Modeling Claim-Making Process
in Democratic Deliberation

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Abstract. Online deliberation is a promising venue for rational-critical discourse in public spheres and has the potential to support participatory decision-making and collective intelligence. With regard to public issues, deliberation is characterized by comparing and integrating different positions through claim-making, and generating collective judgments. In this paper, we examine the claim-making process and propose a conceptual model to manage the knowledge entities (claims, issues, facts, etc.) in claim-making and their relationships. Extending prior works in argumentation models and issue-based information systems, our model is especially capable of depicting the formation and evolvement of collective judgments in deliberation context.

Keywords: Claim-making, online deliberation, collective intelligence.

1 Introduction

A great challenge of modern organizations is to make decisions leveraging collective knowledge and wisdom of the crowd (stakeholders) [1]. Social web technologies generated an incredible breadth of publicly available content (personal experiences, positions on public issues, etc.) and created unprecedented opportunities to collect and share personal ideas for collective action for the community. However, as Gruber [2] argued, existing social web technologies helped us to achieve *collected* intelligence ("what *you and I* think"), which is far from the grand vision of *collective* intelligence ("what *we* think") [3], where ideas are highly connected and mutually informed. Collective intelligence emerges from the process of evolving isolated knowledge nuggets towards a higher order of complex thought, problem-solving, and integration of shared individual knowledge [4].

The construction of collective intelligence requires certain type of communications in a community. The key characteristics of such communications are dialog [5], deliberation [3], and the marriage between the two [6]. Deliberative dialogs are characterized by a desire to understand all views and reach outcomes which are rationally identified as optimal for a given issue, i.e. to *think* together and discover where the collective mind might lie. This involves listening deeply

to other viewpoints, exploring alternative perspectives, and seeking for collective judgments.

One of the most powerful ways to think together is to use reasoned claims to state one's position on an issue [7]. Supported by evidence, claims help to externalize private ideas and personal judgments for public inspection and evaluation. Collective claims towards an issue, which are fully justified and acknowledged, are sought in deliberation to inform subsequent decision-making [8]. The construction of such claims involves careful evaluation of different perspectives and an integration of evidence that is scattered in the minds of the individuals.

A conceptual model is needed to formally represent the claim-making process in deliberation context, especially reflecting the evolvement from personal ideas to collective judgments. Although prior models [9–11] are able to provide a detailed structure of argumentation within a single claim or the trade-off of different claims towards an issue, they are not capable of describing the development from individual claims to collective ones. As an extension to these models, our model reflects this development process by capturing the relations between claims (revision, synthesis, etc.)

In the rest of this paper, we first conceptualize the claim-making process in deliberation context (Sec. 2), followed by a formal definition of our model (Sec. 3). In Sec. 4 we discuss the applicability of prior models in capturing the claim-making process in deliberation.

2   Understanding Claim-Making in Deliberation

The following scenario is representative of the claim-making behavior in deliberation.

Scenario. The local borough is planning to replace the coal-burning system of the local power plant with a high-pressure pipeline of natural gas, in order to meet a new air pollution reduction requirement set by EPA (Environmental Protection Agency. The city council has received a proposal to install a gas pipeline that goes through a residential neighborhood. A community discussion forum collected the following conversation online.

Molly: *I cannot think of running a high-pressure gas line through my neighborhood without any hazard. It reminds me what happened with the explosion of an unpressurized pipeline that caused multiple deaths and destruction in Allentown a few months ago.*

Joe: *Well, the exploded pipeline was installed in around 1960, even before the construction standards were set. Today they have much stronger material for the pipes, which essentially eliminates failures. So I believe the pipeline is totally safe.*

> Molly: *I agree that the safety goal is more workable now. Even though, the danger is still there no matter how small it is. I would say sticking with coal isn't wrong, though.*
>
> Matt: *Coal won't work; it doesn't meet the new EPA standards on air pollution. But switching to gas is also expensive – the government can do pretty much work with 48 million dollars!*

Claim is defined as a falsifiable proposition meant to be supported with evidence [12]. In support of a claim, *facts* are used to serve as evidence, which are usually statistics, professional knowledge, personal experience or other types of objective truth [13]. *Warrant* is a proposition given to indicate the bearing on a claim of some provided facts, and to prove that starting from those facts, the step towards the claim is a legitimate one [9]. With their legitimacy established by warrant, facts act as the evidence that support the original claim. Fig. 1 (a) shows the argumentation of a claim extracted from the scenario above.

Deliberation starts from an *issue* that receives concern from the public, for which collective decision is sought. Note that an issue may consist of sub-issues that address different aspects of the issue. In the scenario above, the issue of building gas pipeline could be addressed from sub-issues such as necessity, feasibility, routing, etc.

Given an issue, the participants in deliberation tend to have intrinsic principles, concerns or preferences that lead them to take positions. We refer to this characteristics as *values* [14,15]. In the scenario, although Matt was aware of the safety of pipeline, he was not in favor of the decision, mainly for cost concern. Through exchanging ideas and understandings during deliberation, the participants clarify and negotiate the discrepancy of individual values and seek *shared values* that are reflected in their collective judgments.

Toulmin's argumentation model [9] and the issue-based information system (IBIS) [10] can be used to analyze and structure the claim-making behavior in this scenario. Examined with Toulmin's argumentation model, the claim-making process involves stating one's opinion, backing up it with facts, and establish legitimacy of the facts towards the claim (Fig. 1a); examined with the IBIS model, alternative options of the issue are presented, and each of them is analyzed from both upsides and downsides (Fig. 1b).

The limitation of these models lies in that Toulmin's model assume the knowledge involved in claim-making to be clearly defined and acknowledged in advance, while the IBIS model assumes that the different positions are juxtaposed and mutually exclusive. However, these assumptions are not valid in deliberation, where the claim-making process has a more complex pattern:

- In deliberation, the evidence needed to generate well-informed claims is scattered in the minds of the individuals, rather than being clear and acknowledged by every individual. Typically the participants are randomly sampled from the community, each having different background in terms of ethnicity, education and occupation [16]. This results in remarkably diversified knowledge background among the participants. For example, the fact about the
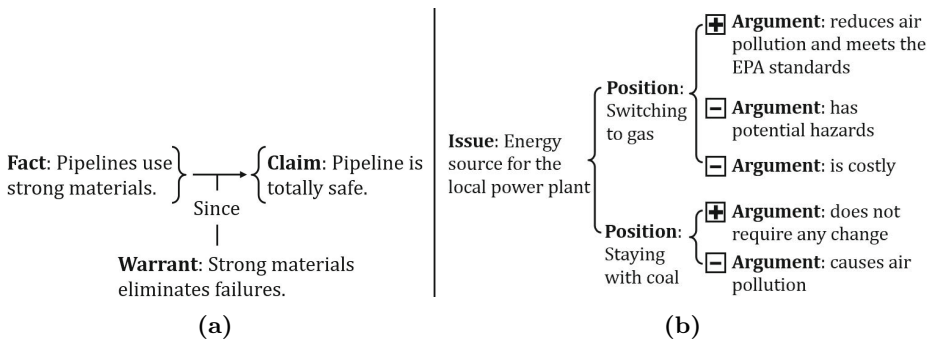
Fig. 1. (a) The argumentation structure of one claim made in the scenario, analyzed with Toulmin's model. (b) Information extracted from the scenario with IBIS model.

advanced installment technology is used to support the claim "gas pipeline is safe", and this fact is known to Joe, but not to Molly. When Joe shared this information, Molly's position changed.

– The claims made by the participants are usually informed by and linked to earlier claims, rather than independent and isolated from each other. Before deliberation, the participants take their initial positions out of their personal value and preferences [6,14]. For example, Molly opposes the idea of building a gas pipeline, because the suggested route was close to her home. In this stage, the claims made by participants are supported by evidence that is unshared and local to themselves. During deliberation, the participants share their judgments of the issue and provide supporting evidence through claim-making. In the light of newly available evidence or being aware of other existing values, people make new claims as revision or reformation of existing claims [17].

As a result of these characteristics of claim-making, the claims in deliberation are changing and evolving. During deliberation, individual knowledge is shared, meshed and integrated, while personal values are externalized and negotiated. With this process, lower-order claims are revised, reformed and synthesized to evolve into higher-order ones that reflect collective thoughts. Eventually, deliberation produces collective claims that take full consideration of the information possessed by the participants and reflect their shared values.

A model for deliberative knowledge should be able to capture the incremental introduction of knowledge, and the relations between claims that contribute to their evolvement. To address these challenges, our model handles the relation *between* claims, in addition to capturing the argumentation structure *within* a single claim.

3   Managing Claim-Making Process

In this section, we give a formal definition of our model, including the knowledge artifacts it captures and the claim-making action it handles, followed by an E-R diagram.

3.1   Representing Knowledge Artifacts

- *Issues.* We define an issue as $i = \langle id, description, I \rangle$, where I denotes a set of issues that are the sub-issues of i.
- *Claims.* A claim is denoted as $c = \langle id, position, time, p, i, F, V \rangle$ where *position* specifies the position expressed in the claim, *time* marks its time of creation, p is the proposer, i is the issue to which c is addressed, F is the set of facts that supports c, and V is the set of values that are expressed in c.
- *Facts and values.* Fact f is defined as $f = \langle id, content, type, time, source \rangle$, where $type \in \{knowledge, personal experience, statistics, other\}$, and *source* could be participant, news agency, government official, etc. We capture the description of a value $v = \langle id, description \rangle$. Set of facts and values are denoted as F and V, respectively.

We also define a participant of deliberation as $p = \langle id, name, age, description \rangle$ and the set of participants P for further reference.

3.2   Representing Claim-Making Actions

- *Proposing a claim.* When stating an initial opinion towards an issue i, a claim $c = \langle id, position, time, p, i, F, V \rangle$ is generated. Extra facts may be adduced to serve as evidence to further strengthen the claim: $c' = \langle id', position, time', p, i, F', V \rangle$.
- *Revising a claim.* In the light of some newly-introduced evidence or being aware of values held by other people, one may revise a pre-existing claim c. By revision, they may refine the expression of a claim with assessment of the evidence, and generate a new claim $c' = \langle id', position', time', p', i, F', V \rangle$.
- *Synthesizing a claim.* An important step in building towards collective judgment is mitigating the difference among a group of claims and synthesizing them [8], as Molly's second statement shows. A new claim c is generated based on the common ground of a set of pre-existing claims C, addressing different positions of them and combining the values of them.
- *Decomposing a complex claim.* The *position* of a complex claim c may contain evaluations/judgments of different aspects, each of them targeted on a different sub-issue, and driven by different value. We define a sub-claim $c' = \langle id', position', time, p, i', F', V' \rangle$ to decompose the original claim. Different from a synthesized claim, a claim with sub-claims is essentially a part of a complex claim, proposed by the same participant.

3.3 E-R Diagram

We schematize the knowledge artifacts and the claim-making process as an E-R diagram, shown in Fig. 2. In translating the claim-making actions into the relations between claims, we introduce $revision(c_i, c_k)$, $synthesis(c, C)$ and $sub\text{-}claim(c_i, c_k)$ relations.

Using this model, we revisit the excerpt of deliberation shown in the scenario in Sec. 2, structure and visualize the claim-making process in Fig. 3.
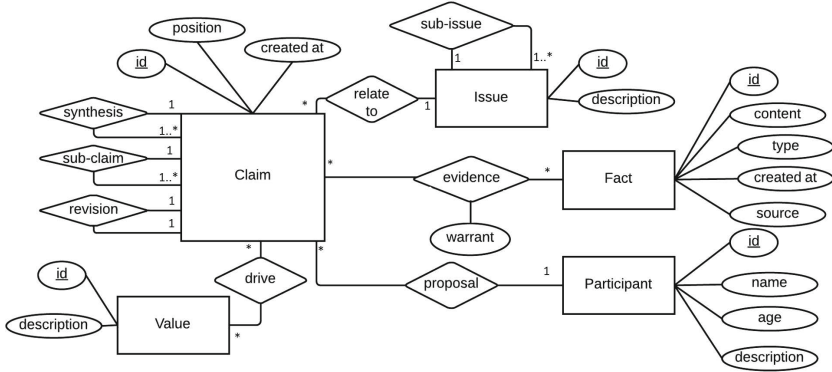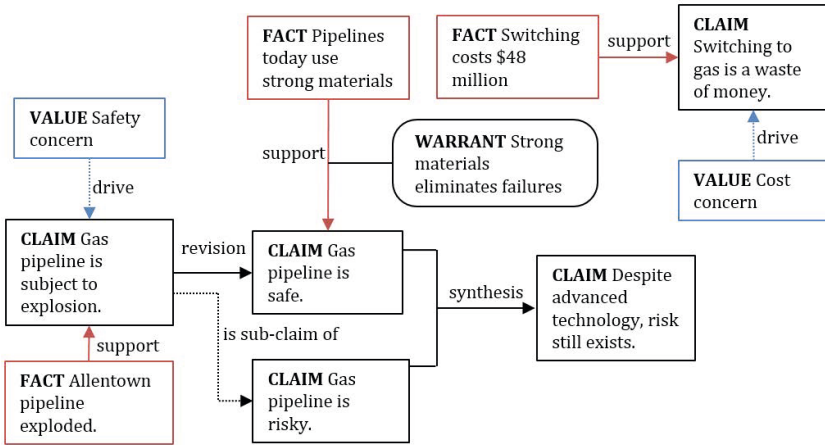

Fig. 2. An E-R diagram for the claim-making model

Fig. 3. Extracted knowledge entities and relations from the scenario

4   Related Works

In this section, we discuss the applicability of prior models in capturing the claim-making process in the context of deliberation.

Toulmin's model [9] provides a detailed anatomy within the argumentation process of one claim. It defines a variety of semantic elements (data, claim, warrant, modality, rebuttals, etc.), from which we adopted the basic claim-warrant-fact structure. The Toulmin model is widely used to structure the argumentation in science and politics [18, 19]. However, it assumes that the elements in the argumentation of a claim as static and clearly presented. It is therefore unable to capture the time dimension of deliberation and the evolvement of claims.

IBIS model [10] and its extensions [20, 21] treat the deliberation process as issue-centered. Given an issue, IBIS captures a group of options towards it [22], each of which is further argued in terms of upsides and downsides. In IBIS-based models, the purpose of argumentation is to evaluate the alternative options and choose a single option as the final decision; therefore it is appropriate for human-centered design [12, 23]. Its limitation is that it assumes the options are mutually exclusive and presented all at once. In deliberation, new options dynamically emerge as revisions to existing ones, partially overlapping with each other rather than being mutually exclusive.

The generic/actual argument model (GAAM) [11] models the decision-making process as a series of clearly-defined generic statements, each of which contains slots that are filled in with actual findings generated in deliberation. GAAM is useful in structuring decision-making process where the steps towards the final decision can be predefined [24]. In deliberation, the claims made in different stages towards the final decision are proposed by participants in the light of available information at that stage, rather than predicted of predefined.

5   Conclusion

This paper introduces a conceptual model for the claim-making process in online democratic deliberation. Extending prior works in argumentation and issue-based information system, this model is tailored to the deliberation context and depicts the evolvement from personal ideas to collective judgments by modeling the relationships among claims. Using an excerpt of deliberation as our scenario, we explained the basic elements and the applicability of our model.

A future direction is to build applications based on the model, and experimentally evaluate the capacity of structuring real social web data with the model. By observing the users' activities in assembling evidence, comparing and contrasting claims, etc., we could move towards an improved understanding of the claim-making process.

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