The Learning Web in the Workplace

Daniela E. Herlea, Mildred L. G. Shaw and Brian R. Gaines
University of Calgary
Calgary, Alberta, Canada T2N 1N4
danah@cpsc.ucalgary.ca, mildred@cpsc.ucalgary.ca, gaines@cpsc.ucalgary.ca
http://ksi.cpsc.ucalgary.ca/SERN/, http://ksi.cpsc.ucalgary.ca/KSI/

Abstract: Workplace learning provides a rich environment for investigation of the *learning web* approach since it involves learners with well-defined job roles collaborating in goal-directed activities. There are not only general learning needs in order to fulfill the roles but also highly focused 'just in time' knowledge and skill requirements. This article reports on an initial experiment to integrate the workplace learning environment with the ongoing workplace activities in such a way that the support of learning is an integral part of the organization's primary activities. It focuses on providing a group communication and negotiation environment in which the specialist roles of the individuals involved are modeled within the system and are explicit in the interactions and services involved.

1 Introduction

The learning web has been introduced as a model for collaborative learning through self-organizing communities operating through distributed networks that transcend conventional institutional, regional and national boundaries (Norrie and Gaines, 1995; Gaines, Norrie and Shaw, 1996), and examples have been given of its implementation for undergraduate education (Shaw and Gaines, 1996). However, the transformation expected in adult education through the learning web approach can best be illustrated through learning environments that are not confined to existing educational institutions but address issues of lifelong learning through the support of individuals and groups operating in the workplace.

The workplace learning environment differs from that of the university because those involved have well-defined functional job roles supporting the objectives of the organization of which they are part. Their learning needs arise out of the adaptive processes entailed by their roles, and are often highly focused on particular 'just in time' knowledge and skill requirements. There are also longer term, transformatory learning requirements as roles and job requirements change that can be satisfied by conventional education and training courses, but the workplace environment has a major emphasis on learning linked to immediate needs and to the support of goal-directed group processes.

The learning web models addresses these more diverse requirements of workplace learning through a unified model that recognizes *communities of knowledge* (Shaw, 1985) and adopts a *collective stance* (Gaines, 1994) which treats organizations and teams as learning individuals similar to individual people. The learning needs of work groups and individuals are modeled as resulting from the recursive sub-division of the organization into partitions similar to the organization as a whole—a model similar to Warnecke's (1993) *fractal company*.

Thus, we do not see the support of workplace learning as being primarily a problem of 'distance delivery' of conventional adult education courses, although that can certainly play a significant role. The significant requirement that differentiates workplace and university education is to integrate the workplace learning environment with the ongoing workplace activities in such a way that the support of learning is an integral part of the organization's primary activities. This article reports on an initial experiment to achieve such seamless integration using the learning web approach. It focuses on providing a group communication and negotiation environment in which the specialist roles of the individuals involved are modeled within the system and are explicit in the interactions and services involved.

2 Requirements Negotiation as an Example of a Generic Workplace Activity

The task chosen as providing a reasonably generic instance of a common organizational function was that of negotiating system requirements between various 'problem owners' and 'system developers' within the framework of Checkland's (1981) *soft systems methodology*. This situation is a common one in all organizations and usually involves learning on the part of both the system specifiers and the suppliers as both groups adapt to one another's needs and capabilities in a dynamic environment. There are two major approaches to what has come to be called *requirements engineering*, that of *participatory design* (Schuler and Namioka, 1993) and that of *joint application design* (August, 1991), and the system supports both approaches.

The general roles defined for the requirements negotiation task are:

- the *facilitator*, who acts as a chairperson of the meeting
- the *users*, who are people involved in using the system, are the "owners" of the problem.
- the *analyst*, who transfers the requirements from the "problem owners" to the design team.
- the *design team*, who are the system implementors, are responsible to meet the elicited requirements.

Other examples of the learning web in action (Shaw and Gaines, 1996) have used the standard facilities of the World Wide Web, sometimes supplemented with constructivist modeling tools operating through the web (Shaw and Gaines, 1995). For the workplace studies we needed tools that explicitly supported structured collaboration in a way that was not yet available on the web, and chose to use the TeamRooms system (Roseman and Greenberg, 1996) which is implemented as an Internet or intranet application using the groupware toolkit GroupKit (Roseman and Greenberg, 1992).

TeamRooms combines shared whiteboards, chat rooms and other customizable groupware applets (integrated mini-applications) in a persistent work environment that lets participants easily and flexibly collaborate and share information with colleagues across a network. The model for TeamRooms comes from real-life team meeting rooms, which provide a shared space for a workgroup. TeamRooms works the same way, except that the room and its objects are now a fully graphical, persistent groupware interface.

3 TeamRooms as a Negotiation Place for Requirements

The first step in customizing TeamRooms to support a learning web concerned with requirements negotiation was to analyze the roles of the major participants using Checkland's soft systems methodology as shown in the concept map in Figure 1.

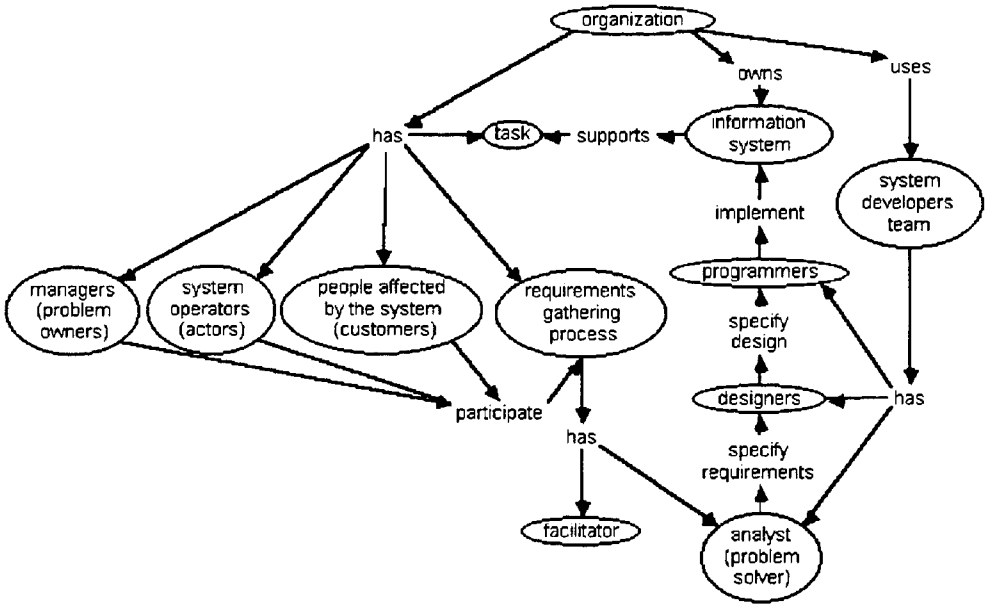

Figure 1 Concept map showing the roles played by the participants within the organization and the requirements negotiation process, according to Checkland's soft systems methodology

Then a set of virtual rooms was defined to support the types of interaction that would be required by participants having these roles. They have been grouped in four areas. The layout of rooms in supporting the iterative requirements negotiation process is illustrated in Figure 2.

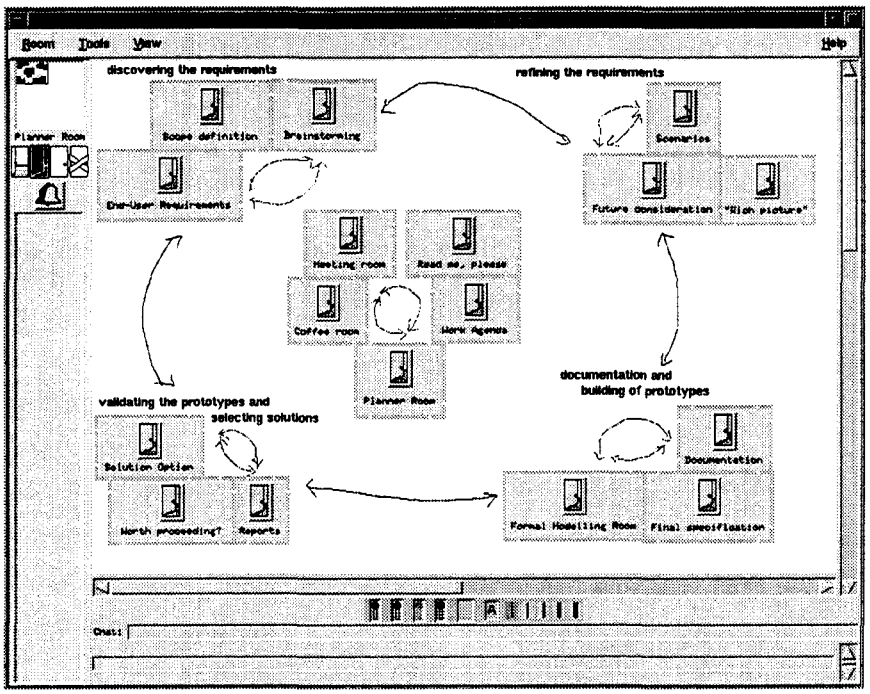

Figure 2. The layout of rooms in the iterative cycle of requirements negotiation

The requirements negotiation process is about navigating this electronic workspace. The participants enter any of these rooms by clicking on the "door" of any room.

4 Collaboration in the Electronic Workspace

Awareness of other users in the work space is very important in simulating the real physical space. The list of users currently connected to the group's server, as well as the room each user is currently working in facilitates locating the other users and making contact with them.

The facilitator, who acts as a chairperson of the meeting, has a critical role in organizing the work of the requirements negotiation team. She enables effective communication, works as a project manager for the elicitation team, can have the knowledge of the room and action of each participant in the working space. She can use the **Work Agenda** Room to organize the work through an agenda of the meetings and lists of activities, using the Outliner or the Note Organizer applets to create a hierarchical activity structure, or a Concept Map applet to identify and set priorities.

Figure 3 illustrates the **Future Consideration** Room, a "storage and future retrieval" area. Exploring the users' environment, the capture team collectively investigates the target users' organizational setting and identifies and describes what they do. They produce documents recording the shared view of the users' environment. They create objects reflecting the users' workspace and save them in a database. Records in this database are files containing information that describes these specific objects. Users of the system may retrieve these files using the File Holder tool. Any file editor would give the participants the opportunity to read and modify the content of the files, after they discussed the changes with the others in the room.

The **Documentation** Room may be used by the analyst to record the elicited requirements. Documenting the elicitation process may be a time consuming task in usual physical meetings. Using the **Documentation** Room in the electronic space, the analyst records all information that participants generated, all the analysis conducted, all of the decisions reached, in hypertext format, creating the requirements documents. This way the documentation files have a higher quality, they are easier and more quickly produced. Validating

understanding of the user environment with the system customers and end users, and formulating requirements based on this existing "picture" may be done in the **Worth Proceeding?** Room (Figure 5).

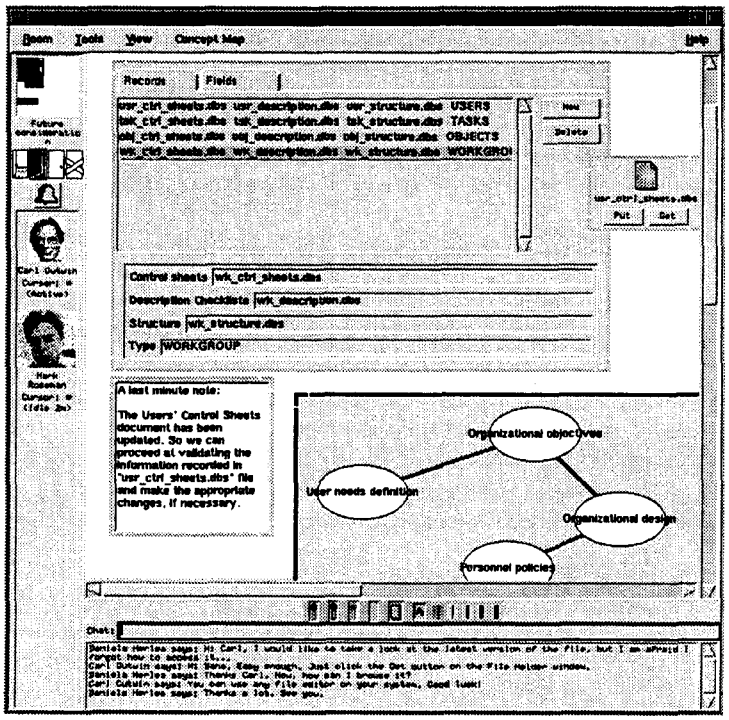

Figure 3 A "storage and retrieval" room for the user environment's objects

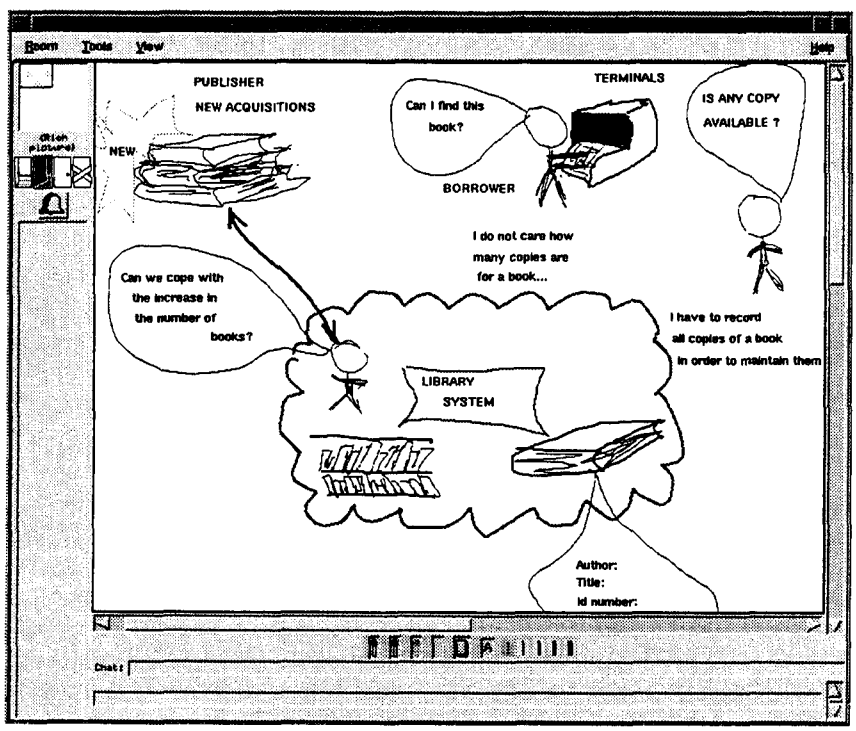

Figure 4 The "rich picture" of the problem situation being investigated

The **"Rich Picture"** Room is used to build the 'picture' of the situation being investigated. In the framework of the *soft systems methodology*, it is the pictorial form that shows the main structures and the pattern of formal and informal communication. The reason for drawing pictures and diagrams is that human affairs

reveal moving pageant of relationships, and pictures are a better means for recording relationships and connections than in linear prose (Checkland and Scholes 1990). The example used in describing the content of these rooms is from a requirements negotiation process for a library system.

As a next step, an initial list of requirements may be proposed and stored in a generic "wish list", in the **"Wish List"** Room. The list of contents for a set of issues related to the requirements document is stored using the Outliner tool that helps in analyzing the information. It enables users to build upon a previously generated list and refine it into a hierarchical structure. In their "discussion" participants are helped by telepointers. They can see the other's cursor location on the document. In face to face meetings, hand gestures play an important role to communicate ideas. Telepointers are examples of a fine-grained awareness of others' actions in the workspace.

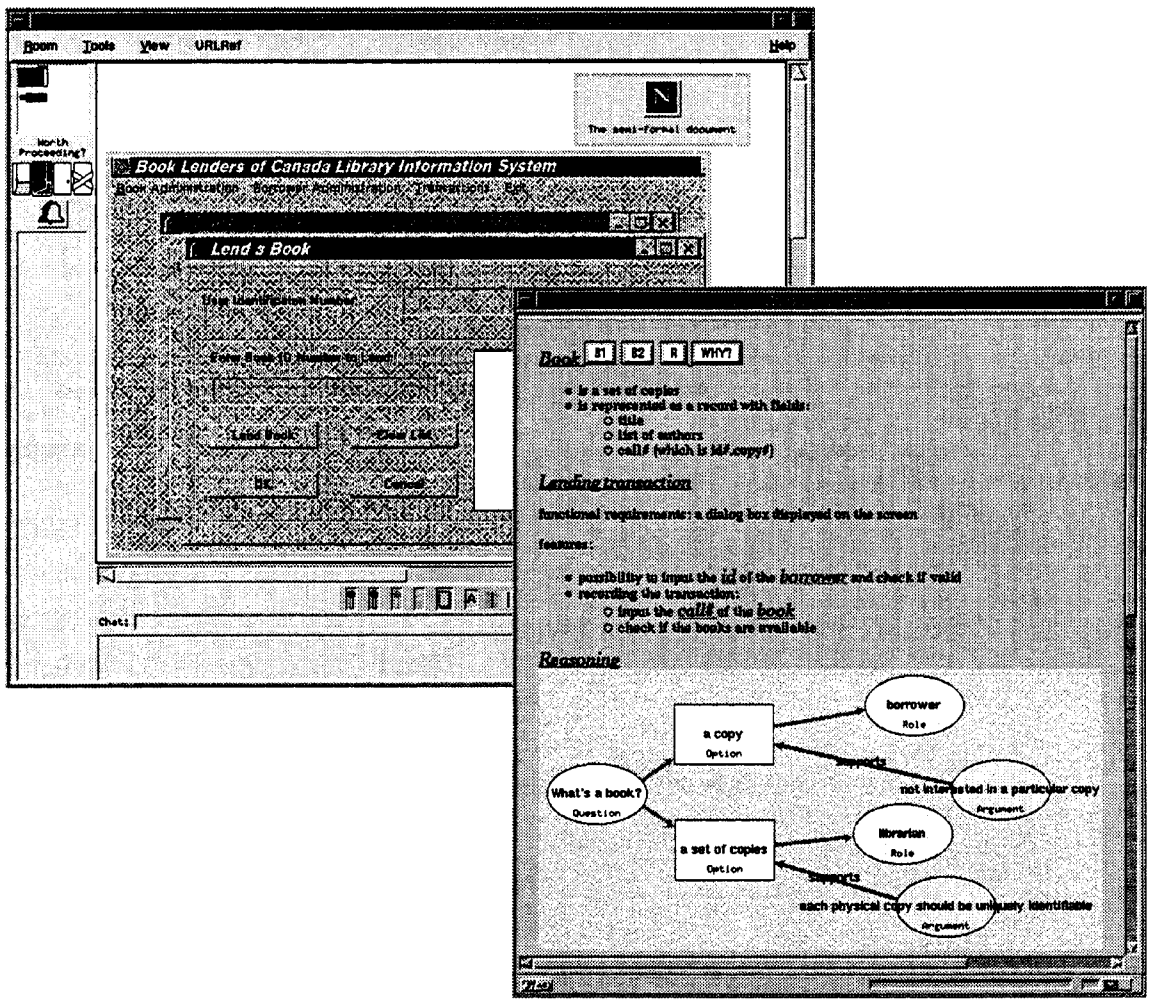

Figure 5 Checking the accuracy of requirements

Figure 5 illustrates the screendump of a lending transaction prototype. The image tool has been used to retrieve it. Participants in the process use it in checking the accuracy of the elicited requirements; they use a Web browser to retrieve the requirements documents.

5 Conclusions

The system described is an initial experiment in using the learning web approach to provide a system that integrates the workplace learning environment with the ongoing workplace activities in such a way that the support of learning is an integral part of an organization's primary activities. TeamRooms provides the facilities to make available a wide range of resources in a structured environment that recognizes and supports the specific job roles of the participants. Some of these resources will be the products of the ongoing activity. Others will provide access to knowledge that supports the 'just in time' learning necessary to carry out the

activity effectively—these will look like 'information retrieval' facilities. Other resources will provide access to background materials necessary to operate more effectively in the roles—these will look like 'education and training' facilities. However, from a user perspective these differences will not be particularly significant because they will see the entire system as supporting their ongoing activities in a seamlessly integrated fashion.

The requirements negotiation process was chosen because it is of particular interest to our industrial sponsors and it is also a reasonably generic activity that occurs in most organizations. However, support of workplace learning can be integrated with virtually all activities that can be supported by a computer-based system. As 'workflow' support systems (White and Fischer, 1994) come to be common in industry they will also come to serve as vehicles for the delivery of workplace learning. As many learning needs are common across many industries, we may expect to see the *electronic data interchange* (EDI) paradigm extended to one of *electronic learning exchange* (ELE) in which the specialist training materials of one organization are provided to others to facilitate collaboration or as a revenue source.

Acknowledgments

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URL's for Materials

TeamRooms: http://www.cpsc.ucalgary.ca/Redirect/grouplab/
Related articles: http://ksi.cpsc.ucalgary.ca/articles/

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