Tackling Cognitively-Complex Collaboration with CoPe_it!

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ABSTRACT

CoPe_it! is an innovative Web-based tool that complies with collaborative practices to provide members of communities with the appropriate means to manage individual and collective knowledge during a sense-making and/or decision-making session. In this article, we demonstrate its applicability in tackling cognitively-complex collaboration settings, which are characterized by big volumes of interrelated data obtained from diverse sources and knowledge expressed by diverse participants. We focus on issues related to the representation of such settings and propose an approach to make it easier for participants to follow the evolution of collaboration, comprehend it in its entirety, and meaningfully aggregate data to resolve the issue under consideration.

Keywords: Argumentative Collaboration, Computer-Supported Cooperative Work, Decision Support Systems, Electronic Collaboration, Incremental Formalization, Visualization of Collaboration

INTRODUCTION

Recent advances in computing and Internet technologies, together with the advent of the Web 2.0 era, resulted to the development of a plethora of online, publicly available environments such as blogs, discussion forums, wikis, and social networking applications. These offer people an unprecedented level of flexibility and convenience to participate in complex collaborative activities, such as long online debates of public interest about the greening of our planet through renewable energy sources or the design of a new product in a multinational...
company. Information found in these environments is considered as a valuable resource for individuals and organizations to solve problems they encounter or get advice toward making a decision. In any case, people have to go through some type of sorting, filtering, ranking and aggregation of the existing resources to facilitate sense making. Yet, these activities are far from being easy. This is because collaboration settings are often associated with ever-increasing amounts of multiple types of data, obtained from diverse sources that often have a low signal-to-noise ratio for addressing the problem at hand. In turn, these data may vary in terms of subjectivity, ranging from individual opinions and estimations to broadly accepted practices and indisputable measurements and scientific results. Their types can be of diverse level as far as human understanding and machine interpretation are concerned. They can be put forward by people having diverse or even conflicting interests. At the same time, the associated data are in most cases interconnected, in a vague or explicit way. Data and their interconnections often reveal social networks and social interactions of different patterns.

The above bring up the need for innovative software tools that can appropriately capture, represent and process the associated data and knowledge. Such tools should shift in focus from the collection and representation of information to its meaningful assessment and utilization. They should facilitate argumentation [i.e., “discussion in which reasoning and disagreements exist, not only discourse for persuasion, logical proof and evidence-based belief” (Kunz & Rittel, 1970)], the ultimate aim being to augment collaborative sense making and/or decision making. This can be seen as a special type of social computing where various computations concerning the associated context and group’s behavior need to be supported. Recent studies on Cognitive Load Theory clearly indicate that the abovementioned objectives are particularly relevant and important in cognitively complex situations (Ayres & van Gog, 2009; Kalyuga, 2009; Kirschner, Paas, & Kirschner, 2009; Leutner, Leopold, & Sumfleth, 2009).

Designing software systems that can adequately address users’ needs to express, share, interpret and reason about knowledge during an argumentative collaboration session has been a major research and development activity for more than 20 years. Technologies supporting argumentative collaboration usually provide the means for discussion structuring and visualization, sharing of documents, and user administration (Karacapilidis & Tzagarakis, 2009; Stegmann, Weinberger, & Fischer, 2007). They support argumentative collaboration at various levels and have been tested through diverse user groups and contexts. Furthermore, they aim at exploring argumentation as a means to establish a common ground between diverse stakeholders, to understand positions on issues, to surface assumptions and criteria, and to collectively construct consensus.

Although helpful in particular settings, the above solutions prove to be inadequate in cognitively-complex situations. In this context, our work focuses on the development of a Web-based tool, namely CoPe_it! (http://copeit.cti.gr), which is capable to tackle the diversity and complexity of the above issues, the ultimate goals being to make it easier for users to follow the evolution of an ongoing collaboration, comprehend it in its entirety, and meaningfully aggregate data to resolve the issue under consideration.

**EXISTING APPROACHES**

Existing approaches to support argumentative collaboration vary in terms of the problem dimension they principally address and the context they particularly target. One category, focusing on a meaningful representation of the related items and their interconnections, builds on the concepts of IBIS (Issue Based Information System), introduced in 1970 (Kunz & Rittel, 1970). For instance, gIBIS (Conklin & Begeman, 1989) is a pioneer argumentation structuring tool that allows users to create issues, assert positions on these issues, and make arguments in favor or against them. QuestMap
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