in more jobs in the countryside.*

When presented with a list of possible objections characteristic of the scheme, the participant may reply that the Countryside Union is biased. Additionally he may enter an opinion of his own that the Leisure and Life Federation has estimated that repeal would lose jobs as countryside tourism would diminish.

Next the current facts can be questioned. Here the participant may question the claim that current methods of fox control are less humane than hunting. The justification here may be an argument from *Expert Opinion*:

> *Sir Thomas Thompson FRVS is an expert in animal neurophysiology. He has stated that the suffering of a fox during a hunt is less than that of a fox which is shot or snared. Therefore current methods of control are less humane than hunting.*

The participant may accept this argument and object instead to the claim that the ban ignores the findings of a Government enquiry. This claim may be justified by *Argument from Citation*, quoting from the Cotton Commission of 1923. From the list of critical questions bearing on the citation, the participant may select the objection that there has been a later enquiry, citing the Banks Commission of 1998.

Here the survey ends. The participant has been guided through the argument in favour of repeal, step by step, and invited to object to key elements at a fine granularity. Where the participant objects, justification is given, using a range of argumentation schemes. Again the participant is prompted for objections to these schemes. Some may convince, others may not. In the example above, some doubts have been resolved, but the participant remains unconvinced that more jobs will result from a ban, that tolerance will be promoted, or that hunting was supported by a relevant Government enquiry.

If these opinions were generally held, the argument could be modified, perhaps removing the unnecessary reference to the inquiry, dropping tolerance from the list of values and providing a stronger justification for the additional jobs or an explicit rebuttal of the argument of the Leisure and Life Federation. This might then produce an argument acceptable to a larger proportion of the people.

Here we have given only one level of justification. There is, however, no reason why the justifications should not themselves be justified: for example the independence of the Countryside Union might be

established by some argument. These linkages between arguments and increasing the depth of justifications will be a focus of our future work.

What we have given here is a natural language characterisation of the debate as would be seen by participants of the survey. Yet our task with respect to the underlying theory of argumentation schemes is to clearly define the formal language needed to support computational processing.

We have illustrated the introduction of an instantiated argumentation scheme, which is an argument for a particular claim given particular premises. We have shown how the participant to the survey is led through a series of screens which examine the various parts of the argument, allowing respondents to the survey to identify just what aspect of the argument they agree or disagree with. Note that in some instances, the point under discussion relates to a further argumentation scheme, as in the instance in the example where the argument from *Expert Opinion* was invoked.
To advance the current version of the survey tool, the SCT further formalises argumentation schemes, decomposing them into their fundamental expressions. The justification for this more fine-grained, analytic approach is to support automated analysis of relationships among the argumentation schemes, where the relationships are of attack (of various sorts) and interdependence. In the next section, we briefly discuss some of this theoretical background.

5 TOWARDS A FORMALISATION OF ARGUMENTATION SCHEMES

We have to this point looked at particular arguments embodying argument schemes. In this section we will discuss some of the underlying theory relating to argumentation schemes.

Argumentation schemes may be characterised formally as defeasible inference rules within some framework of defeasible logic such as ASPIC+ (Prakken, 2010). Instantiations of argumentation schemes can be attacked in one of three ways. Thus an argument Arg_y attacks an argument Arg_x, where we have several sorts of attack – rebuttal, premise defeat, and undercut:

- *Rebuttal*: If the *conclusion* of Arg_y is incompatible with the *conclusion* of Arg_x, Arg_y rebuts Arg_x;
- *Premise Defeat*: If the *conclusion* of Arg_y is incompatible with one of the *premises* of Arg_x, Arg_y premise defeats Arg_x;
- *Undercut*: Defeasible rules are not applicable in all circumstances. If the conclusion of Arg_y is incompatible with the *application of the rule* used by Arg_x, Arg_y undercuts Arg_x.

If, for example, one has an argument from expert opinion, an argument based on the contrary opinion having been expressed by another expert would rebut it, an argument demonstrating that the expert never expressed the relevant opinion would defeat a premise, and an argument showing the expert to biased, perhaps because his research is funded by a company with vested interests in the conclusion, would undercut it. Conflicts based on rebuttal and premise defeat may be settled by preferences between arguments (based on their strength, source, or other properties), but (in ASPIC+), undercuts always succeed, unless themselves defeated by another argument.

Given a set of such arguments, and the attack relations between them, we can construct an *Argumentation Framework* (Dung, 1995) Note here that arguments can be defended by other arguments attacking their attackers. This enables us to identify sets of arguments within the framework which form collectively defensible *positions*. A variety of semantics for defensible positions have been suggested, the most popular of which are *grounded*, representing the minimal complete defensible position, and *preferred* representing the maximal complete defensible positions. There can be several preferred extensions, where cycles of attack force us to choose between arguments; the different choices lead to different positions. An argument which is part of *all* defensible positions is said to be *sceptically* acceptable, while one which forms part of *at least one* defensible position is said to be *credulously* acceptable.

Argumentation schemes can be expressed at several different levels of abstraction. For the purposes of Argumentation Frameworks, the scheme is unimportant. The scheme may have played a role in

identifying attackers of the argument, but it is otherwise immaterial for the purposes of evaluation. At this wholly abstract level of representation, there is not even a distinction within the argument of premises and conclusions, so we cannot even say what claims correspond to a given position. Yet since we will often wish to have this ability, we represent an argument as a set of premises together with a claim. This provides our first instantiated level of representation, where we have only one generic argumentation scheme.

In order for the notion of different schemes to be meaningful, we must subtype propositions: thus the Argument from Expert Opinion requires one each of three different subtypes of propositions: one to identify the expert, one to state what that expert asserted, and one to assert that the expert has expertise in the domain to which the assertion applies. At this level we can also identify undercutters, which will be arguments with conclusions of particular subtypes. For example, an argument concluding that the expert was biased, or joking, or otherwise insincere, would make the scheme inapplicable.

At the next level of abstraction we can identify propositional functions and terms capable of making statements of the required subtype. Thus the expert premise could be expressed as the propositional function *is-an-expert-in* applied to terms *E* and *D*, as in *is-an-expert-in(E,D)*; similarly, we may have , *is-knowledgeable-about(E,D)*, *respect-opinion-about(E,D)*, or *is-a-world-leading-authority-in(E,D)*. Given that we need to specify a vocabulary for our systems, some limited number of propositional functions and terms will be supported, and perhaps one canonical form chosen. Note the variables for terms need to be subtyped as well: E can only be a person, for example. Such information will be represented in a supporting ontology. It is at this level that we can express argumentation schemes as defeasible rules of inference in ASPIC+ or another suitable defeasible logic.

The final level of instantiation is where the variables in the propositional functions are associated with particular entities, *is-an-expert-in(John, Physics)* and the like. The linguistically correlated expressions, e.g. John is an expert in Physics, are presented to and received from, users.

In addition to the analysis of schemes into increasingly precise forms, we require an analysis of the relationships *between* schemes. Typically we find that certain schemes are characteristically used to support or attack arguments made using other schemes. Thus, for example, there are a variety of schemes intended to establish *causal* relationships, and one of these will be required to justify the key premise in practical reasoning schemes that the action proposed will realise the goal. Similarly *Argument from Bias* (A person says that P, but he is biased and so cannot believed), is used to undercut arguments relying on a person's opinions, such as those made using *Expert Opinion*. Since the SCT is based on the *Value-based Practical Reasoning* scheme, it will be necessary to identify argument schemes which establish each of the premises of that scheme:

- What the current circumstances are;
- What actions are possible in those circumstances;
- What will result from the performance of those actions;
- What values will be promoted and demoted by those results.

In addition there will be schemes required to support, for example, preferences between values. The argument schemes used to establish premises of the Value-based Practical Reasoning scheme will themselves need their premises to be justified by further arguments and be open to attacks using other characteristic schemes. The original argument will also be attacked using only particular schemes: rebutters for example, need to have as their conclusion that an action should not be done. Yet other schemes supply undercutters for the practical reasoning scheme. Thus, the *SCT* will require a *network* of interrelated schemes to fully present policy justifications and potential criticisms.

Although a range of schemes have been identified in works such as (Walton, Reed, & Macagno, 2008), disciplined representation and codification at the levels of abstraction identified above remains in its infancy; work has as yet barely started on establishing the relations between schemes. These argumentation techniques are thus beyond the current state of the art, but we believe them to be essential for effective support of the sort the SCT is intended to provide. In this way, our project will further argumentation research and well as e-participation.

6 CONCLUSION

In this paper we have outlined a *Structured Online Consultation* tool, which is to be used for the policy consultation phase of the policy-making process. We have described a current Government sponsored policy making tool in use in the UK and several limitations with it. Various tools in the IMPACT Project, the SCT among them, are designed to address these limitations using current web technologies and state of the art computational argumentation techniques. The SCT uses formalised argumentation schemes which enable defeasible reasoning such as found in policy consultations, where participants may disagree. A current prototype implementation was outlined. In the final section, we indicated some aspects of our formal analysis of argumentation schemes.

In introducing our proposal, we mentioned an online policy-making support tool, the United Kingdom's Cabinet Office Public Reading website, and outlined several generic limitations: it is difficult to gain an overview of the impact of the comments on the policy; experts analyse the comments, which makes the relation between comments and policy outcomes obscure; the comments are given in an unstructured and unsystematic format; agreement or disagreement to a proposed rule is not sufficiently fine-grained to be as informative as may be needed; and underlying motivations and justifications are not made explicit. There are several other policy-making support tools in the European Union and the United States which use currently available wiki, comment, email technologies; they share, to a greater or lesser degree, these limitations. The UK Prime Minister's Office ePetition and the European Commission's The European Citizens' Initiative facilities allow citizens to electronically create, sign, and submit petitions; essentially, these are web-based versions of what is currently accomplished manually. Both of these tools contribute to the policy formulation stage of the policy-making cycle, but not to the comment stage. Other initiatives aim to improve the *quality* of comments to proposed legislation. The US General Services Administration is preparing a tool to support consultation, ExpertNet, which is to provide structured responses that are useful, relevant, and manageable, for example, by ranking responses, providing specific questions, or annotating responses. In the US state of Massachusetts, legislators seek to use a wiki tool, LexPop, to "crowdsource" the incremental development of legislation. The RegulationRoom is an academically hosted facility for commenting on proposed legislation, providing guidelines on effective comments. These current tools and initiatives are clearly important and useful in leveraging current technologies to draw in greater citizen participation to policy-making by moving in the direction of making participation easier and improving the informativeness of feedback.

While these tools make important contributions in terms of access, speed, and specific informative elements (e.g. ranking), they do not further the substantive semantic analysis of the comments in a form that supports machine-processing of rich, complex information, particularly where the comments introduce conflicts and inconsistencies that must be reasoned with. In brief, these tools do not make use of current thinking or techniques found in Artificial Intelligence. In contrast, the SCT, which is based on a formal, computational model of argumentation and argumentation schemes, provides just such a semantic analysis in a form which can be processed and reasoned with further. While it does structure the feedback, it does so in a way that is accessible and corresponds closely with intuitive considerations. Not only is the informativeness of comments increased, but reasoning about conflict and inconsistency is facilitated. Consequently, analysts, policy-makers, and members of the public will have a greater understanding of the meaning and implications of the policy as well as how they might specifically critique or contribute to it. Along with the other tools in the IMPACT toolbox, such as reconstruction, visualisation, and policy modelling, SCT provides a means to identify, represent, and reason with information concerning policy, using an underlying computational model.

In future work, we will formally specify the argumentation to be used in the SCT, which will then be implemented in the tool. The tool will also be used and tested in "real world" settings by policy-making organisations, comparing and contrasting the existing tools to the SCT along with taking further guidance on developments of tools for policy making.

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References

Atkinson, K and Bench-Capon T. 2003. 'Practical reasoning as presumptive argumentation using action based alternating transition systems'. Artificial Intelligence, 171(10-15):855-874.

Bench-Capon, T. 1991. 'Knowledge based systems applied to law: a framework for discussion'. In T. Bench-Capon, *Knowledge Based Systems and Legal Applications* (pp. 329-342). Academic Press.

Dung, P. M. 1995. 'On the acceptability of arguments and its fundamental role in nonmonotonic reasoning, logic programming and n-person games'. *Artificial Intelligence*, 77(2):321–358.

Prakken, H. 2010. 'An abstract framework for argumentation with structured arguments'. *Argument and Computation*, 1(1):93-124.

Walton, D., Reed, C., & Macagno, F. (2008). *Argumentation Schemes.* Cambridge: Cambridge University Press.

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[ii] For further information about the project, such as participants, publications, and deliverables, please see the IMPACT Project website:

http://www.policy-impact.eu/

[iii] See:
http://publicreadingstage.cabinetoffice.gov.uk/
Accessed 07/03/2011. This website is in Beta and subject to change. The discussion is for illustration purposes only.

[iv] See:
http://www.csc.liv.ac.uk/~parmenides/foxhunting/
Accessed 07/03/2011.