Informal Online Decision Making: Current Practices and Support System Design

First Author Name (Blank if Blind Review)
Affiliation (Blank if Blind Review)
Address (Blank if Blind Review)
e-mail address (Blank if Blind Review)

Second Author Name (Blank if Blind Review)
Affiliation (Blank if Blind Review)
Address (Blank if Blind Review)
e-mail address (Blank if Blind Review)

ABSTRACT
Existing group decision support systems focus on complex or enterprise decision-making, much of it pre-Web. There is little research that takes this work and applies it to support a new type of lightweight, informal decision-making made popular by the amount of information on the Web. We examine related work and undertake an online survey and formative study to examine how people currently use the Web for decision support. Our results and analysis provide a basis for the design of a lightweight informal Web decision support tool.

Author Keywords
Group decision support systems, informal, design recommendations.

ACM Classification Keywords
H5.2. User Interfaces: User-Centered Design, H.5.3 Group and Organization Interfaces

INTRODUCTION
The Web is an unrivaled source of information. Whether we are deciding on what camera to buy, where we might go for a holiday, or what bank to use for a savings account, we increasingly turn to the Web. More specifically, while we may use the Web to gather information towards a decision, there are few mechanisms designed to support either the process of making the decision itself, or to review or share the rationale for a decision after the fact. Most research around decision support has been in the cooperative work space for formal group decision support systems (GSS), focusing on idea generation, problem formulation/solution, and decision analysis [14,1] in support of the groups originally identified by DeSanctis & Gallupe, "*committees, review panels, executive board meetings, task forces, and groups of managers*" [5]. Little attention has been paid to supporting smaller scale, or more informal decision-making such as between friends or colleagues, and such that can be supported by use of the Web rather than formal tools.

In order to understand what functions a tool would need to support Web-based decision making, we considered two strategies: first we looked at how work in formal GSS systems might apply to a less formal Web system; second, we carried out an online survey and a formative study to investigate how people currently use both the Web and communication tools for decision support. We present a set of design recommendations we have synthesised from these studies towards the development of an informal Web decision support tool.

RELATED WORK
Carlson [4] presented the motivation for Decision Support Systems in terms of reduced costs for data gathering, computation, and presentation, and added value in analysis and comparing alternatives. DeSanctis & Gallupe [5] mention simple to sophisticated systems "*representing varying degrees of intervention in the decision process*".

A vast corpus of decision-making studies exist [7,12]. Fjermestad & Hiltz [7] state that despite analysing over 200 studies there is a lack of computer supported face-to-face studies as well as relatively few asynchronous studies, and that Web-based systems need to be explored and compared. A more recent look at progress in Web-based decision support technologies [2] states there is little work on design guidelines, though focuses on complex formal systems, further highlighting the need for research into lightweight alternatives.

The Co-oP system [3] follows a group problem solving process that can be abstracted to almost any GSS: "*problem definition, group norm definition, prioritization of evaluation criteria, individual selection of alternatives, group selection of alternatives, consensus seeking and negotiation*". The Hermes system [11] is web-based, but focuses on supporting complex argumentative discourse between decision makers. The authors of a web-based system for conferencing and collaboration remark that there is a lack of methods to seek consensus and make decisions [10]. Shim et al. [14] look to the future of decision support technology, identifying the web browser, personalization, and ubiquitous computing as trends to impact DSS.

E-mail has grown to more than a communications medium, and is being used for task management, personal archiving, coordination and collaboration; Whittaker [15] terms this as

"*email overload*". As a collaboration medium though, email suffers from not preserving context and structure (especially for latecomers to a conversation), and application switching (for instance, in order to attach or read related documents to a message). Geyer et al. [8] bridge the gap between ad hoc (such as e-mail) and formal collaboration by introducing the notion of shared artifacts aggregated and organized into semi-structured activities, reporting that people related to the concept of "activity-centric" work.

There has been little published on more lightweight systems, but Farnham et al. [6] examined whether a group's computer-mediated decision making could be improved by providing a pre-authored script to synchronous chat. They found that the script allowed groups to reach consensus, and that groups applied structure in later unstructured sessions. However, such structure must be employed judiciously, as negative comments focused on the time constraints placed. An instance of online decision-making can be seen in the short paper describing VERN [16], a tool dedicated to the singular task of finding optimal meeting times within a group.

Web2.0 tools and concepts have addressed parts of this problem in various ways. Social bookmarking [9] allows sharing of, and commenting on, links. Social networking sites such as Facebook allow event co-ordination through groups and specific event instances with a 'wall' -- a single-thread message board. Google Notebook and GoogleDocs can be shared and collaborated on in real-time; Google Notebook has a simple right-click "Add to Notebook" ability for content, though no formal decision-making features. ClipClip is a type of scrapbook, for bookmarking part of a site, preserving page aesthetic. Various voting and polling websites exist, such as Doodle and Evite. We observe that nothing exists to directly support the *whole* decision-making process, from topic, sharing, discussion, to voting or ranking of results, and that little empirical observation of these tools has been recorded in the literature.

Though many synchronous decision-making studies have been conducted before [7], there has been a lack of computer supported face-to-face studies, and few, if any, that examine existing practice given access to the Web and the users' normal working habits and applications (Notepad, email, Google Notebook, etc). In the next section we describe how we studied current practice in online decision-making to inform a system that takes affordances from both formal decision systems and the Web's instances of separate unstructured processes.

STUDY DESIGN

Survey. In order to obtain a broad view of current decision-making practice, a Web-based survey was sent out to the authors' two affiliated groups. The brief 8 question survey asked: what types of group decisions people make, what physical location the group is in when doing so, what tools or practices people use to keep the information and if they come back to it, their experiences with such tools, and whether they ever encounter anything they would like to achieve but with existing tools cannot.

Formative study: we focused on a decision-making task in 3 different types of co-location. The 3 situations were: face-to-face with 1 PC, face-to-face with multiple PCs, and asynchronously over e-mail. 3 separate groups were given a scenario of being at a conference in a location unfamiliar to them (New York City), and having to choose a restaurant for dinner with the conference chair on a given evening in a month's time. The two co-located groups were given 2 sessions of 45 minutes on consecutive days to complete the task, and the asynchronous group was given 3 days. An observer took notes (the e-mail group were logged and debriefed after), specifically examining the differences and similarities in the decision-making process across situations, as well as problems, tools and information sources interacted with. Groups were debriefed upon completing the task. 3 groups of 4 participants took part in one condition each, the participants already knew one another and were friends or colleagues; this is important since it creates less of a contrived scenario, and, combined with allowing the participants freedom to use any tools they wished, i.e. to go about the task as they usually would, one from which we can gain a realistic idea of the process and problems with group lightweight decision-making.

RESULTS

Survey Results

162 responses were collected from the survey. Of the respondents, 89% were aged between 18 and 35 (overall between 17 and 65), and 78% were male. Participants were asked the issues or topics of decision that they made, so we could gain an idea of the variety of decisions that are considered. Responses are detailed in Figure 1. Some of these could potentially be grouped: flights, hotels may be part of holidays, but have been left as respondees entered them. This should not be seen as an exhaustive list; many responses were along the lines of "*this list would be enormous*", or "*everything, too many to list here.*"

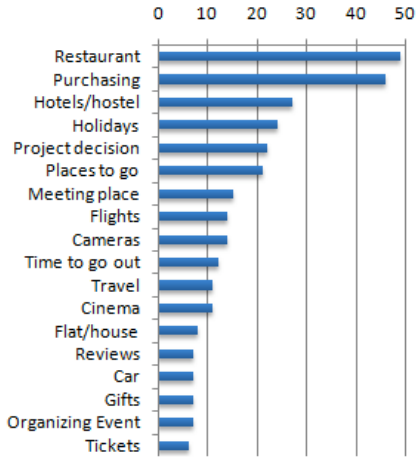

Figure 1. Decision topics and number of responses.

We are also interested in the tools people currently use to conduct these online decisions, responses are detailed in Figure 2. GMail has been explicitly separated from e-mail, since people often referred to its default grouping of all e-mail messages in a thread, including those sent by you, as helpful. 40 responses explicitly stated that they refer back to the information, to continue adding sources, to review the decision, or, "*for example, to prove who suggested which place"*. An obvious distinction was made apparent in keeping browser tabs open during a quick comparison, and saving in some other format until a) the decision has been made, or b) permanently to review at a later date.

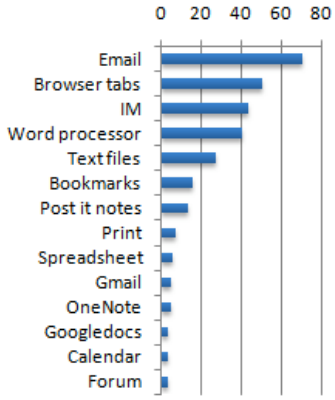

Figure 2. Tools currently used to support decision-making.

From related work and our results we have defined a 3-stage cycle of online decision-making (see Figure 3) which bears some similarity to information foraging theory [13]. Using this model, we can label findings, observations and problems, and use these labels to clearly address issues in the System Design section. Many interesting comments were gained from an open-ended question in our survey about experiences with current tools and what people would like to see. These responses are detailed here, according to our model in Figure 3.

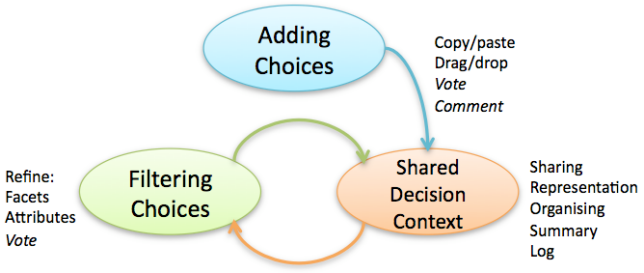

Figure 3: Cycle of online decision making. The attached labels describe findings we talk about in the Results section.

Adding: Comparing information from different websites, drag/drop from a website to a library, one click add to clipboard (similar to Google Notebook). During input, sharing URLs whilst searching or seeing what was on someone else's screen was mentioned. Once the data is in the 'library', voting, annotating and commenting are also seen as important.

Sharing: A number of people stated it would be useful to have everyone's thoughts in one place, suggesting a "*wiki-style repository*", or "*online blackboard*". A summary of the 'stage' the decision process was in was seen as helpful.

Filter: Seeing an overview of attributes of entities (e.g. if looking for a holiday, save the website along with price, location and dates) was mentioned, in order to filter and refine down the search, as well as extracting features from lists once created. Voting fits into this category as well as input, being used to iterate through a decision.

In the reporting of different physical locations while making a decision, the results show that while separate asynchronous communication is the most often used, co-located decisions are still frequent, and of course long-term decisions could be made over various locations, as well as with offline interaction. Having identified a broad view of topics, tools and suggestions, we looked to the formative study to gain a more in-depth view of the decision-making process from beginning to end, and highlight any differences in the process caused by various co-location.

Formative Study Results

As expected from previous work [3], the overall process was similar in each group, focusing around: problem definition, individual and group selection, criteria verbalisation, and consensus finding. We highlight specific observations, problems or requests in discussion, and again group according to our model in Figure 3.

Adding: Different to the other groups, participants in the multiple PC group found themselves doing the same task map searching, but only occasionally stopped when this was made clear, saying they wanted to be sure of the information themselves, since no shared document was available at that time. In all groups, there was a tendency to search first via a map view, then by community rating site, and then to an individual restaurant site. Also in all groups participants expressed different opinions of review/rating sites, saying they trust some more than others.

Sharing: Every group started by looking at a map of the location, implying integration with different representations is key. There were often "*so what are the current contenders?*" questions. Participants in the multiple PC group created a shared Google Notebook. In the 1 PC group, a text file was used with links and notes on restaurants. Participants also forgot why they liked or disliked a certain restaurant, "*we said no to this one, right?*" In the asynchronous group in particular it was a lot more difficult to track the current state of the decision process, with each participant able to come to their own conclusion before e-mailing the rest of the group.

Filter: In all groups facets of the data started appearing: cuisine, price, location, rating, with participants expressing preferences for each, and using these as constraints to refine their choices. The multiple PC group were frustrated there was no easy way to vote on the restaurants in Google

Notebook, though liked the ability to comment. Filtering and choosing in the 1 PC group seemed the most equal, whereas 'leaders' appeared in the multiple PC and e-mail groups.

ANALYSIS AND SYSTEM DESIGN

From the survey results shown in Figure 2 it is apparent people use a wide variety of existing tools to make online decisions, but from observing current practice, as well as the survey comments on unsatisfaction and improvements, there would be a clear value for a lightweight tool to support online decision-making. We have shown that though some of the desired functionality (as gauged from survey responses) exists in various separate Web2.0 sites, recent work does not address that people a) have difficulty making online decisions, and b) would like the identified features to be bought together and better tools to assist. We present a number of recommendations for such a tool, available through a web browser with no additional download, addressing the three areas identified in our model in Figure 3.

Adding. Google Notebook's ability to right-click and 'Add to Notebook' was mentioned as desirable, and along with the observation that the 1 PC group used something as simple as a text editor, it is clear a low barrier to entry is essential. A similar way to copy and 'add to tool', or even to drag and drop from a separate browser window is desirable. Based on differences in the synchronous groups, real-time searching together and sharing URLs is desirable when in close contact.

Sharing. Having a shared space for collecting and commenting on items was mentioned numerous times. Different representations of the data were seen as important, integration of a map view, for instance. To support different interactions with the system, a discussion area could be made visible, for both synchronous and asynchronous chat. Since a log of events (reasons for choosing, or discarding an option) was mentioned, tying the discussion to a specific view is feasible. Based on problems in not knowing the current state of the decision in the asynchronous group, a summary of recent activity and the stage in the decision process would help people remember where they were, and a 'stage' implies a process, perhaps for longer-term decisions. This process could be abstracted out into a set of definable policies (voting style, voting rounds, how to end), which would also help the problem [6] of online groups not coming to a consensus.

Filter. Based on overlaps in groups, exposing the facets of the objects (cuisine, price, location, rating), would allow users to both filter their search within objects, as well as express preferences for certain attributes. Comments could also be tied not just to an object (i.e. restaurant), but to a specific facet (i.e. price, service) of that object. Voting is clearly an essential feature. By logging the filter actions and the resultant voting, the system can help expose why certain decisions were made.

CONCLUSIONS

Our analysis of related work shows that while there has been considerable research on group decision support systems, much of it pre-Web, there has been little work on lightweight informal decision-making in either computer supported face-to-face or asynchronous situations. We have therefore investigated both how people use computer tools like the Web, email, etc. to support group decision processes, as well as what kinds of topics they usually share for decision-making. It is clear from our results that there would be a benefit to better support for group decision-making. Based on the gaps identified in existing tool use for these processes, we carried out a formative study to explore the features new tools would need to provide to support group decision-making. The results of this study provide the basis for lightweight group decision support tool design.

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