Highly Configurable Telecooperation Tools
Position Statement for the Panel
"Tools: the Quest for Adequate Support"

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Abstract

The position statement start by recalling a standard classification of telecooperation tools, then briefly comments on the state of the art. A quest is made for highly configurable and customizable tools as the only viable approach to computer-supporting productive telecooperation on a large scale. A highly configurable whiteboard is described as an example.

1. Introduction: Classification of Tools

In the remainder of this statement, a known classification of telecooperation tools will be used, based on three main categories cf. [1] (this classification forms a better basis for discussion than the well-known "four quadrants" spanned by the categories "same time / different time" and "same location / different location" [4]):

- **Communication:** tools which compensate for the lack of face-to-face collocation of all team members, such as audio/video conferencing and chat facilities.
- **Coordination:** tools or parts thereof which control operations and regulate the flow of action, such as floor passing [2], role or constraint resolution, application sharing (see below) etc.
- **Production:** the tools which support the very purpose of a telecooperation setup (such as a distributed electronic meeting); as is well known, such tools can be further divided into
  - **Cooperation-Unaware** tools, i.e. software which was built with a single user in mind, such as, e.g., CAD or office tools. Such software must be combined with an application sharing facility which replicates tool output onto the computer screens concerned and coordinates keyboard/mouse input (and possibly more) such as to mimik a single user with respect to the application.
  - **Cooperation-Aware** tools, i.e. software which was explicitly built for cooperative use; such tools range from rather general purpose (e.g., joint editing facilities or shared (software) whiteboards) to rather special purpose (e.g., cooperative CAD or cooperative simulation tools targetted for particular industry segments); many meeting support tools can be viewed as ranging between these two extremes (cf. tools which may, e.g., be built on a notion of "brainstorming" or a specific creativity technique).

2. State of the Art: Persistent Problems

Rather than providing an in-depth state of the art review (which a position paper has neither room nor purpose to do), the author would like to point to three problems with respect to the

advancement of telecooperation; these problems seemed to persist over the last decade despite enormous research efforts:

1. (to be skipped for the panel) *the coexistence of two rather decoupled research domains:* "CSCW" and "workflow management". *CSCW* has developed strengths in domains best characterized as "rather synchronous work", "interdisciplinary research including the humanities", "small workgroups with creativity and little constraints"; *workflow management* on the other side has developed strengths best described as "rather synchronous work" "bridging computer science and business / management", "large communities with well-defined procedures and tightly controlled constraints". In order to increase the synergy between these two domains, the respective "communities" must be brought much closer together; only then, tools and methods can be successfully integrated. At least, the two communities have started to recognize the problem, efforts are under way. The tools problem will be a second step and will thus not be discussed further here.
2. (the main point for the panel) *insufficient promotion of specialized cooperation-aware tools:* according to the classification above, telecooperation today is often based either on cooperation-aware but rather generic tools or on domain or task specific but cooperation-unaware tools. A major reason is the development effort for cooperation-aware software (together with the high degree of expertise required in this domain; this expertise is hardly found among professional programmers and virtually lacking in the applying organizations).
3. (a side-remark for the panel) *lack of cooperation/management support for non-computer experts:* our experience with computer based classrooms and meeting rooms shows that non-computer experts - i.e. the potential users! - do not have the skills to instrument and control telecooperation tools the way they would like to. As the above classification indicates, different tools for communication, coordination, and production will often have to be used and controlled in a telecooperation setting; they have to be parametrized, multiplexed and controlled on different and often remote sites, and might even have to be handled differently for different subgroups. In other words, even the existence of adequate tools - required in item 2 above - is insufficient since the average user can not adequately combine and use them.

3. Core Statement: A Quest for Highly Configurable Tools

For more then eight years now, the research groups headed by the author have actively participated in the search for CSCW specific software engineering support. Languages, methods, protocols, and components have been developed with the intend to facilitate the construction of cooperation-aware tools. Yet up to now, the research results have not yet fostered tools which would have considerably penetrated revenue-generating or even mission-critical processes in telecooperating organizations. Obviously it takes considerable time and effort for any technology to be transferred from academia to software production to application (cf. object-oriented technology). One might argue that the technology developed might not be mature enough, but even well-renowned contributions such as the GroupKit development support [5] did not (yet) succeed in the field on a large scale.
In an attempt to improve and shorten the technology transfer cycle, our group has attempted a different approach lately: instead of aiming at "heavy-weight" software engineering support for the whole range of cooperation-aware applications, we are currently investigating "light-weight" composition support for more specialized segments of such tools. In a concrete project, we develop a *highly configurable electronic whiteboard* with the following rationale and features:

- Since we restrict ourselves to the narrow field of whiteboards, the tool and its components can be prebuilt to a stage where they can be configured by users with a certain degree of computer literacy.
- Based on the principle of decoration patterns, the "customizers" can pre-configure the whiteboard for a very specific use case; to cite just two examples, possible use cases may range from the planning of an oil pipeline where very domain-specific objects and constraints have to be considered, to the application of a creativity technique where ideas and arguments have to be treated in a well-defined manner. Since the whiteboard can be adopted to any such use case, its applicability remains very broad. At the same time, no software house has to be involved in customizing the general, highly configurable whiteboard for a particular use case.
- Object and relation types offered to the telecooperating whiteboard users may not only be configured as to their graphical attributes (shape, color etc.) and composition constraints; rather, many more "characteristics" can be reflected, such as whether or not (and which) role-based authorization support is associated with an object/relation type, whether or not respective objects are to be recorded (in a persistent "video" which can be reviewed in order to watch the "growth" of a whiteboard "drawing" as it happened during the meeting), how to reflect authorship (labeled, colored, etc.), whether or not to make the objects scrollable, etc.
- Not only traditional graphical objects can be configured this way, but also applet-like applications (such as videoconferencing output, wall clocks, animated characters, electronic meeting assistants, and many more).

The whiteboard example cited here is meant to demonstrate the quest made on the panel: a quest for highly configurable, cooperation-aware tools which can be readily delivered to organizations and configured there; the configuration support must be flexible enough to lead to tools which users will actually accept as sophisticated enough for serving their purpose in a satisfying manner (a requirement which, e.g., standard whiteboard software simply does not fulfil)

In addition to the above-mentioned central requirement, it has to be noted that problems 1 and 3 as cited in chapter 2 have to be reflected as well. As to problem 3, the Telecooperation Group at the University of Linz has developed a graphical group management software which provides drag-and-drop access to all configured telecooperation tools from a single consistent user interface, enabling all-in-one control of all tools and all workplaces. Floor plans and physical configurations (such as the setup of an electronic meeting room) can be incorporated and complemented with photographs of participating users and other person or role identifications in order to provide intuitive access to users and tools. For more details, cf. [3]

4. References

[1] Calvary, G., Coutaz, J., Nigay, L.: *From Single-User Architectural Design to PAC*: a Generic Software Architecture Model for CSCW*, Proc. CHI'97, ACM Press, pp. 242-249, 1997

[2] Dommel, HP., Garcia-Luna-Aceves, JJ.: *Floor control for multimedia conferencing and collaboration.* Multimedia Systems (1997) 5: Springer Heidelberg, pp. 23-38,

[3]. Falkowski, C.: *A Room Mangement System.* In Streitz, N., et al. (Eds.), Cooperative Buildings - Integrating Information, Organization, and Architecture. Proc 1st Intl. WS Cooperative Buildings (CoBuild'98) February 25-26, 1998, Darmstadt, Germany. LNCS. Springer: Heidelberg, 1998

[4] Johansen, R.: Groupware: Computer Support for Business Teams. The Free Press, NY, 1988

[5] Roseman, M. and Greenberg, S. *Building Groupware with GroupKit.* In M. Harrison (Ed.) *Tcl/Tk Tools,* p535-564, O'Reilly Press, 1997.