Facilitating Organisational Activities Using Plans and Audits

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Abstract

Group Decision Support Systems (GDSS) present important limitations that constrain their usage in current organisations. The fundamental reason is the lack of integration in the complex network of coordinated and collaborative activities that occur in an organisation's everyday life. An approach to broaden the use of GDSS is proposed, based on: (1) turning the facilitation of decision-making processes an everyday job; and (2) supporting and facilitating follow-up processes, intended to disseminate decision results throughout organisations. The proposed approach leads to the design of two enabling software components designated by Plans and Audits. Plans foster and guide the planning of group activities, while Audits support process awareness, management and corrective actions. A simulation framework for evaluating the functionality of Plans and Audits is also proposed.

Introduction

The concept of virtual organisation, understood as a computer augmented organisational system, has lead to the development of software components that increase organisational effectiveness through better management of information, improvement of communication and support to business processes. Virtual organisations encompass multiple structures, levels, units, personnel, internal and external boundaries. In organisations, business processes are executed by orchestrated individual and group activities. This orchestration is possible due to multiple mechanisms, such as norms, rules, hierarchies of power and control, or social interactions. Mintzberg [12] defines an organisational model that highlights each one of these different mechanisms.

The role of computer-based artefacts in a virtual organisation can be broadly defined as supporting work by enhancing group cognition. This broad definition encompasses the provision of mechanisms to overcome limitations of groups of people engaged in cooperative work. As such, computer artefacts have tried to enhance communication among members of groups, provide shared information bases, coordinate individual tasks to assure a coherent result, guide and stimulate collaboration, all this while overcoming limitations of distance, time and memory. A fundamental distinction that underlies this work is the separation between coordination and collaborative systems, as artefacts supporting two different facets of organisational work. Cooperative work is broadly seen as the activity performed by groups of people engaged in a process to achieve some goal. Coordinated work occurs when individual activities of the members of a group are organised (in terms of scheduling, input and output) to reach the predefined goal. On the other hand, collaboration happens when members of a group organise themselves through informal contact and mutual adjustment.

This paper addresses computational support to one particular aspect of collaborative processes: the decision-making activities, mostly taken at the upper levels of the organisational structures but with repercussions either downwards or across external

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boundaries. Our perspective is assembled from experience with groupware systems in general and Group Decision Support Systems (GDSS) in particular. Current GDSS show important limitations: different levels of support to decision-making are provided but no services exist to integrate and spread the usage of GDSS. In particular GDSS, as catalysts for collaboration, are typically used out of the context of the co-ordinated activities that justify collaboration, or are consequent to that collaboration.

At the same time, we assist to the dissemination of other computer supported organisational systems, notably workflow systems. GDSS and workflow systems position themselves at opposite sides if one considers human intervention or, alternatively, technological level of intervention. At one extreme we find GDSS, collaborative, human centred, based on informal routines and data structures, while at the other extreme we find workflow systems, computer centred and based on formal procedures, the essence of coordinated work.

Efforts have been made to increase flexibility of workflow systems towards a more human centred perspective. Some approaches apply mechanisms such as dynamic loading, late modifications to instantiated procedures or sentinels [25], while others attempt to model flexibility in formal procedures [7][8][5].

Following the same trend, although using a different approach, we argue that workflow based environments require the kind of informality, flexibility and collaboration support provided by GDSS [2][10][9]. In the design of computational support to address this issue, we approach the problem by considering two key areas of concern:

- Support groups making decisions - In this area, our objective is to turn planning and management of group decision-making processes an effortless and everyday job.

- Support decisions follow-up within and across organisations - Our objective is to bridge the GDSS functionality with the support provided by other organisational systems.

The resulting computational support is divided in two different components: Plans and Audits. Plans layout and guide the selection of appropriate strategies for the orchestration of group activities. Audits focus on awareness, management and corrective actions necessary to accomplish and optimise results.

Behind these design concepts are the fundamental notions of situated work [27] and awareness generated by breakdown [31]. In coordinated work (as the work corresponding to a workflow step or tasks) persons are immersed in individual work and are often unaware of the contribution of that task to the global cooperative process. When breakdown occurs, in the sense of a (anticipated or exceptional) need for collaborative activity, or group decision in our context, awareness concerning the context of the group decision process is required. Plans are guidelines for the emerging group activity. Audits are designed to support the awareness of the situated nature of the group decision process.

The paper reflects the above areas of concern. We start by characterising the computational support to group activities, focusing on the concept of facilitation rooted in GDSS functionality. Then, we describe our design approach. Finally, we describe a preliminary simulation framework that allows evaluating the use of Plans and Audits in a virtual organisation.

The Facilitation Concept

Group decision-making processes can be operationally characterised as arbitrary sequences of tasks. Although no pre-defined steps can be established a priori, several models identify the following main steps [23][12]: (1) search for information; (2) evaluation and proposals; (3) exploration and decisions. GDSS usage is intended to allow organisations to solve problems following such a deliberate model. Commercial GDSS such as GroupSystems [20][21], Meeting Works and Group Explorer [6], or research systems such as SAMM [1][4] and Colab

[26], support decision-making processes by incorporating tools specific for each one of the above steps. One important element of GDSS, the human facilitator, is responsible for combining the set of tools that best fit both the problem at hand and the situated context; and also helping and guiding the group participants throughout the decision process.

From the usage of GDSS (mainly GroupSystems) [1], we derived significant observations concerning human facilitation. Facilitation activities evolve in two steps: (1) before the group session or, henceforth, "the meeting", the facilitator must plan the decision-making process, creating an agenda and outlining the steps that the process should follow as well as tools to be used; (2) during the "meeting", the facilitator must audit the GDSS usage, receiving and processing feedback from meeting participants in order to decide when to proceed, how to proceed or whether to apply corrective actions.

Human facilitation has been identified as the most crucial element of a GDSS [22]. From a virtual organisation perspective, facilitators are in a critical position, monitoring efficiency, quality and commitment to solutions, and reporting results to the organisation. We believe that support to facilitation activities - planning and auditing - is an important software component of virtual organisations absent from the previously quoted GDSS. Currently, facilitation skills require special training and are not easily available in organisations, and that is a main factor limiting GDSS usage. The computer support to this activity aims at spreading GDSS usage.

From an operational point of view, GDSS lead a group to a closure point where a solution was found and a commitment was made. From a strategic point of view, however, this is just a milestone in a larger business process. Actions should be taken after the closure point, representing what we call decision follow-up. This concept is not supported by current GDSS.

Decision follow-up concerns identifying which resources are needed to accomplish the solution, committing resources, and scheduling new activities. Resource commitment and scheduling is exactly one of the subjects addressed by organisational coordination theories, such as the ones defined by March and Simon [18], Thompson [28], Van de Ven et al. [29], Mintzberg [19] or Malone and Crowston [17]. These theories are summarised in Table 1.

Another perspective of the relation between the GDSS closure and coordinated activities is clearly the one induced by workflow systems [9]. Focussing on the particular aspect of control, central to the workflow approach, we may classify workflows as:

- Ad-hoc workflows - Control is in the hands of individuals. This may be compared to non-facilitated GDSS, where decision processes evolve without an adequate strategy. Decision follow-up, on the other hand, should be planned and audited.

- Production workflows - Control is exerted by the system. Fits the operational objective of routine and well-defined business processes, but a strict control exerted by the system restrains the support to decision follow-up. A properly planned and audited decision follow-up should moreover be able to adapt to contingencies.

Authors	Types of coordination
March and Simon [18]	Feedback; Programming
Thompson [28]	Standardisation; Plan; Mutual adjustment
Van de Ven et al. [29]	Impersonal (plans and roles); Personal (supervise horizontally); Group (scheduled and unscheduled meetings)
Mintzberg [19]	Mutual adjustment; Direct supervision; Standardisation
Malone and Crowston [17]	Fit; Flow; Share

Table 1 - Coordination theories

Organisational coordination theories generalise and extend the workflow approach. For example, using Mintzberg's model, we may view organisations combining production workflow (standardisation of inputs, outputs and processes in Mintzberg's terms) with mutual adjustment and direct supervision. While ad-hoc workflows can be considered a specialisation of mutual adjustment, direct supervision is missing from the workflow perspective.

We consider that decision follow-up should adopt the more comprehensive concepts provided by organisational coordination theories rather than workflow technologies. Furthermore, we extend the role of the human facilitator in group decision making to the context of decision follow-up. In this context, facilitation activities evolve in two steps: first, the facilitator outlines a plan for the follow-up process; afterwards, the process development is audited. These new responsibilities require an extension of the computer support to human facilitation and increase the weight of such software component in the virtual organisation.

To summarise, we need planning and auditing tools in order to facilitate group activities. In the next two sections we describe our software design of these tools.

Facilitation Tool

The software system, designated by Facilitation Tool (FT)[4], identifies two types of users (clients): the facilitator and participants (of group activities). Facilitators can also be participants. FT implements two different services, Plans and Audits. More specific classes of Plans and Audits are defined to distinguish decision-making and follow-up processes. **D-** (decision making) and **F-** (follow up) prefixes denote these different classes in the next sections.

D-Plan and D-Audit

The facilitator uses D-Plan to define all the details related to decision-making processes. The functions provided by D-Plan include an agenda, management of participant lists, definition of issues, expected outcomes and decision process outline. The definition of the decision process outline is the most important activity, since it specifies the sequence of tasks to be conducted by a group during the actual meeting.

Using D-Plan, the facilitator defines a decision process outline according to the following elements (adapted from [13]):

- The facilitator can break down a problem in several **issues**.

- An issue is handled according to a sequence of different **phases**. There are four different phases, temporally ordered: *divergent* (search for information), *groan* (discuss issues), *convergent* (attempt to reduce the number of solutions) and *closure* (select one solution by consensus or voting).

- Each phase can consist of one or more **strategies**. E.g., *exploring the territory*, *searching for alternatives* or *discussing difficult issues* are different strategies defined in the *divergent* zone.

- In turn, a strategy can consist of one or more **activities**. E.g., *who, what, when, where and how* characterises one sequence of activities in the *explore the territory* strategy.

- Each activity falls in one of the following basic **group tasks**: *generate ideas*, *organise ideas*, *select/evaluate ideas* or *analysis/planning*.

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[4] Based on a client-server architecture, consisting of the Facilitation Server developed in Java, and Java Applets (clients) which are downloaded from a WWW home page using conventional browsers.

- Finally, basic group tasks map directly into one or more **tools**, provided by particular instances of GDSS. For instance, *generate ideas* maps into GroupSystems' brainstorming tool. Currently, D-Plan has profiles for GroupSystems and Meeting Works.

After the decision process is planned, the facilitator can save the agenda for future use and print a report with all the details. Figure 1 presents the D-Plan user interface for process outlining, showing issues (top left), selection of process elements (right) and list of group tasks produced (bottom left).
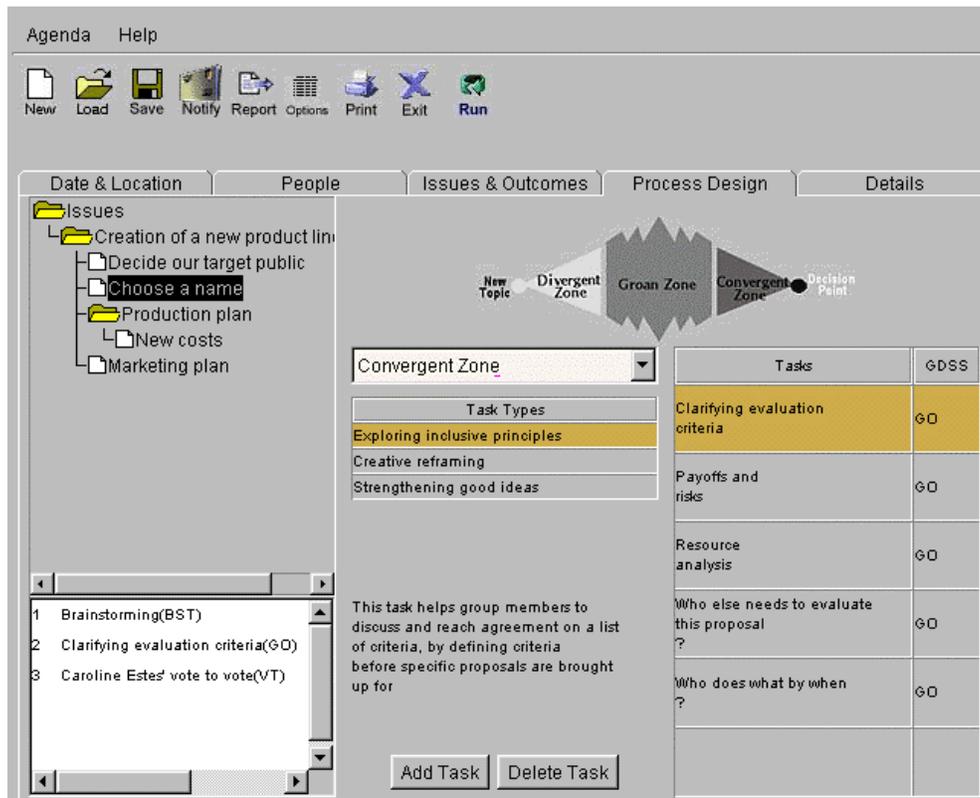
Figure 1 - D-Plan

When a facilitator logs in the FT and downloads D-Audit, the tool executes a simple start-up protocol: it sends e-mail notifications to participants, requesting them to log in the FT, and waits, monitoring logins. The participants must also connect to the chosen GDSS, although that event cannot be monitored by D-Audit. After all participants log in, D-Audit allows the facilitator to (see Figure 2):

- Identify which GDSS tool must be used, according to the decision process outline defined earlier (some common configuration options are also proposed to the facilitator).

- Use a set of basic facilitation techniques, which include (adapted from [13]): (1) paraphrasing; (2) drawing people out; (3) stacking requests; (4) tracking topics; (5) encouraging people; (6) balancing interventions. The available set of techniques changes according to the current zone and activity.

- Get immediate feedback from participants about the meeting, through an opinion meter which provides the following voting methods: (1) yes/no; (2) agree/disagree; scale (from 1 to 20-points).

- Measure the degrees of conviction and agreement of the participants about a particular issue, through a criteria meter.

Note that the facilitator may always go back to D-Plan and change the decision process outline during the actual meeting.

D-Audit also provides some other services to the facilitator, in particular meeting reporting.

Figure 2 – D-Audit

F-Plan and F-Audit

A facilitator uses F-Plan to define all the details related to follow-up processes. Follow-up processes can be organised according to the following outline:

- Define **goals** (these may be uploaded from D-Plan).

- Divide goals into **follow-up tasks**.

- Assign **types** to follow-up tasks (we use McGrath's typology [15]): *generate* (plans or ideas), *choose*, *negotiate*, and *execute*.

- Assign **profiles** to follow-up tasks. There is a choice of three different profiles that can be selected: (1) *standard*, (2) *supervisor*, and (3) *adjustable*.

- Attach **people** to tasks.

- Profiles lead the facilitator to the creation of one or more **tips** with the following types: *instructions*, *roles* and *outcomes*.

- Finally, the collection of tips created by the facilitator for a follow-up task defines a follow-up **announcement**.

Profiles characterise tasks according to different coordination strategies and independently from task types. The *standard* profile applies to well-known situations, where a follow-up process is already specified (like prescribing a workflow procedure, if one exists). The

supervisor profile is adequate to situations where one person is designated by the facilitator to supervise others performing the task[5]. Finally, with the *adjustable* profile, the facilitator designates a group and delegates the task responsibility to the group (it may be used to start or continue a new decision-making process using a GDSS).

Tips, which are related to profiles according to Table 2, define information units necessary to dispatch tasks. The *instructions* type lets the facilitator specify any commands necessary to start the task. The *roles* type allows specifying roles of people participating in the task. And the *outcomes* type allows specifying the expected results from the task.

Tips	Profiles		
	Standard	Supervisor	Adjustable
Instructions	X		
Roles	X		X
Outcomes	X	X	X

Table 2 - Profiles and required tips

Note that in the F-Plan functionality described above we adopted an approach similar to the one adopted for the decision-making context, i.e. develop independent tools that complement usage of other systems. That is the reason why F-Plan only recommends alternative systems. Recommendations change according to task types. Currently, envisaged systems include e-mail, GDSS, group agendas, PERT, and workflow systems.
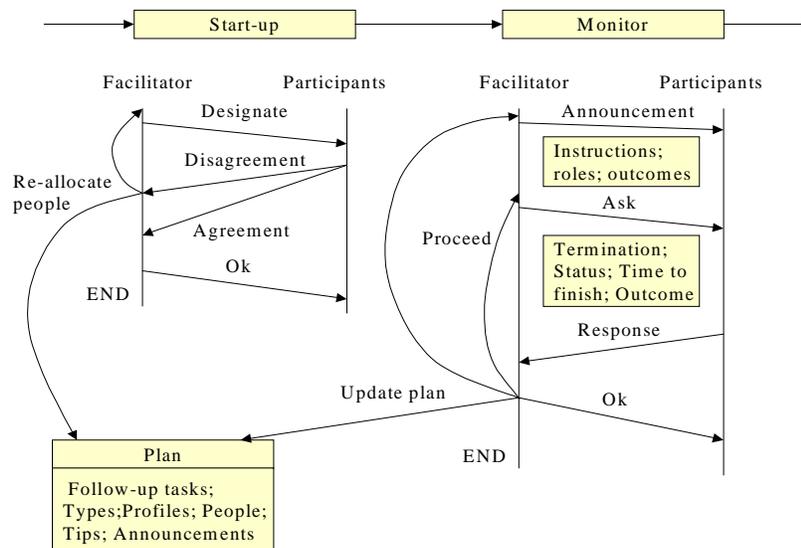
Figure 3 - Functionality of F-Audit

After planning a follow-up, the facilitator starts F-Audit. F-Audit allows the facilitator to go through tasks and interact with people attached to tasks. The functionality is implemented in two steps, according to the diagram shown in Figure 3. At the start-up phase, the facilitator either obtains agreements from the selected participants or else must re-allocate people. Afterwards, the facilitator sends an announcement and starts monitoring process completion.

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[5] Currently, we are not supporting multiple supervisors.

She/he asks for feedback information about process termination, status, time to finish and outcome. According to responses, the facilitator may proceed, terminate monitoring or update the plan and restart monitoring.

Simulation Framework

The preliminary evaluation of the facilitation support led us to design a framework to simulate the facilitation of organisational activities using Audits and Plans. The generic structure of this framework is illustrated in Figure 4 and shows how D-Audit, F-Plan and F-Audit integrate the organisational tasks performed by decisional and operational agents.

The kind of activities supported by D-Plan are complex to incorporate in the simulation framework and therefore will be experimented elsewhere (in the context of GDSS usage).
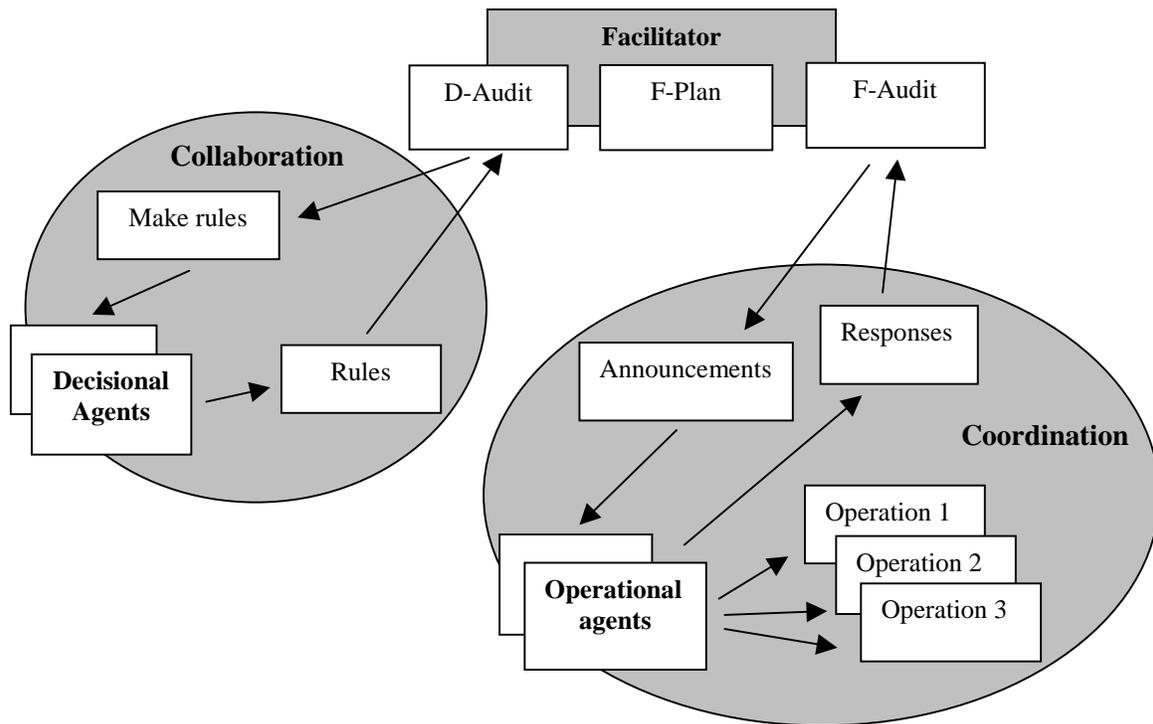
Figure 4 - Simulation framework

The simulation framework uses one specific scenario, considering the objective of maximising capital gains in a stocks market. The participants in a simulation session start with an initial amount of stocks and money, and are requested to buy and sell stocks in a way that optimises their gains. Market values are given to participants with a maximum but variable rate of 5 seconds. An experiment operator manipulates values and update rates.

Besides Plans and Audits described in this paper, the simulation framework uses the following tools: a freeware Java Applet supporting group discussions, used as a rough substitute for a GDSS; several Web pages with forms/CGI's, used to coordinate participants; and a Java Applet to input market values from the experiment operator and display them to participants. There are also available Web pages for executing buying/selling tasks, calculating gains, and several pages with pre-formatted rules (e.g. buy if value under X, sell if value above Y). The pages with pre-formatted rules are intended to simulate coordination through standard work processes.

The simulation framework requires six (6) persons with the following roles: two (2) traders, two (2) policy makers, one (1) facilitator and one (1) operator. The policy makers (decisional agents) are responsible for analysing market trends and specifying buy/sell rules. As shown in Figure 5, they use the lower left frame for discussion and the lower right frame for specifying rules. Frames at the top provide an overview of the stocks portfolio.
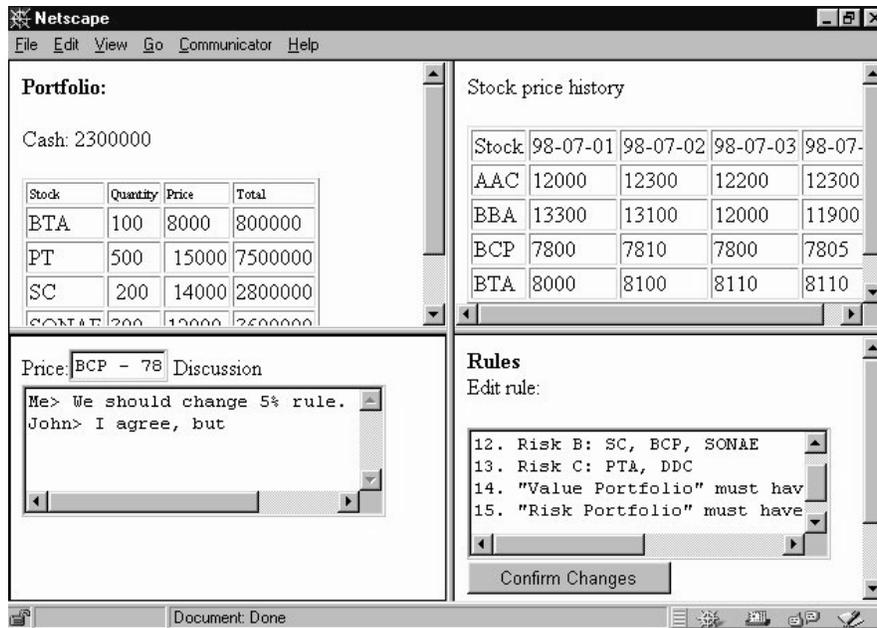

Figure 5 - Policy maker

Traders (operational agents) can buy and sell stocks using the frames shown at the top of Figure 6. The lower left frame allows traders to discuss while the lower right frame displays rules generated by policy makers.
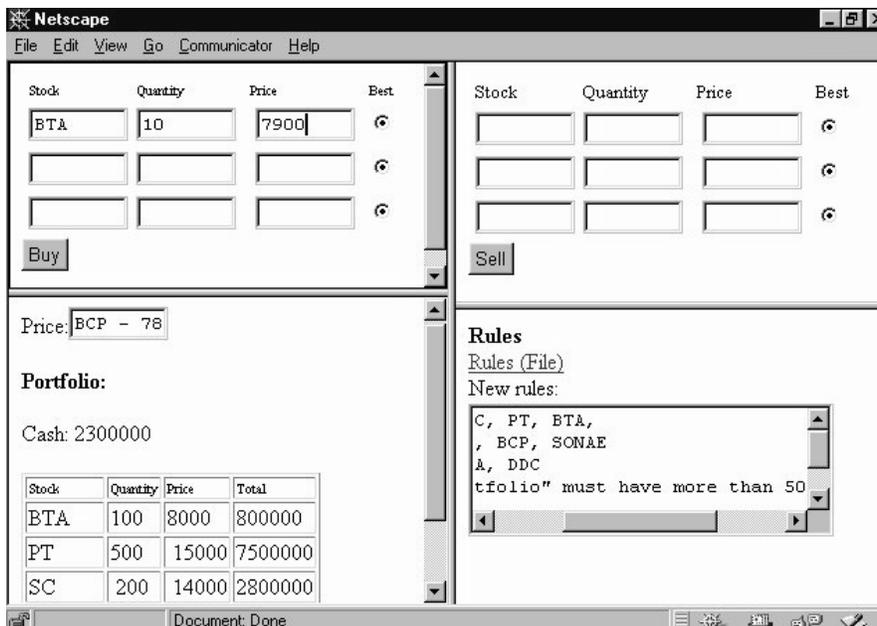

Figure 6 - Trader

The facilitator is at the core of the follow-up process: she/he operates D-Audit to obtain rules from policy makers and operates F-Audit to deliver rules to traders and monitor their accomplishment. Moreover, the facilitator uses F-Plan to decide either to run pre-formatted rules, designate supervisor one of the traders, or to deliver rules to both traders. This scenario experiments the three different profiles supported by F-Plan.

Conclusions

Our goal is to broaden the use of computational support to group decision-making activities in virtual organisations. This goal requires addressing two important and complementary issues. First, ease the operation of GDSS, in order to allow non-specialised individuals to facilitate decision-making processes. Second, facilitate the integration of collaborative decision-making processes with the global coordinated functioning of the organisation.

We follow an approach that recurs to well-known models of decision making and coordination of groups of individuals. Furthermore, we depart from the view that these new computational services should adapt to systems already operating in virtual organisations, such as group agendas, PERT tools or workflow systems.

The proposed solution consists of Plans and Audits. Plans foster and guide the design of decision-making processes, and also follow-up activities taken after closure points have been reached. The functionality of Plans is based on decision and coordination models. Audits support maintenance and corrective actions over these processes. The functionality of Audits is based on interaction between the facilitator and other users, feedback and information collecting.

At the moment, D-Plan and D-Audit have been implemented while F-Plan and F-Audit are in the final design stage. A validation of the proposed solution requires extensive field studies, due to the multiple systems embraced and time dispersion of events. Consequently, we devised a simulation framework that allows experiment systems functionality on a laboratory. Controlled experiments have not started yet.

Concerning future work, we observe that the notion of process awareness has not been sufficiently developed. Although Audits are intended to collect process data from users, the comprehensive information is only delivered to the facilitator. The other users could nevertheless benefit from process awareness, for example, layout decisions specified with Plans. Furthermore, process information can also be automatically collected from related systems, in particular workflow systems, if appropriate application interfaces are available.

We have not considered in this paper the notion of external coordination, fundamentally studied in the context of market and economic studies (e.g. [30]), but interrelated with the theories of coordination quoted in this paper. For instance, [11][16][24] have addressed this issue. External coordination provides another alternative for planning follow-up actions: negotiate a contract with an external organisation.

Another perspective which have not been considered by this paper, but able to extend further the current computational support, is associated to negotiation models (e.g. [14]). In some sense, the functionality of Audits requires a way of negotiating process completion, and though the inclusion of explicit negotiation models could benefit the system functionality.

Acknowledgements

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