

How much logical structure is helpful in content-based argumentation software for legal case solving?

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ABSTRACT

Current argumentation support software often employs graphical representations of logical relationships. Little is known about the extent to which logical structuring helps to increase a user's task performance. In this research, various levels of graphical representation of the logical structure of legal subject matter are experimentally compared in terms of performance. It is shown that logical structuring significantly increases task performance, but we have found no evidence that the extensive representation of logical structure as employed by several contemporary software applications is more effective or usable than a simplified graphical representation that was previously implemented in an application called ArguGuide.¹

Keywords

Legal argumentation, argumentation support software, legal decision support systems

1. INTRODUCTION

Currently argument visualization tools are in the focus of attention (cf. Kirschner et al. 2002, Verheij 2005). According to Van den Braak and colleagues (2006), however, research on argument visualization tools is still largely lacking empirical evidence for their benefits as support tools (but see Schank & Ranney 1995, Carr 2003, Pinkwart et al. 2008, Van den Braak et al. 2008). The present research aims at establishing empirical evidence for the usefulness of the design of an argumentation tool for a principal legal task: legal case solving.

Verheij (2007) has suggested that legal professionals may benefit more by software that provides checklists for legal content (as a kind of 'memory extensions') than by visualizations showing the logical structure of an argument. With this suggestion in mind, the ArguGuide system (Schweers & Verheij 2007, Verheij 2007) was designed to support the task of establishing the legal consequences of a given case situation. ArguGuide is a prototype of an integrated software environment for the preparation of legal argumentative texts, such as a plea note or court decision, developed in collaboration with two legal professionals. There is a writing pane and a pane showing the logical structure of the legal topic. By clicking elements of this 'content map' relevant sources are activated in a pane showing legislation and case law. By its focus on supporting access to legal content more than on argument diagramming, ArguGuide was designed as a mild challenge to 'boxes-and-arrows' software. Recently, an updated,

RDF-based version of this system has been implemented.

The logical structuring in ArguGuide's content map is limited to a hierarchical relation of relevant elements of the legal topic, and an indication of the direction of relevance (whether pro or con). In ArguGuide, there is no way to visualize conjunctive or disjunctive relationships between elements, as is often possible in argument visualization packages. This was a deliberate choice, as it was silently assumed that this was the right level of beneficial logical structuring for the task of case solving.

The present study was set up to put this assumption to the test and possibly empirically underpin the design of ArguGuide. To test whether the level of detail in the logical structure of ArguGuide is too low, sufficient, or too high, we experimentally measured case solving task performance in participants who used the hierarchical representations as used by ArguGuide with that of participants who used representations with either more or less graphical elements.

2. Experiment: materials, design, results

Participants in our experiment were presented with nine legal cases. Four fields of Dutch civil law were selected: product accountability ('productaansprakelijkheid'), tort law ('onrechtmatige daad'), breach of contract ('tekortkoming in nakoming') and expiration ('verjaring'). In total, 44 participants, mostly students, took part in the experiment. Performance was scored on six different logical dimensions: errors in (1) legal correctness; (2) logical correctness; (3) completeness; (4) efficiency; (5) distinguishing conjunctive/disjunctive relationships; and (6) recognition of negation. Further information concerning the materials, design and results of the experiment is available in the text mentioned in note 1.

3. Discussion

Our main goal was to establish empirical evidence for the design of ArguGuide (Schweers & Verheij 2007, Verheij 2007). For that purpose, we investigated performance differences between three experimental conditions, in order to test how much logical structure in the representation of a legal topic is useful to support a case solving task. Our three conditions (flat, hierarchical and augmented-hierarchical) represent increasing levels of logical structuring (Figure 1). Since the hierarchical condition corresponds to the logical structuring used in ArguGuide, our experiment can test whether the relatively 'low-logic' approach of ArguGuide can be supported by evidence. If it is true that certain logical relations (in particular the conjunctive or disjunctive relation of the elements making up a reason) do not lead to problems when solving legal cases (cf. Verheij 2007), it was expected that we would not find significant performance differences between the hierarchical and augmented-hierarchical condition. We did expect a significant increase in performance

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¹ This research abstract is based on a text available at <http://www.ai.rug.nl/~verheij/publications/icail2009.htm> (January 20, 2009).

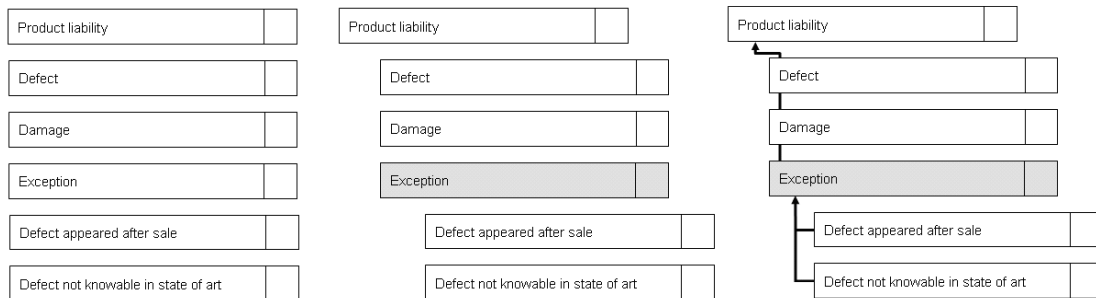


Figure 1: The three experimental conditions: flat, hierarchical and augmented-hierarchical

from the flat condition to the hierarchical condition and augmented-hierarchical condition. A discussion of the six dimensions to assess task performance occurs in the text mentioned in note 1.

4. Conclusion

We have provided evidence that some logical structuring of the relevant legal topic is helpful in a case solving task, but up to a limit. In this way, we were able to empirically underpin a design proposed before (ArguGuide by Schweers & Verheij 2007, Verheij 2007).

We found statistically significant performance differences between the hierarchical and the augmented-hierarchical condition on the one hand and the flat condition on the other. Hierarchical and augmented-hierarchical condition participants outperformed flat condition participants in legal correctness, logical correctness, completeness, and distinguishing conjunctive/disjunctive relationships. This gives reason to believe that the hierarchical and the augmented-hierarchical condition give performance support that is superior to the flat condition.

Nothing in the results of the experiment indicates that statistically significant performance differences exist between the hierarchical and augmented-hierarchical conditions. Since statistically significant differences have been shown to exist between the flat and hierarchical/augmented conditions, this does not seem to be a result of a lack of statistical power. Apparently, the addition of explicit conjunctive/disjunctive relationships to an existing hierarchical structure does not increase performance in any of the experimental assessment dimensions, unlike the introduction of hierarchy and explicit negation such as is the case between the flat and hierarchical condition. This corroborates the assumption underlying ArguGuide (Schweers & Verheij 2007, Verheij 2007) that in the legal domain, hierarchy and negation offer just enough logical structure for the support of performance in a task of legal case solving. On the basis of our findings, we conclude that graphically showing conjunction/disjunction is redundant since users already extract sufficient logical cues from the meaning of the legal elements themselves.

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