

Toward Machine-assisted Participation in eRulemaking: An Argumentation Model of Evaluability

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ABSTRACT

eRulemaking is an ongoing effort to use online tools to foster broader and better public participation in rulemaking — the multi-step process that federal agencies use to develop new health, safety, and economic regulations. The increasing participation of non-expert citizens, however, has led to a growth in the amount of arguments whose validity or strength are difficult to evaluate, both by the government agencies and fellow citizens. Such arguments typically neglect to provide the reasons for the conclusions and objective evidence for factual claims upon which the arguments are based. In this paper, we propose a novel argumentation model for capturing the evaluability of user comments in eRulemaking. This model is intended to be used for implementing automated systems to assist users in constructing evaluable arguments under online commenting environment for the benefit of quick feedback at a low cost.

1. INTRODUCTION

eRulemaking leverages information technology to increase public awareness of and participation in federal rulemaking—a multi-step process that federal agencies use to develop new rules, incorporating the feedback from citizens directly affected by the proposed rules [12]. Immediate access to materials about a proposed rule, as well as the ability to share them widely and instantaneously, should increase awareness and participation among citizens who have been missing from the off-line process. One would also expect that the flexibility of time to read, reflect on, and respond to an agency proposal should simultaneously increase the quality of that participation.

Yet, experience demonstrates that merely putting proposed rules and their supplemental materials online has not been enough to overcome the barriers that non-expert citizens face when trying to participate in what is often a highly technocratic process [5]. Without knowing the expectations for participating in rulemaking, non-experts often default to “voting and venting” behaviors—expressing their outcome

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preferences or identifying problems but not providing additional data, information, arguments, or reasons that could substantiate their positions [7]. Because rulemaking is a reasoned decision-making process, and agencies are required to weigh reasoning and evidence, arguments that do not explicitly state reasons or neglect to provide objective evidence for factual claims are not influential. Such arguments prevent an effective communication with other participants, as well.

To better understand the problem, let’s consider short snippets of user comments about Airline Passenger Rights rule by Department of Transportation collected from an eRulemaking platform, *regulationroom.org*:

- (1) All airfare costs should include the passenger’s right to check at least one standard piece of baggage.^A All fees should be fully disclosed at the time of airfare purchase, regardless of nature (i.e. optional or mandatory).^B Any changes in fees should be identified by air carriers at least 6 months prior to taking effect.^C

Because this comment consists purely of claims without any support, it is difficult to evaluate its strength, making it neither influential nor useful for the lawmakers. (In argumentation terminology, there are three seemingly independent arguments, each consisting of a conclusion without any explicit premises.) This is unfortunate, as the commenter already took the time and effort to participate in eRulemaking process, yet hardly any benefit was produced. Had the commenter made the supporting premises explicit, the arguments would have been better assessed and more valuable for the lawmakers.

- (2) I would support a full ban of peanut products on any airline.^A Peanut reactions can be life threatening.^B An individual doesn’t have to consume the product to have a life threatening reaction.^C They can have contact or inhalation reactions.^D Restricting to certain flights is not enough to protect the passengers,^E as residue can be rampant.^F

This comment is much more evaluable, as the premises for the conclusion to fully ban peanut products on airlines are clearly stated. (There are conclusions from sub-arguments, as well, but we will discuss them in more detail when we revisit this example.) To fully assess the argument, however, the readers will need to verify the factual claims such as

2.F, and perhaps 2.B, depending on the reader’s background knowledge. Thus, providing evidence, such as a URL or a citation of an accredited source¹, for those claims would have made the evaluation process easier.

- (3) There should definitely be a cap and not this hideous amount between \$800 and \$1200.^A \$400 is enough compensation,^B as it can cover a one-way fare across the US.^C I checked in a passenger on a \$98.00 fare from east coast to Las Vegas the other day.^D

The is a clearly written comment that can be adequately evaluated as it is. One thing that can be added is, perhaps, evidence for 3.D.

One approach to make the comments more suitable for assessment is to introduce human moderation: Cornell eRule-making Initiative (CeRI) partners with federal agencies to host online discussions of ongoing rulemakings on its civic engagement platform, *regulationroom.org*, with active moderators interacting with the commenters. A key role of the moderators is to prompt commenters to better support the proposition they make, asking for either a reason or evidence. Though human moderation can be effective, hiring and training human moderators can be cost intensive. Also, a quicker moderation is desirable: A majority of the commenters are one-time visitors who never return to the website², and thus, the moderation that takes place after the commenters leave can be ineffective.

In this paper, we propose an argumentation model capturing the evaluability of arguments. This model is intended to be used for implementing automated systems to assist users in constructing evaluable arguments under online commenting environment for the benefit of quick feedback at a low cost.

2. RELATED WORK

There are several models of argumentation that can be considered for modeling evaluable comments, yet fall short of fulfilling the purpose.

Structural Argumentation Models Argumentation models is an active area of research that typically focus on capturing the interaction of arguments via attack and other relations [6, 2]. Among those, structural argumentation models define practical models that can be applied to real text. Besnard and Hunter defines an argument as a pair $\langle \Phi, \alpha \rangle$ where the set of formulae Φ is the support and α is the consequent of the argument [3]. Such distinction of the premises from the conclusion has become quite a standard over the years. But for the purpose of measuring the evaluability of comments and providing helpful feedback, the interaction of multiple types of elementary units of argument via various support relations is desirable. Another popular model by Prakken differentiates strict from defeasible rule and define three different attacks on an argument: rebut, undercut, and undermining[13]. However, we are currently focusing on support relations for constructing more evaluable comments.

¹See Section 3 for details

²Of the 12,665 total visits to *regulationroom.org* to discuss a proposed *Home Mortgage Consumer Protection* rule, 8,908 corresponded to unique visitors.

The Toulmin Model Several researchers have proposed models of the internal structure of arguments, including Toulmin, Farley and Freeman, and Reed and Walton [15, 8, 17]. One of the most widely known argumentation models is the Toulmin Model [15]. As this model has been receiving much attention, many extensions have been proposed. For instance, Bench-Capon added an additional component called “presupposition component” denoting a necessary assumption for the argument that is to be taken without dispute [1], and Freeman identified subcategories of *Warrant* to distinguish various types of warrants [8]. One major issue with the Toulmin Model is that it is underspecified in a few ways, and this is problematic for implementation. Even the experts cannot agree on the correct interpretation, especially about the *Warrant*: For instance, Hitchcock considers it an inference-license, not a premise [9], whereas Eemeren et al. claim that *Warrant* is indistinguishable from *Data* [16]. In our model, we clearly define the elementary units and their interactions.

Argumentation Schemes Argumentation schemes provide templates for prominent patterns of arguments, defining specific premises and a set of critical questions for each scheme [17, 4, 18]. The critical questions make argumentation schemes useful for assessing the validity or strength of arguments, and can provide a more detailed assistance to commenters. However, given the comments consisting of arguments with only a few or no premises explicitly stated, it is practically impossible to decide which argumentation scheme matches the commenters’ intentions, and this in turn means that we cannot easily identify relevant critical questions for given comments.

3. THE MODEL

We now present an argumentation model capturing the evaluability of arguments in user comments with various elementary units and support relations.

3.1 Elementary Units

We adopt and modify results from argumentation research that classifies different types of claims in order to study their characteristics [11, 19]. Hollihan and Baaske, for instance, distinguish three types of claims: fact, value and policy. Simply put, fact claims are verifiable with objective evidence, value claims express preference, interpretation or judgment, and policy claims assert a course of action to be taken. (As we describe each type of elementary units, please refer to examples from Table 1.)

For our purpose, however, we distinguish fact claims about personal state or experience and non-experiential ones and accept the former as a form of evidence and thus not require any further support. The reasons are threefold: (1) it is often practically impossible for the commenters to provide evidence for fact claims about personal state or experience. One reason is that people normally do not have evidence for what they experience (See TESTIMONY 3, for example). This is especially true if we restrict the eRulemaking interface to a typical online commenting environment, where only textual inputs are accepted. Thus, even if one had a picture of left-over peanuts on their seat, they cannot upload it as evidence for TESTIMONY 3. Another reason is that a sufficient evidence may violate the privacy, as in the case of TESTIMONY 1

Unit	Support	#	Example
POLICY	REASON	1	Peanuts should be banned from all airlines.
		2	Do not force passengers to risk their health.
		3	Government needs to protect their citizens.
VALUE	REASON	1	Global warming is more important than any other pressing issues we are facing.
		2	They will lose business eventually.
		3	I am not happy with my new pet.
FACT	EVIDENCE	1	Food allergies are seen in less than 20% of the population
		2	The report states that peanut can cause severe reactions.
		3	The governor said that the economy will recover soon.
TESTIMONY	EVIDENCE*	1	I've been a physician for 20 years.
		2	My son has hypocemia.
		3	There were leftover peanuts from the previous flight on my seat.
REFERENCE	NONE	1	http://www.someurl.com/somewebpage.html
		2	J. Doe 2014
		3	J. Doe 2014. Paper Title. In Proceedings of Conference Name. Pages 12-25

Table 1: Appropriate Support Type and Examples of Each Elementary Unit Type

*Optional Evidence

and 2. (2) In eRulemaking, lawmakers accept a wide variety of comments from citizens, including accounts of personal experience relevant for proposed rules. Arguments based on such *anecdotal evidence* is exactly the type of information that are valuable, yet cannot be obtained through the lawmakers' usual channel of communication with domain experts. If these accounts are relevant and plausible, the agencies may use them, even if they are not substantiated with evidence. (3) Toulmin and Hitchcock classifies them as justified grounds, as well. (See Table 2)

Note that, because a policy claim expresses a specific type of judgment—the one that asserts what should be done—it can be considered a type of value claim. Then, we have a good match between the claim types and appropriate support relations: Since fact claims are verifiable, the best form of support is evidence, in the form of a reference to an accredited source, showing the claim is truthful. On the other hand, no such evidence exist for value and policy claims as they are unverifiable by definition. Thus, an appropriate support is a reason from which the claim can be inferred³.

Lastly, we add a type called REFERENCE to encompass URLs and citations of published articles, as most factual evidence in online comments are provided in this form. REFERENCE

³Even though the appropriate support type for both policy and value claims is reason, their distinction is retained for a possible extension of the system: The system can guide commenters to explicitly suggest a course of action, instead of simply making a value judgment on the proposed rules. However, this may not be necessary, as value claims made about different aspects of proposed rules typically make it obvious what course of action the commenter prefers.

and TESTIMONY are the only elementary units that qualify as evidence. And this completes the set of five elementary units for our model as follows:

Proposition of Non-Experiential Fact (FACT) : A proposition of fact is an objective proposition where *objective* means “expressing or dealing with facts or conditions as perceived without distortion by personal feelings, prejudices, or interpretations.”⁴ By definition a FACT has truth values that can be verified with objective evidence. We restrict the notion of verifiability to the evidence potentially being available at present time. Thus, predictions about future are considered unverifiable. The examples show various types of propositions that can be proved with direct objective evidence⁵. Note that, FACT 3 is considered a FACT because whether or not the governor *said*, “The economy will recover soon.” can be verified with objective evidence, even though his speech itself contains a value judgment.

Proposition of Experiential Fact (TESTIMONY⁶) : Objective proposition about the author's personal state or experience. One major characteristic of this type of objective propositions, as opposed to the non-experiential ones classified as FACT, is that it is often practically impossible to provide objective evidence proving them: It is unrealistic to expect an objective evidence for a personal experience to exist in public domain, and thus, one often does not have the evidence. For instance, you would not expect there to be any evidence for TESTIMONY 3. Also, the author may not want to reveal the evidence for privacy reasons (See TESTIMONY 1 and 2).

Proposition of Value (VALUE) : Proposition containing value judgements without making specific claims about what should be done (If so, then it is a POLICY.). Because of the subjectivity of value judgements, a VALUE cannot be proved directly with objective evidence; however, providing a reason as support is feasible and appropriate. Consider VALUE 1, for instance. There is no objective evidence that can directly prove the proposition, because even if you were to provide objective evidence showing negative effects of global warming, subjective judgment must be made to reach the conclusion that it is the most important issue. VALUE 2 is considered unverifiable, because as discussed in FACT paragraph, objective evidence need to be able to exist at the present time. For VALUE 3 the objective evidence will be available only in the future. An expression of private state, such as VALUE 3, are similar to propositions of value in this respect, thus are categorized as VALUE includes opinions as well as proposition of value⁷.

Proposition of Policy (POLICY) : Assertion that a specific course of action should be taken. It almost always contains modal verbs like “should” and “ought to.” Just like VALUE, a POLICY cannot be directly proved with objective evidence,

⁴<http://www.merriam-webster.com/>

⁵See Section 3.2 for what constitute *objective evidence*.

⁶Technically a better term would be OBJECTIVE TESTIMONY, but we use TESTIMONY for the ease of use.

⁷The motivation for the classification of propositions is to determine the desirable types of support: If the desirable types of support are the same, they should be classified into the same category.

Justified Grounds from [10]	Type	Justified Grounds from [14]	Type
Direct observation	*	Experimental observations	REFERENCE
Written records of direct observation	REFERENCE	Matters of common knowledge	FACT***
Memory of what one has previously observed	*	Statistical data	REFERENCE
Personal testimony	TESTIMONY	Personal testimony	TESTIMONY
Previous good reasoning or argument	Any	Previously established claims	Any
Expert opinion	**	Other comparable "factual data"	REFERENCE
Appeal to an authoritative reference source	REFERENCE		

Table 2: Elementary Unit Types of Justified Grounds (Evidence)

* This cannot be part of an argument. The moment you state your observation, it becomes a testimony.

** If there is a written record, which should be the case for established expert opinions, it is REFERENCE. If a local expert expressed an opinion to the arguer, or he is an expert himself, it is TESTIMONY.

*** As there is no knowledge base of common knowledge, factual propositions about a common knowledge cannot be distinguished from the rest. Thus FACT is not considered as evidence in the automated system.

and a proper type of support is a logical reason from which the proposition can be inferred. In fact, You can present objective evidence about a similar event that has taken place to make an analogy, but it is still not a direct proof that the same thing will happen again. In other words, the existence of a similar event can only be an indirect evidence for the assertion insufficient on its own, not a direct proof for it.

Reference to a Resource (REFERENCE) : reference to a source of objective evidence. In online comments, a REFERENCE is typically a citation of a published work or a URL for online documents. Quotes or paraphrase of a reference such as FACT 2 or 3 are not REFERENCE, as whether the given resource contains the claimed content is a factual statement that can be verified. REFERENCE could also be an attachment if the commenting interface allows it. As it is shown in Table 2, REFERENCE is the elementary unit category for the most types of justified grounds. REFERENCE

3.2 Types of Support

As discussed in the previous section, the elementary units are distinguished with the following types of support in mind.

Reason : An elementary unit X is a *reason* for proposition Y if Y explains why X is true. For example, VALUE 2 can be a reason for POLICY 1. To show a FACT proposition is true, the strongest form of support is an objective evidence showing that the claim is true, not a reason explaining why the conclusion is true, as such inference in practical reasoning are often defeasible.

Evidence : X, a set of elementary units of type TESTIMONY or REFERENCE, is *evidence* for a proposition Y if it confirms that proposition Y is valid or not. For example, evidence for FACT 1 can be a citation or link to a medical research showing the percentage of the population with food allergies is less than 20%. The possible types of evidence are limited to TESTIMONY or REFERENCE based on previous study on what constitute justified grounds [14, 10]. See Table 2 for how the list of justified grounds map to our classification of elementary units of argument.

3.3 Formalization of the Model

Let *Proposition* = {POLICY, VALUE, FACT, TESTIMONY}, *Evidence* = {TESTIMONY, REFERENCE}, and *Type*(*l*) a func-

tion that maps argumentative propositions⁸ to the set of elementary units.

Definition 3.1. An *argument* is a set $\{R, E, c\}$ where:

1. *c* is the conclusion such that $Type(c) \in Proposition$.
2. *R* is a set of reasons explaining that *c* is true, such that $\forall r \in R, Type(r) \in Proposition$.
3. *E* is a set of evidence confirming that *c* is true such that $\forall e \in E, Type(e) \in Evidence$.

Definition 3.2. Let $A = \{R, E, c\}$ be an argument. The set of *sub-arguments* of *A* is defined recursively as the union of $\{R'_i, E'_i, r_i\}$ for $\forall r_i \in R$ such that $Type(r_i) \in Proposition$ and each of their sub-arguments.

Definition 3.3. An *evaluable argument* *A* is an argument $\{R, E, c\}$ where at least one of the following is true for *A* and all its sub-arguments:

1. $Type(c) = TESTIMONY$
2. $Type(c) \in \{POLICY, VALUE\}$, and $R \neq \emptyset$ such that $\forall r \in R, Type(r) \in Proposition$
3. $Type(c) = FACT$, and $R \neq \emptyset$ such that $\forall r \in R, Type(r) \in FACT$
4. $Type(c) = FACT$, and $E \neq \emptyset$ such that $\forall e \in E, Type(e) \in Evidence$

In other words, an argument can consist of zero or more number of reasons and pieces of evidence, but there are a few restrictions that must be met in order for it to be properly assessed. When the conclusion is a TESTIMONY, explicit premises need not be provided in order for the argument to be assessed. (As discussed, we take TESTIMONY as a type of objective evidence.) Conclusions of all other types need at least one type of support: POLICY and VALUE require an explicit premise as support, and FACT can be supported with evidence or another FACT. (See Example 2.C and D.) One simplifying assumption we are making is that if each proposition has at least 1 supporting premise or evidence, understanding the argument and assessing it is much more

⁸An argumentative proposition is a proposition that is part of an argument.

c	Type	Appropriate Support	Existing Support		Needed Support
			P	E	
Example Comment 1					
A	POLICY	P	\emptyset	\emptyset	P*
B	POLICY	P	\emptyset	\emptyset	P*
C	POLICY	P	\emptyset	\emptyset	P*
Example Comment 2					
A	POLICY	P	{B,C,E}	\emptyset	E or P**
B	FACT	E or P	\emptyset	\emptyset	
C	FACT	E or P	{D}	\emptyset	E or P**
D	FACT	E or P	\emptyset	\emptyset	
E	FACT	E or P	{F}	\emptyset	E or P**
F	FACT	E or P	\emptyset	\emptyset	
Example Comment 3					
A	POLICY	P	{B}	\emptyset	(E)***
B	FACT	E or P	{C}	\emptyset	
C	FACT	E or P	\emptyset	{D}	
D	TESTIMONY	(E)***	\emptyset	\emptyset	

Table 3: Comment Examples Processed According to the Argumentation Model

* POLICY, VALUE, FACT or TESTIMONY

** Optional

*** If E: TESTIMONY or REFERENCE, If P: FACT

feasible than the case in which no explicit premise or evidence is given.

Table 3 shows how the comment examples from Section 1 are processed according to the argumentation model. The last column lists what additional support is needed to make the argument evaluable as defined. All three conclusions in Comment 1 need support in the form of premise, and providing evidence or premise for three conclusions from Comment 2 will make the argument more evaluable. Comment 3 is a well written comment that can benefit from adding evidence for Proposition D, but it is only optional.

4. CONCLUSIONS

eRulemaking is an ongoing effort to use online tools to foster broader and better public participation in rulemaking. The increasing participation of non-expert citizens, however, has led to a growth in the amount of arguments whose validity or strength are difficult to evaluate, both by the government agencies and fellow citizens. To support the implementation of automated systems to assist users in constructing evaluable arguments under online commenting environment for the benefit of quick feedback at a low cost, we propose an argumentation model capturing the evaluability of arguments. For future extensions of our system, considering the potential attacks to help users construct arguments that are harder to defeat can be interesting.

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