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eCollaborativeDecisions – a DSS for Academic Environment

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***Abstract*—**This paper presents an innovative approach within the area of Group Decision Support System (GDSS) by using tools based on intelligent agents. It introduces iGDSS, a software platform for decision support and collaboration and an application of this platform - eCollaborative Decisions - for academic environment, all these developed within a framework of a research project.

***Keywords*—**Group Decision Support System, Managerial Academic Decisions, Computer Interaction.

I. INTRODUCTION

IN the 21st century it is almost a must to simplify the work and let the complexity to be the burden of the system, not of the user. Most of the activities that are involving human groups are the result of certain decisions. These decisions can be made at different hierarchy levels and are usually taken by a small group of persons. For this reason, but not only, a system that could ease the decisional processes would be a big plus.

The latest trends in distributed and modern collaboration technologies allow people to move across organization boundaries and to collaborate with others within / between different organizations and communities. A GDSS (Group Decision Support System) uses computer support and communication facilities to facilitate group decision-making processes in either face-to-face or dispersed meetings.

Transcending the status of a buzz-word, GDSS have proven their efficiency in tangible real life applications such as "interactive, computer-based systems that facilitate the solution of unstructured and semi-structured problems by a set of decision-makers working together as a group", or "aiding groups in analyzing problem situations and in performing group decision-making tasks using a structured, computerized process".

Usually, the managerial decision can be found in two forms: the *decisional act* and the *decisional process*. The decisional act refers to decisional issues of low complexity with repetitive attributes or in which the implied variables are well-known by the decision makers. On the other hand, the decisional process is more time consuming because it involves the information acquisition and analyzing, as well as members involvement and consultation regarding the decisional issue in matter. In essence, the decisional process consists of different stages that *prepares*, *adopts*, *applies* and *evaluates* the managerial decision.

Due to the incompleteness and the rigidity employed in the actual decision models, GDSS has been criticized on a number of grounds [2]. The main critics refers to the fact that actual GDSS cannot foresee all the steps required for reaching a consensus, nor can support in a flexible way a wide range of group decisions for the latest emerging organizational phenomena (i.e. work group autonomy, responsibility of professional roles, the flattening out and decentralization of organizations) [6]. This can harden their use, leading to the users' rejection. Therefore, it is of major importance for every organization to be able to customize a decision – making system so as to map their own needs at all hierarchy levels (employees, middle and top management).

In order to accomplish the premises stated above, the system refereed within this paper was built as a *decision support framework*, where besides the already existing tools, any third party user can customize and add more tools modified to his needs. The framework enhances the decision assisting tools to run within a context made up by entry data, participant members having certain rights and a repository database for storing the results.

II. iGDSS – THE DECISSION SUPPORT SYSTEM

iGDSS (intelligent Group Decisions Support System) is a product developed in the framework of a research project, broadly described in [2]. It is a software platform for business process management, electronic decision support, and collaboration. The solution is designed to be a collaborative decision-making support system that has the following properties: safety, usability, efficiency, and effectiveness. This system includes concepts of Human Computer Interaction, decision support systems and elements of agent-oriented

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artificial intelligence.

iGDSS supports three layers of innovation:

- enhancement of organizational intelligence through secure access to a central knowledge base;
- implementation of an intelligent workflow, with a multi-agent system managing decisional sessions;
- employment of active models in a form of shared plans of actions, facilitating users intentional attitude.

iGDSS offers a rich suite of decision support software tools that focus on a specific aspect of group collaboration, such as idea generation, evaluation, organization, and exploration.

The foreseen benefits resulting in a competitive advantage are the following:

- increased efficiency, due to the speed and quality for information processing and information transmission;
- improved quality; time, space, and geographical limitations-independence - removal of common communication barriers, systematically directing the pattern, timing, and content of discussion, and providing techniques for structuring decision analysis;
- avoidance of the conflict-provoking behaviors of positional bargaining;
- more objective evaluation: groups are better at catching errors than are the individuals who proposed ideas;
- synergy and social inclusion.

Overall, the solution can shorten the cycle time for strategic planning, product development, problem solving and other business processes where group decisions are a must.

III. eCollaborativeDecisions - a DSS for Academic Institutions

During the last twenty years, the transition of higher education from a system based on a small elite to a system based on mass participation has transformed the way the management has to act in order to provide the necessary tools to improve the efficiency of an the academic environment. In a mass participation system, standards and value must be made explicit to those investing time and money in education. For this reason there is now a need for external quality and standard insurance and DSS tools make this thing possible [3], [15]. As in all fields in which GDSS is applied, the educational one is confronting with the same challenges. Different kind of decisions must be taken at different hierarchy levels and usually these decisions must be taken by a group of members. If the decisions of these members are not mediated by a decision support system (as in most of the cases) then these decisions can be influenced by different factors like *disorganized activity, member dominance, social pressure, inhibition of expression* or other difficulties commonly encountered in a group. The roles of GDSS are to reduce these "process losses" and to increase the efficiency and quality of the resulting group decision [14], [3]. Moreover, results indicate that automated facilitation, embedded in the GDSS is at least as effective as human facilitation in enhancing the faithfulness of appropriation of the technology as stated in [14]. Another advantage of computer mediated decisions (as a support system) is that it allows participants to comment or vote anonymously. Participation to the decision-taking process is also increased because each group member has more time to present his or her ideas; this not being the case in verbal meetings where people must take turns to speak and may have only a few minutes in which to contribute. In a GDSS, all participants may communicate in parallel by simultaneously writing or reading comments [12], [13].

In the education system, information sharing is needed (data, knowledge, etc.) in order to support the various processes that take place at the managerial level. Also there is an increased need for collaboration in creating different types of documents and reports (both technical and multimedia) and dedicated tools for tracking the projects related to the quality of the educational process. Since the communication between different universities or even between professors from the same university (especially in projects requiring inter- and trans- disciplinary) is indispensable, a conference support system would allow an efficient communication and furthermore if these systems would be accompanied by message management systems used as communication gateways the whole communication process would be improved.

Despite the great variety of DSSs, most are individual tools developed to help a particular user involved in a specific decision process. In management most decisions may require prior consultation with more than one person to discuss and argue about alternatives. Thus, GDSSs have emerged as a vital important area in the management domain, providing collaborative frameworks for decision support. Generally, the present educational environment features the use of groups, which work in multi-disciplinary environments and deal with uncertainty, ambiguous problem definitions, and rapidly changing information.

A DSS for academic institution should include the following functions: gathering of the information; analyzing of the information and creating alternatives; choosing an alternative; implementing it; and following up on implementation. These five elements should always be present, the first four, although not especially visible in small decisions, are at all times there, but the final element (following up on implementation) is often overlooked, and, thus the implementation must consider these factors .

The general key characteristics of DSS and their capabilities should be as follows [9]:

- support for decision makers in semi-structured and unstructured problems;
- support managers at all levels;
- support individuals and groups;
- support for interdependent or sequential decisions;
- support intelligence, design, choice, and

implementation;

- support variety of decision processes and styles;
- adaptability and flexibility;
- interactions and ease of use;
- effectiveness balanced with efficiency (benefit must exceed cost);
- complete control of the decision-makers;
- ease of development by end users (modification to suit needs and changing environment);
- modelling and analysis support;
- data access;
- standalone, integration and internet-based.

Taking iGDSS as a framework we have developed a specific software tool for academic environment named eCollaborativeDecisions (eCD), and we defined it as a collaborative environment that facilitates group meetings and processes useful for decision making in academic institutions, increasing the speed of the decision process and the quality of the decisions [4]. The product facilitates the generation of ideas, discussing, analyzing and organizing them, establishing priorities and reaching consensus.

The following paragraphs will briefly present the way in which this platform works.

The *work space* is the entity that displays the projects where the user is involved as resource. It facilitates the following operations (Fig. 1):

- Designing, opening, respectively deleting a project;
- Visualizing the projects according to their status (open/closed) or to a predefined category;
- Accessing e-mail inbox;
- Configuring the parameters relative to the application / to a specific project.

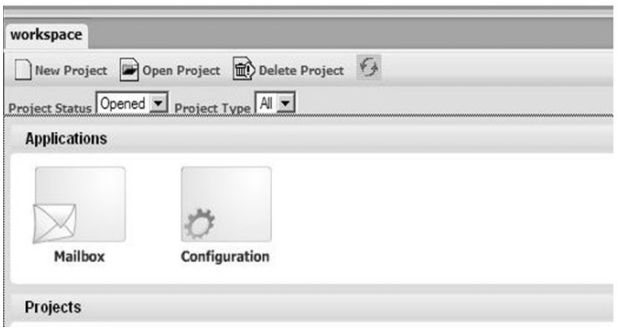

Fig. 1 Work space

Excepting the access to e-mail inbox, which is a personal operation for each user, the rest of the tasks are closely related to the rights any person has within the system. In particular, the system's administrator is the person who has full rights in the application's context; at project's level, the facilitator is the person who has the highest level of access to different functions.

The *Configuration Module* allows defining the resources, decision tools, roles, group types and agents (Fig. 2).

Every *resource* has its role, which implicitly confers certain rights within the system (Fig. 3). A user can have one of the following qualities: facilitator, active member, observer or guest observer (usually for third parties).

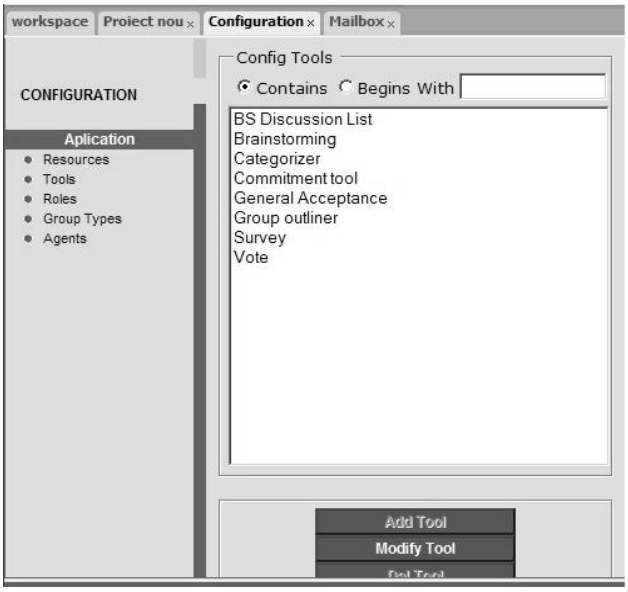

Fig. 2 Configuring the application

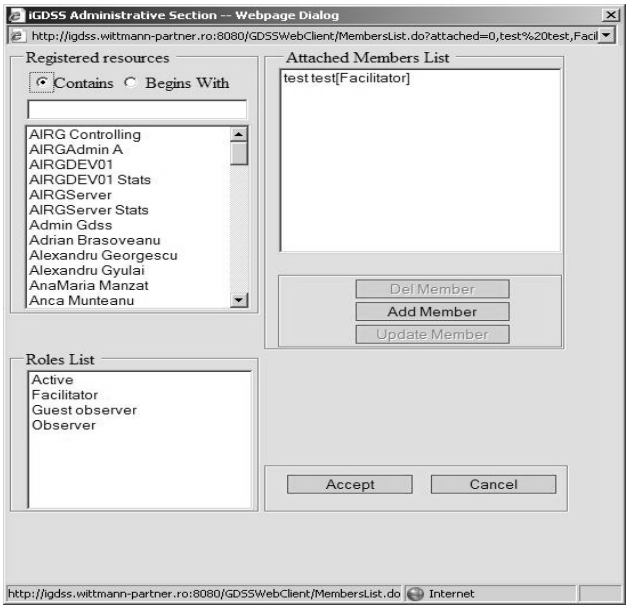

Fig. 3 Resources editing within the project

The eCollaborativeDecision application is focused on the concept of *decision project*. A project is a set of decision sessions that have a mutual purpose. In fact, a decision project implies a work flow; for each of its nodes that require a user action; a session is created for an effective interaction with the system.

The existing modules of a project include (Fig. 4):

- Decision Map: a series of decision processes approached as individual tasks that a user must accomplish, specific for each person;
- Project Information: general information on the decision process (description, members, begin / end);
- Decision View: a hierarchical structure of decision plans / sessions;
- Discussion List: a discussion list applicable along the entire project.

Fig. 4 Modules within a project

A project can include one or more decision plans, which are composed of one or more sessions. A decision plan contains a description, has a start and finish and an editable list of members and predecessors (Fig. 5).

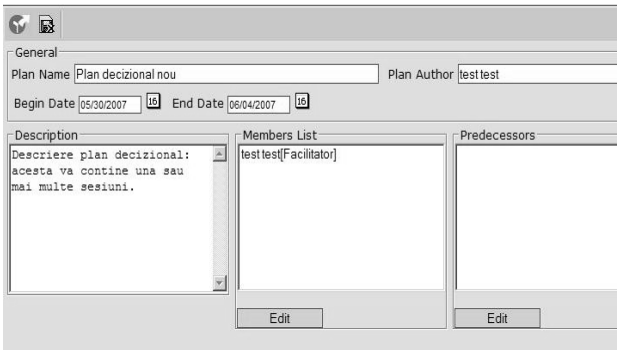

Fig. 5 Designing the decision plan

The functional finality of a decision session is making a decision. The session is created by the facilitator who advances a problem whose solving involves making a decision; the session has a definite period of action and involves a certain number of participants.

A session has three phases:

- initial phase: setting the duration of the commitment period and establishing the decision instrument for this session;
- commitment phase: is the phase when the parameters of the decision process are set: agenda, data, members, tools;
- actual session phase: generates results (that can be the input for other sessions).

IV. eCollaborative Decision for Research Administration

The processes involved in the administration of scientific research at university level are very complex and often it implies different actors (managerial structures at university / faculty / department levels, teachers, research staff, students). At Lucian Blaga University a new regulation project usually comes from the research department or as a proposal from other universities, faculties or research structures. The project should be debated in the Senate Commission for Scientific Research and finally it has to be approved by University Senate.

In order to improve the decision making process, we decided to implement a decision support system. Instead of buying a software / platform, we rather preferred to particularize an existing one – eCollaborativeDecision. The flow chart (Fig. 6), is describing in clear manner what is happening in a decision process at the research department.

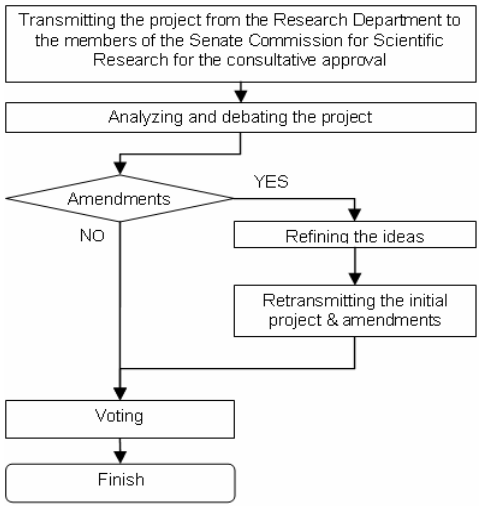

Fig. 6 LBUS Research department decision flow

The operational plan includes the following steps:

- Creating a decision plan and obtaining the consultative approval (Fig. 7);
- Creating the sessions of the plan (Fig. 8);

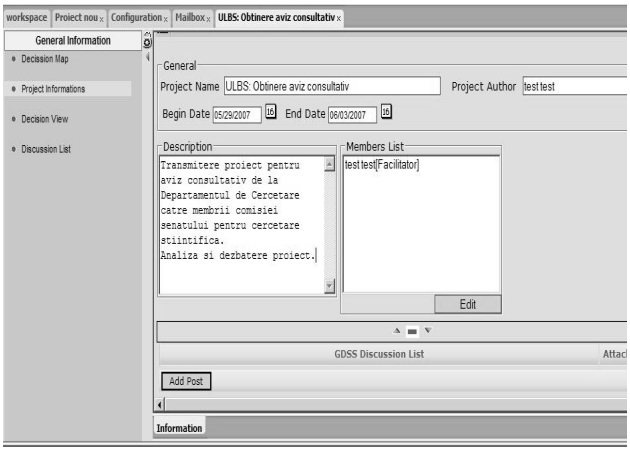

Fig. 7 Information on the project

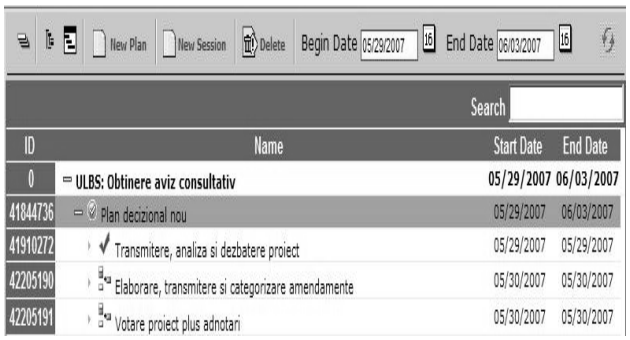

Fig. 8 The decision plan and corresponding sessions

The sessions can be visualized as Gantt graphic or Pert diagram (Fig. 9, 10).

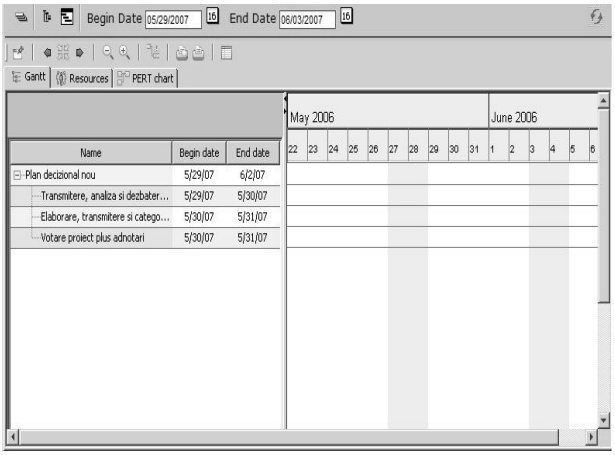

Fig. 9 Gantt visualization

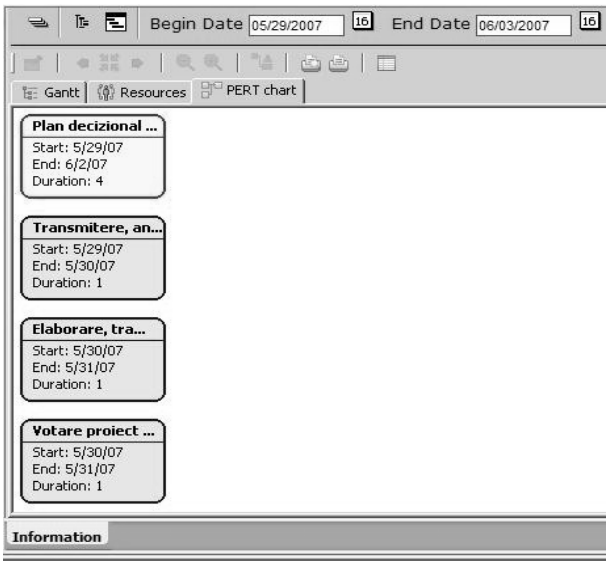

Fig. 10 Pert visualization

At the beginning of the project, a first decision session is set (Fig. 11).

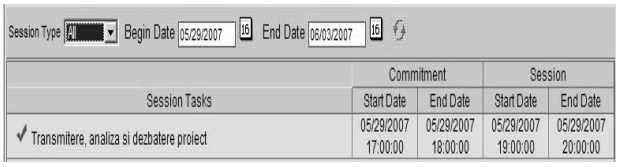

Fig. 11 Decision session is set

Afterwards, the necessary session parameters are configured (Fig. 12):

- "Depth": the number of the response levels.
- "Can append topics": the possibility of attaching one / more subjects
- "Anonymous": the option of marking the session as anonymous.

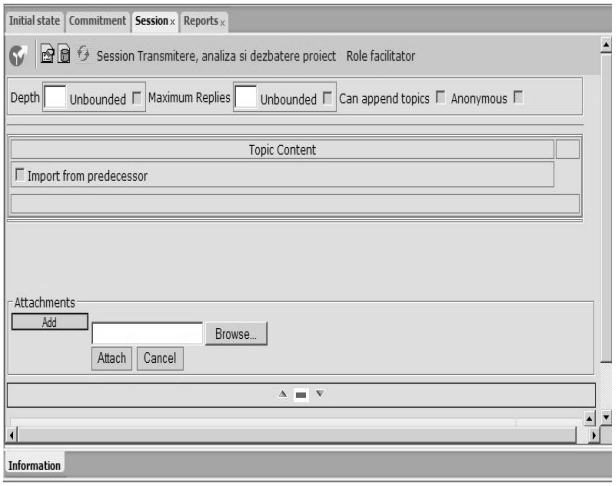

Fig. 12 ULBS: Configuring the decision session

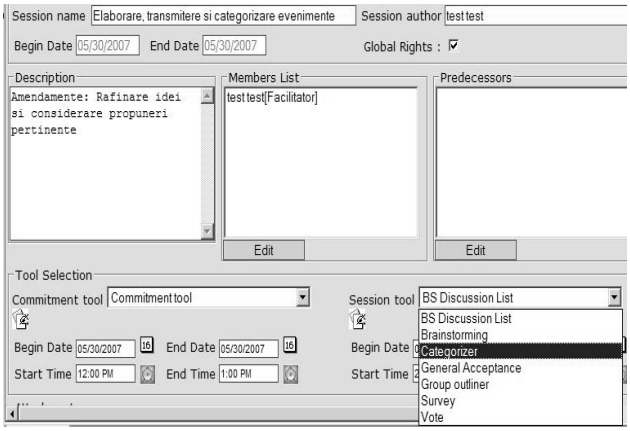

Fig. 13 ULBS: Designing the session

The second decision session is set: events elaboration, transmission and categorization (fig. 13).

The designed session is configured according to the specific decision tool used, marking (fig. 14):

- the maximum number of items that can be categorized;
- the maximum number of categories that can be specified;
- the possibility of adding new items;
- the possibility of adding new categories;

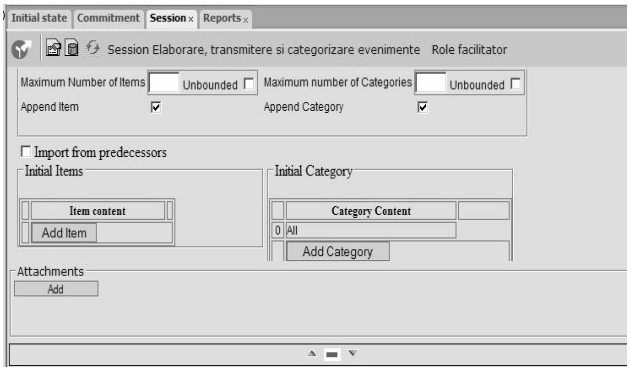

Fig. 14 Configuring the categorization session

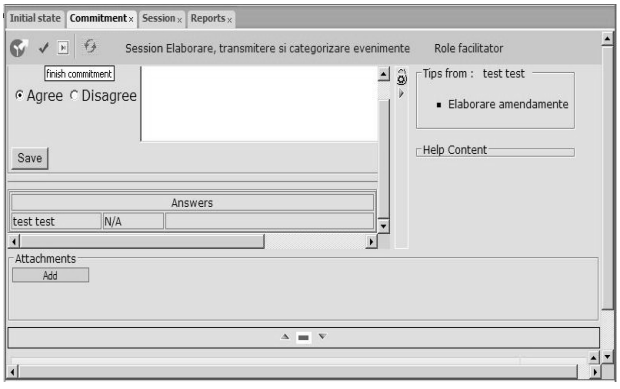

Fig. 15 Commitment phase

During the commitment phase, the user expresses her / his approval or disapproval in regard to the participation in the session, by marking "Agree" or "Disagree", then "Save" (fig. 15).

The movement from a phase to another during the session can be done either automatically, when the duration of the precedent session expires, or manually – when the facilitator considers that the current session is over.

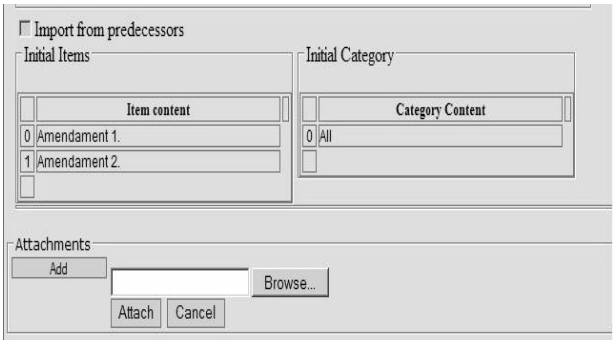

Fig. 16 ULBS: session phase: categorization

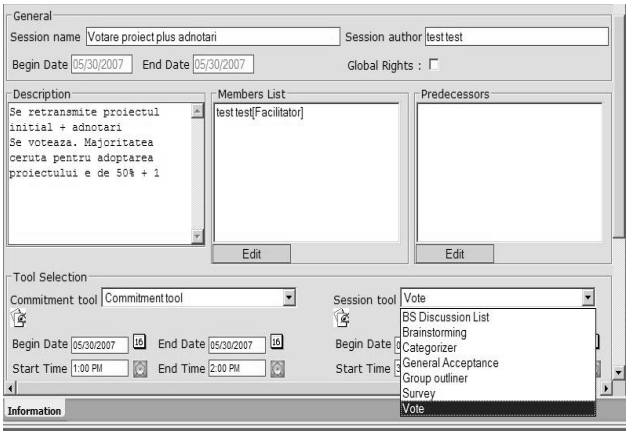

Fig. 17 ULBS: voting session

The actual session phase is the phase during which the decision instrument chosen in the initially phase is used.

The third decision phase is set, considering the voting instrument.

The voting type is configured and the option of anonymously voting and / or importing predecessor elements is elected.

New issues can be added and attachments, as well.

There are six type of voting (Fig. 18):

- Vote on a scale from 1 to 10.
- Multiple selections
- Yes / No.
- Agree / Disagree on a scale of 5 points.
- Agree / Disagree on a scale of 4 points.
- True / False.

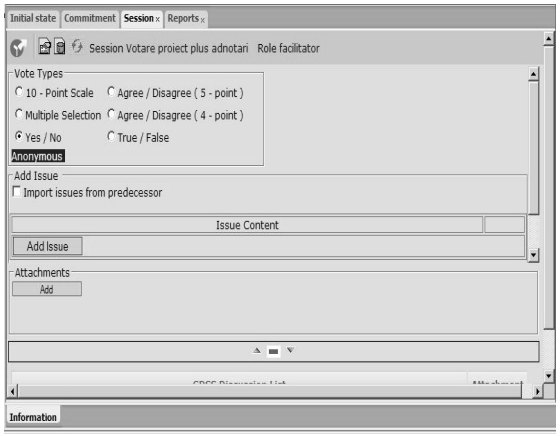

Fig. 18 ULBS: configuring the voting session

V. Conclusions and Intentions

By implementing and using eCollaborativeDecision platform, the decision processes could be greatly improved. Some of the achieved goals of the platform are: it assists the decisions by combining knowledge and human intuitions with specific knowledge, being supported by the technology and its main advantage: speed. Decision assisting can be implemented in all management levels including individual and workgroup. It can also simultaneously assist many interdependent and/or sequential decisions considering the fact that much of the decisions are correlated in practice.

eCollaborativeDecision is based on standard or user defined models; modelling capabilities of the system are enabling experimentation when many configurations are given. Furthermore, it includes different analysing categories such as scenarios elaboration and selection. The intentions are aiming at further fine-tuning the platform, adding new tools and improving the current ones.

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