Interface Architecture for a Web-Based Group Decision Support System

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Abstract: With the exponential development of the web, the decision-makers are likely to use the web to support their decision –making processes. In group decision-making processes supported by an information system – web-based or desktop-based – one of the most important element which can influence in a great extent if the system will be or not accepted and successful used for decision making, is the user interface. In this paper, we propose an architecture of an interface for an ideal web-based group decision support system.

Keywords and phrases: interface architectures, web-based interfaces, group decision support

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1. Introduction

For the user, an appropriate user interface is "the most important determinant of the success of a decision support implementation" [15]. Users expect from developers to create advanced interactive interfaces which are easy to use and easy to learn, without the need of reading many pages of manuals. Unfortunately these interfaces are difficult to design and implement. As user interface became easier to use, they became harder to create [16]. In 1992, the results of a survey [14] indicated that 48% of an application code is dedicated to the user interface. Also the study has shown that 45% of the average time is dedicated to the user interface during the design phase, 50% during the implementation phase and 37% during the maintenance phase. These results highlight the user interface importance and the need for tools to help developers to create complex interfaces in a shorter time [18]. In group decision support systems, the interface is even harder to design seeing that the interface must create a context for individual experience and also for the common experience. A well-designed user interface makes the user comfortable with the system and also with the other team members. It can also increase human processing speed, reduce errors, increase productivity and create a sense of user control [15].

2. Web-Based Group Decision Support Systems

The decisions, in an organizational context, are usually made after an "intensive consultation of several actors but not by individual decision makers" [7][21]. Group Decision Support Systems (GDSS) assist collective decision-making activities of groups of people with similar authority levels. A GDSS must be easy to use, flexible and it has to support anonymous participations in several stages of decisional session. Also it must facilitate the communication between the group members. Among the advantages of using a GDSS are the mitigation of the group negative behavior and automated session recording [5].

GDSS can be traditional applications, installed on a specific location – server based (e.g., a decisional room) or as web-based services [13]. Web-based applications have the advantage to support group decisions within geographically distributed organizations. Thus the system can be implemented as a web service and to the decisional sessions can participate persons from any place without needing anything else than a web browser on an Internet-connected computer.

Web based applications have several common features: (1) these applications are distributed, meaning that the computational tasks take place in different physical locations; (2) usually the user interface runs on other computer than the application host computer; (3) the main paradigm of these applications is the client-server architecture; (4) the interface is implemented as a small size client, universal and extensible; (5) the application includes reusable components; (6) the information specific to the application are implemented as data, server extensions and scripts which runs both to server and client; (7) unlike the desktop applications, the web-based ones runs continuously (it is not closed when the user end its tasks) [8].

Due to an exponential evolution of the web and its advantages, there have been created web-based group decision support systems for a wide range of decisional activities. The most known web-based GDSS are: ThinkTank (http://www.groupsystems.com), FacilitatePro Web Software (http://www.facilitate.com), Meetingworks Connect

(http://www.meetingworks.com)

and Grouputer (http://www.grouputer.com/).

In 2008, Filip presented a list of main decisional activities which a "typical and complete" GDSS should support ([6] quoted by [3]). These activities are the following:

- **Generating ideas** (action plan, decisional alternatives, evaluation criteria etc.) that may serve to the decisional problem approach. The ideas generation can be assisted by the GDSS through: (a) *electronic brainstorming* - the participants anonymously introduce into the system their own ideas related to the topic (30-45 minutes). At the end of the brainstorming session (which must follow certain rules) the system generates a report with the proposed ideas, (b) *topic commenter* – each participant has access to the topics list. He can view all the comments and he can add his owns, (c) *group outliner* – serves to the topics presentation in a shape of a tree or a multilevel list, where the participants can associate, orderly, their comments.

- **Organizing ideas** by grouping them in several central key ideas. This activity (45-90 minutes) may reduce with 20 times the ideas number. A GDSS can support (a) *ideas categorization* – by creating a certain number of ideas category (the most important or the most general ones) where there are collected the participants contributions, (b) *issue analysis* – helps the participants to identify the most important occurrences in the generated ideas list.

- **Prioritizing** assess the importance of the key ideas. A GDSS can assist this activity by: (a) *voting tools* – a GDSS can support several voting methods. The participants selects one of it and at the end of the voting process, a results report is created, (b) *on-line questionnaire* – the GDSS moderator creates a set of questions and analyze the participants online answers, (c) *group dictionary* – helps to interactive create definitions for the elements used in the decisional process.

- **Developing policy** - the participants creates and adopts decisional plans and politics. A GDSS may help in (a) *policy formulation* – the participants can work together on

documents related to politics and missions, starting from a first version of the document, elaborated by the group moderator, and creating successive versions until the common consensus, (b) *stake-holder analysis* – the plans and politics implications are systematically evaluated.

3. GDSS Interface Architecture

Starting from the above mentioned list of decisional activities that a GDSS should support, in the following there will be presented an interface architecture of an "ideal" GDSS.

At the beginning of the group decision support systems research, the attention was focused on the system, on the elements and structure of group decision support systems. Later, the researchers understood the importance of user experience and paid more attention to the user interface of GDSS [20]. The GDSS end user is a member of a decisional group. The group "is established in an environment where there is a question to solve" [9]. In mixed status groups, higher status group members tend to dominate meetings [4]. Studies have found that "anonymous interaction masks status cues and thereby increases participation" [11][12]. In this respect, it will be considered that the GDSS users (group members) are equal. But "a distinguished person may exist, called moderator, responsible for directing the session until all individuals reach an agreement on the solution to choose" [9]. Thus, we consider that the final user might have one of the two roles: group moderator or simple group member. The roles will be referred, now on, in this paper as *facilitator* and *member*. The *facilitator* will be considered also a *member* that participate to the decision making process not only facilitate the meeting.

The interface for the *facilitator* must be richer than for the *member*, derived from the actions that he/she must perform, according to the "ideal" GDSS presented above, for a successful decision-making session [1][2].

Beside the activities whereon all the users can participate to, the *facilitator* must perform the following main actions:

1) To create and set the session details (e.g., starting date, hour, name, objective, instructions and access key for the participants);
2) To create the working agenda and set the time for each action (e.g, brainstorming, organizing idea), and members rights;
3) To set the decisional activities details;
4) To group the generated ideas into key ideas;
5) To generate the meeting report.

These actions are related to two types of activities: meeting organization activities - actions 1), 2), 3) and 5) and decisional activities - action 5).

The *member* will add ideas according to the decisional session objectives, he/she will participate to ideas prioritizing (by voting and/or questionnaires) and then to policy developing. The member will also add/modify the meeting resources.

The proposed interface will include two tabs which will be named *Session* and *Meeting*. The *Session* tab contains options regarding the group meeting organization, so it will be visible only by the *facilitator*. The *Meeting* tab will host the meeting itself and contains all the features related to the decision-making process and it is accessible by all users (*facilitator* and *member*).

In Figure 1, a conceptual architecture of the interface is presented. The elements represented in rectangles with black borders are editable in the tab that contains these elements.

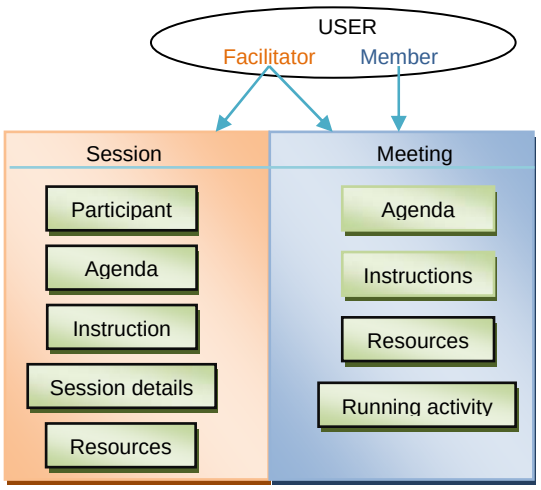

Figure 1. Interface conceptual architecture

For example *Agenda* (the list of the decisional meeting activities) is visible in both tabs but it is editable only in the *Session* tab. The same, the session *Instructions*, created by the *facilitator*, are visible into the *Meeting* tab but not editable. The meeting *Resources* can be modified by all users. The *Running activity* is the most important element because the decisional activities scheduled in Agenda alternate here, one by one, as the meeting goes forward.

and by the *member*. The *member* cannot do any special activities than the inherited ones, but the log in action as a member of the group. The model has a high level of abstraction, specific to an early design phase.

Once the *facilitator* logs on the GDSS, a window containing a form for the session details pops up. The *facilitator* set the date, the objective and the meeting key access. These meeting details will be sent with the invitation

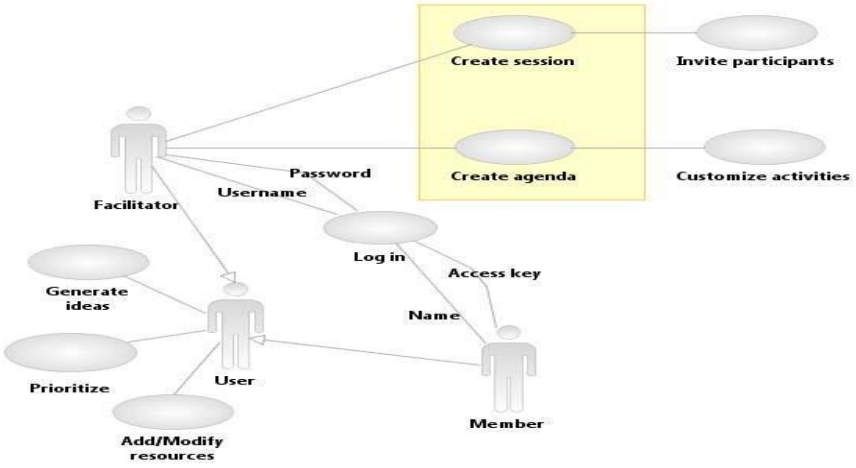

Figure 2. A use case diagram (modified after [17]).

The interface is presented from a chronological perspective of *facilitator* actions, since he/she logs on the system and creates a session and until the end of the session when the session report is generated. Figure 2 presents a schematic UML model of the interface highlighting the users and the main activities that the users can perform.

It can be observed that all the activities that the user can do are inherited by the *facilitator*

to participate to the decision- making, by mail, to the team *members*. Than a form for the meeting agenda creation opens.

The *facilitator* can opt for a classical agenda containing 4 main activities: brainstorming, ideas organizing, prioritizing and policy developing or for a custom, agenda by selecting the activities from a larger list which contains activities related to the decisional process (Figure 3).

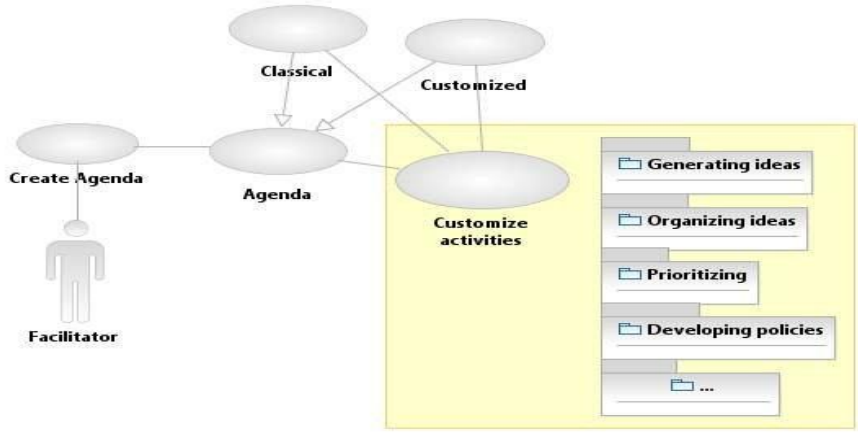

Figure 3. Meeting Agenda (modified after [17]).

The meeting starts to the date settle by the *facilitator*. The *members* will see and access only the *Meeting* tab. The meeting will start with the generating ideas activity, than the *facilitator* will organize the group ideas, using a drag-and-drop technique. At the end of organizing ideas step, the group should have a clear perspective on the possible alternatives. All the members participate to the ideas prioritizing task. The ideas prioritizing will be made based on a set of criteria using a voting system (ranked, range or approval voting). For a clearer picture over the results, the system should generate different types of charts.

All the settings that the *facilitator* made until this step can be modified in the *Session* tab. He/she can add files (PowerPoint presentations, Excel and Word files, video clips and so on) to support the meeting, in the *Resources* area. The resources can be modified also by the *members* before or during the meeting by adding new files or modifying the existing files if the decisional process requires.

While in simple problems, one alternative may be obviously superior, in complex situations several alternatives may likely be combined to form one or more effective solution [10]. When the group came to an agreement related to the solution to adopt, a plan must be developed during the policies developing phase [18]. During the policies developing, a sufficiently detailed plan and methods of evaluation must be elaborated [10].

At the end of the meeting, the system generates the session report which contains all the activities results: generated ideas, scores and the action plan.

4. Conclusions

Due to the fact that "the design of the user interface and the design of the functionality go hand in hand" [19], the conceptual interface architecture presented in this paper seems much closed to the GDSS functionality description. This closeness is normal since for the user "the interface is the system". Moreover, in web-based systems, the interface is one of the main design considerations.

Considering a "typical and complete" web-based group decision support systems, the proposed interface combines desktop features with web features, focusing on the user and on the activities specific to group decision-making processes. The interface model is schematic, specific to this early phase of design, and it will be enriched and improved during development.

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