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Web Supported Competency Based Approach to Learning about eCommerce

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Abstract

The paper provides a framework for teaching about electronic commerce in business curricula. It emphasizes alignment of technology to business and uses a case study based on a design process to demonstrate such alignment. The paper describes web based teaching methods for doing so with the eventual goal of research to personalize learning to learner needs. It suggests a competency driven approach that provides choice for learners to follow different learning paths and bases this path on a metamodel of knowledge, in this case electronic commerce. The metamodel characterizes knowledge into learning about the technologies, learning about the benefits of the technologies to business processes, and uses a design process as the underlying framework to align technologies to business strategy.

1. Introduction

Electronic business (Kalakota, 2002) is now almost a required part of any information systems study program but is currently an ill-defined area. At one end, it can be taken to mean using computers to improve any business process. At the other end it can be constrained to those processes that use World Wide Web technologies. This paper develops a framework for teaching about electronic commerce emphasizing the use of the WWW and aligning technology to business needs. To do this it uses the approach shown in Figure 1, where learning centers on aligning technology to business needs. It uses design methods as the basis for a systematic approach for learning alignment. The goal of the design methods is to develop an understanding of how to get business benefits by aligning information technology to business needs. The approach differs from contemporary approaches such as case based learning as it provides a framework for integration rather than relying on learning from examples.

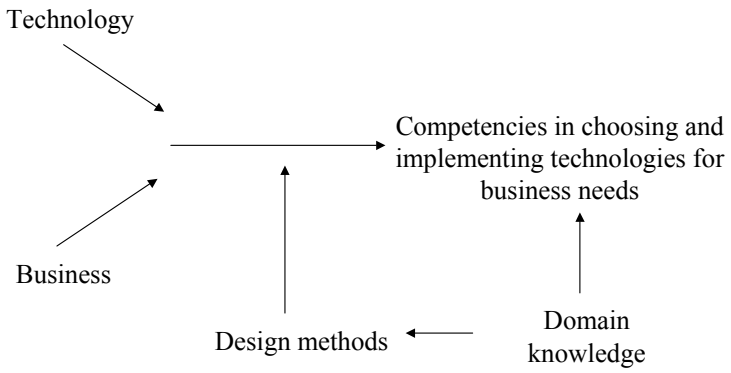

Figure 1: *The Underlying Approach*

Our goal is to provide a web based support tools for these learning activities. Wade and Power [1998] for example outlined a number of requirements for computer supported learning systems and described alternate technologies for supporting them. Neal [1997] has carried out work on their use in distance teaching emphasizing the delivery of materials. It is however fair to say that much of this early research has been in specific settings and supported limited activities. Most effort concentrated on developing web-based support for courses that are part of a curriculum. Our approach differs from these by providing a certain degree of personalization by allowing students to develop in-depth study for selected parts. This is in line to the increasing interest now found in specializing learning. The paper stresses a competency based approach [Hezemans and Ritzen, 2002] that allows learners to select subject areas and study these while concurrently developing generic competencies, such as idea generation or report preparation. The paper builds on earlier work (Hawryszkiewycz, 2002) for customizing learning environments using learning objects. The competency approach is adopted because the large amount of material that makes up e-commerce almost makes it impossible to teaching the entire subject to any depth especially when combining two domains of study. Students can choose to study particular areas of electronic commerce although they must do so within the integrative framework. This requires the underlying support of a domain metamodel to allow students to select particular parts of the problem domain and a matching interface.

The paper thus consists of two parts. One is to describe the way that knowledge about electronic commerce is organized to support personalization. The second is to describe the services provided to support personalized learning.

2. The Framework for Subject Knowledge

The main processes that characterize up e-business are illustrated in Figure 2, which illustrates a number of main processes and a common foundation. The main processes are:

- Customer relationship management (CRM), which concerns the ways organizations work with their clients,
- Selling chains, or responses to tenders, which are a special case of CRM where an organization helps a client to formulate a complex requirement and then provides ways to meet this requirement,

- Procurement, where one organization arranges purchases from another,
- Supply chains where a product or service requires a number of organizations to work together and integrate their activities into a smooth flowing process.
- Alliances between organizations that are established often as part of the other processes, and
- Trading and knowledge sharing portals that serve as ways to create initial contacts between trading entities, which can be individuals or organizations.

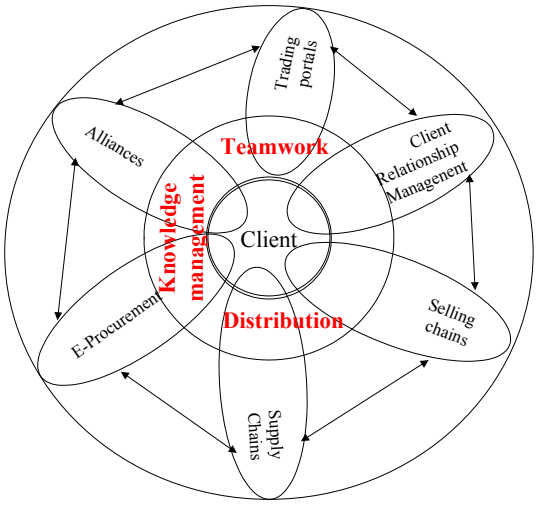

Figure 2: *Business Processes*

These business processes are related as they often exchange transactions between themselves. Thus supply chains often require procurements of parts to be arranged. Selling chains are often extensions or specializations of customer relationship management. They also contain a number of common characteristics, which are used to provide a common framework. These are:

- **Teamwork and collaboration -** All business processes require people to work together. Thus a system must provide ways to help people exchange knowledge and be aware of each other's activities and to retain and pass on any accumulated knowledge between different members or to new members.
- **Distributed and virtual work -** An extension of teamwork where team members are separated by distance or where teams are transitory with experts brought into teams as needed.
- **Knowledge management** – Many processes are increasingly *knowledge intensive*. The goal is for people in these processes to continually improve the process by people learning how to carry out their work better. Again a strategic approach is used here primarily based on comparison of codification and personalization strategies (Hansen and Nohria, 1999).

3. Integration with the Business Process

It is proposed here that a course in electronic commerce should emphasize a strategy driven approach. Strategy defines the projects. Strategy primarily considers large scale aspects such as those defined by Porter (2001) where technology is used to provide competitive advantage. Thus for example collaborative technologies are important as infrastructure support for knowledge based businesses such as consultancies. Workflow management may be more important for production environments that have specialized product flows and need to improve the value-added chain. Strategy defines projects, which are identified through a development process such as (Jutla, Craig, Bodorik, 2001, Levi, 2002). Our approach is illustrated in Figure 3. It is used in the case study where student groups follow the processes delivering reports at each stage supported by groupware that provides groups with private project spaces.

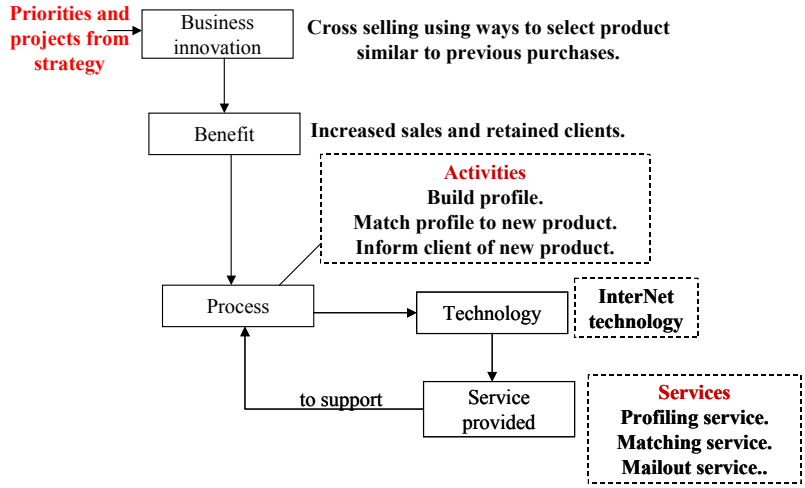

Figure 3: *Design Process*

The steps followed are to:

- Identify the strategy priorities and projects, as for example, customer relationship management. This will be defined as part of the strategic process and define approved projects with clear business objectives,
- Identify the business innovations, such as for example, cross selling, that will be included in the development in response to the strategic change,
- Identify the benefits provided by the innovations focusing on improved business activities that lead to improved revenues or profits,
- Define typical business scenarios that must be supported by the new system, and
- Outline some potential technical solutions to support the activities and in particular the kinds of services that they will provide to implement the process and select one of these solutions.

It is often useful to use check lists in such processes, especially when looking for innovations and setting priorities. Subsequent sections will include typical innovations and the benefits that they realize. Innovation is a relative term and it

suggests new ways that a particular organization can adopt in the way it conducts its business.

4. Structuring the Subject Knowledge For Computer Support

The body of knowledge depends on a subject domain. It is usually implemented as a metamodel of concepts and associated road maps that describe design processes. The concepts are related to encourage discovery learning found necessary in any personalized learning system. We use the metamodel shown in Figure 4 to provide a basis for learning about electronic commerce. The metamodel groups concepts by technology, commerce, organizational structure and business practice and provides links between them. There are road maps that describe design processes and these are linked to design concepts, grouped by analysis, design and service selection. Apart from the ontology of concepts the body of knowledge also includes exercises and solutions, exams, case studies and other study material.

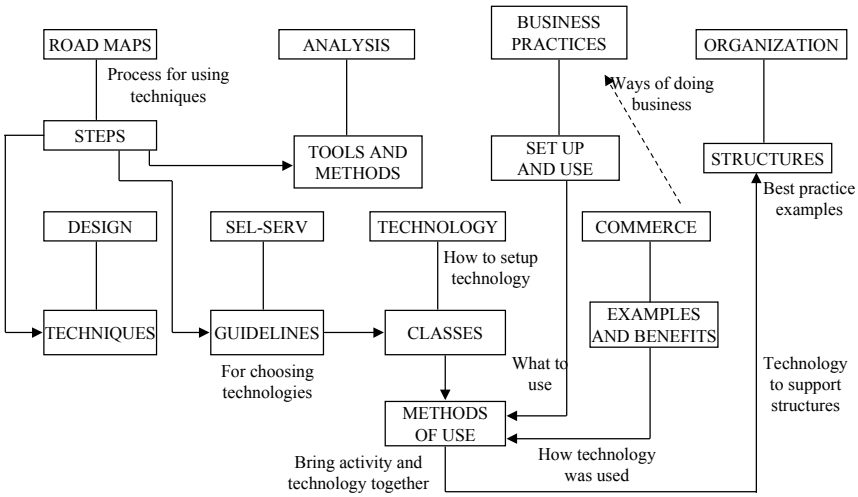

Figure 4: *Metamodel for Electronic Commerce*

The concepts shown in Figure 4 are entered into a knowledge map that provides initial entry point for learners. The relationships between the concepts can then guide students through a study pattern (Fischer, 2001). Thus it is possible for some learners to start with a commerce application or business practices, see what it does and then follow through to technologies useful for the application. Others may start with the technology and follow it through to potential applications. Each of the objects in Figure 4 then becomes a web page with links to related pages for discovery learning. Each such page can also become a learning object that can contain assessment materials as described in the next section.

5. Web Based Support

The web based support must provide ways to customize learning places. The choices (Hawryszkiewycz, 2002) include the kinds of learning methods used and learning activities that are supported. An example of such learning activities is

given in this paper based on a course of technology to business students. This illustrates a number of generic competencies here called Type A, Type B and Type C for convenience. The main competencies are:

- Type A - Understanding technologies and their application, which is primarily the teaching about the capabilities of different technologies. This primarily requires application of socialization for explanations and elaborations about subject material through discussion and exercises,
- Type B – Technology evaluation expressed as articulation on the use of technologies in business contexts by developing topic reports making hypothesis about how technologies can be used to realize business goals. It primarily involves interpretation of the way technologies can be used and framing them (Boland and Tenkasi, 1995) in ways that facilitate interpretation in terms of business objectives and submitting them as individual topic reports, and
- Type C - A case study of application of groupware technology, which primarily requires the construction and evaluation of a small system. This is carried out through a case study.

Each of these teaching activities requires a different learning method. Services are provided to learners to get access to the body of knowledge, and support the different types of learning activities.

6. Providing Services for Learning

Our approach is to develop a set of services (Hiltz, Turoff, 2002) to support a range of learning strategies. These services are based the work of Nonaka [1994] as underlying theory and the goal is to use learning process objects as a framework to realize Nonaka's knowledge sharing and creation activities shown in Figure 5.

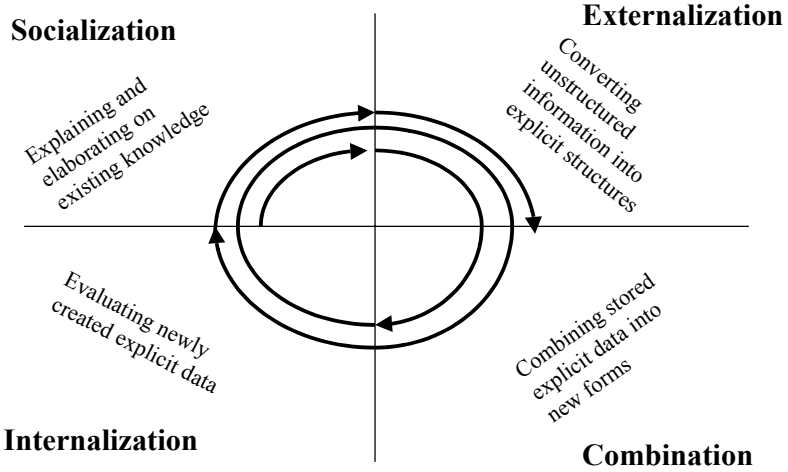

Figure 5: *Nonaka's Knowledge Creation Process*

Nonaka's process includes four phases together with their associated environments. These are:

- socialization to bring people together and share their experiences and insights in an area. For example, this may be a description of subject material in lectures and in informal ways to exchange experiences, develop trust, share values, particularly applicable in learning about a particular subject,
- externalization, is where some of this captured expertise is framed and interpreted into a form that can lead to further actions. For example, tacit knowledge about subject material is externalized through examples and experiments. This requires articulation on ideas using agreed upon terminologies to externalize them to familiar contexts, usually assignments. The emphasis is on dialoguing, sharing of mental models, articulation of concepts, development of common terms and requires ways to visualize interactions, construct artifacts. These activities are often best carried out in groups,
- Combination is where ideas generated in externalization are compared to earlier outcomes, as for example previous assignment solutions, to relate newly created artifacts to previous stored ones,
- The ideas are then combined where necessary with existing information and then applied in practice during internalization in completing assignments followed by reflection on the outcomes after assessment.

Any outcomes of any actions evaluated in further socialization and the cycle is repeated. Our goal is to provide such generic services as reusable objects and provide ways to customize them to particular application needs.

Providing the Services

Figure 6 illustrates the basic structure of this interface, which shows all the information in the subject. It provides an access to the three kinds of activities described earlier as case study, topics and ability to create project teams. It also includes menus for defining learning communities in terms of its roles, interactions between them, defining the explicit body of knowledge and providing the actions needed to use it.

It also provides different roles with different views to support different activities. Thus for example the folder names ‘information-to-tutors’ can only be seen by tutors thus reducing the need for meetings and saving peoples time. The interface can then be used to enter different learning activities to enter the body of knowledge and use its associated knowledge services.

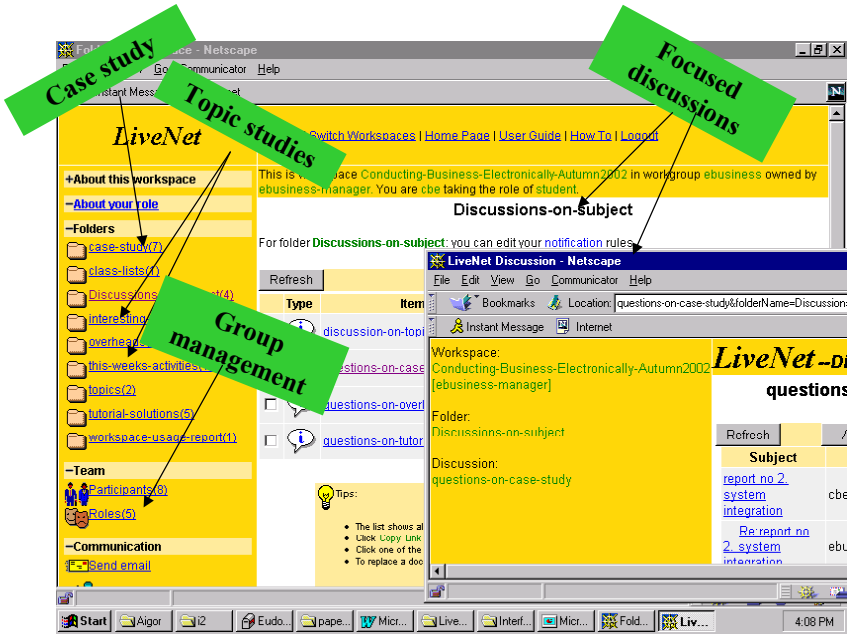

Figure 6: *A LiveNet Collaborative Services Interface*

Support for Type A - Learning about the Subject Material

The kind of support needed in learning basic subject material using the metamodel is illustrated in Figure 7. It can include previous experiences and suggested actions in a business process step. It can also include guidelines for filling in forms and check-lists for deciding on actions. Thus they can be accessed from a community space like that in Figure 6 or specific items can be linked to specific business process steps. Figure 7 is a simple knowledge map used in this system. It is a linear list of terms, each of which leads to a concept screen that describes the concept and a self-assessment screen.

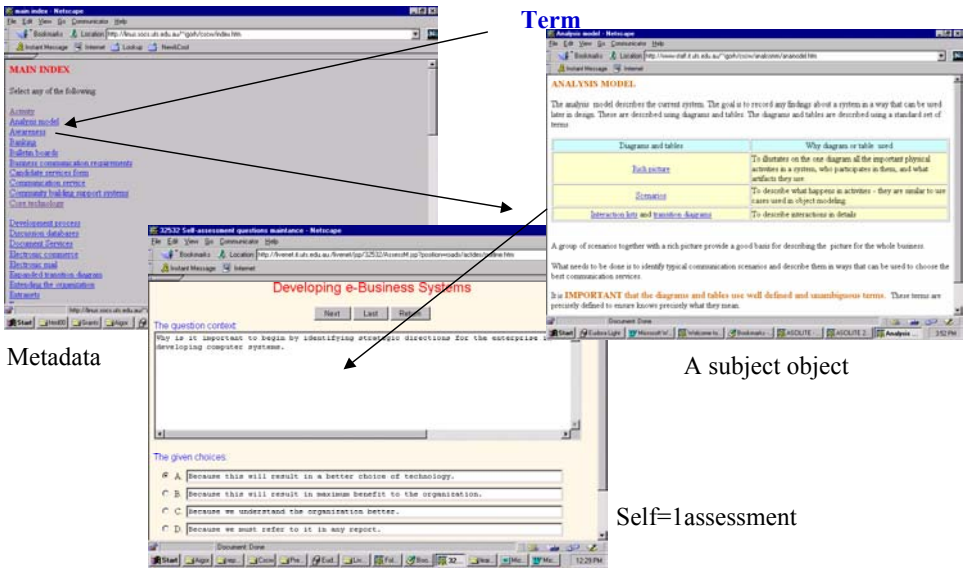

Figure 7: *Learning about a Subject*

On selecting a concept or process step the user is presented with a description and can then follow up with some self-learning services. With concepts that refer to process steps, they can add to the concept by recording their experiences and interpretation of step guidelines.

Support for Type B - Extending to Interpretation

Figure 8 shows the customization of the interface for the interpretation to support topics based on the work of Boland and Tenkasi (1995). The now requires more than one frame to be displayed concurrently to the leaner with ways to map between the different frames. In this case one frame is the business objectives including expected business benefits. The other is the technical issues.

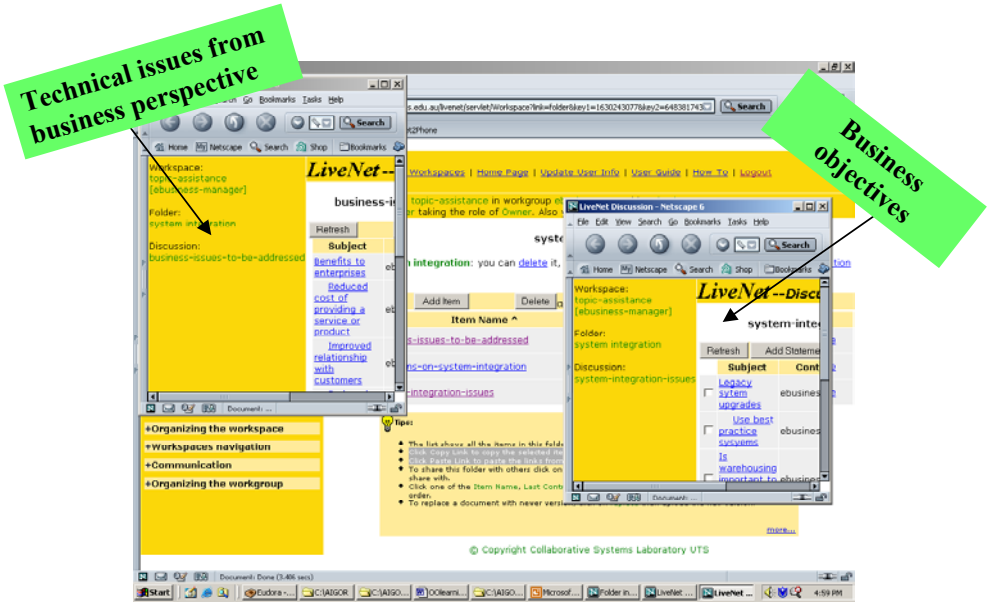

Figure 8: *Interpretation through Topics*

Here subject material and business objectives are framed into forms that support interpretation of each in each other's context. These can then result in hypothesis about use of technologies that are elaborated in a topic report.

Support for Type C - Case Studies

Students can then setup their own workspaces for the case study. This involves creating the space, inviting people into the space organizing documents and interacting through discussion databases. The interface shown in Figure 6 provides the group management services needed to create such groups. Students are then set a case study to set up a collaborative application using LiveNet or other groupware for this purpose.

7. Some Experiences And Future Work

The system is introduced gradually to students following a process similar to that of Salmon (2000) and illustrated in Figure 9. Thus initially in stage 1 students use

the system to access lecture material and engage in simple discussions to familiarize themselves with the system primarily concentrating on Type A activities. This basically introduces technology in gradual stages. These begin with familiarization using the community interface in Figure 8. Some personalization is then introduced through students preparing reports on high level issues of alignment of technology to business objectives.

A project space is used in Type C activities to coordinate group development requiring students to gain familiarity with setting up workspaces. In the case study students were given a number of milestones to aim for, starting with analysis, through design specification to setting up a prototype LiveNet system. Generally, these were successful in the sense that students understood the basic LiveNet modeling method and workspace description and set up prototypes. The social effect of this is to require students to pace their work according to the process rather, as is often the case, leaving it to the last minute. This has an obvious learning benefit although it is perceived as a nuisance by some students in that it requires them to follow a design process.

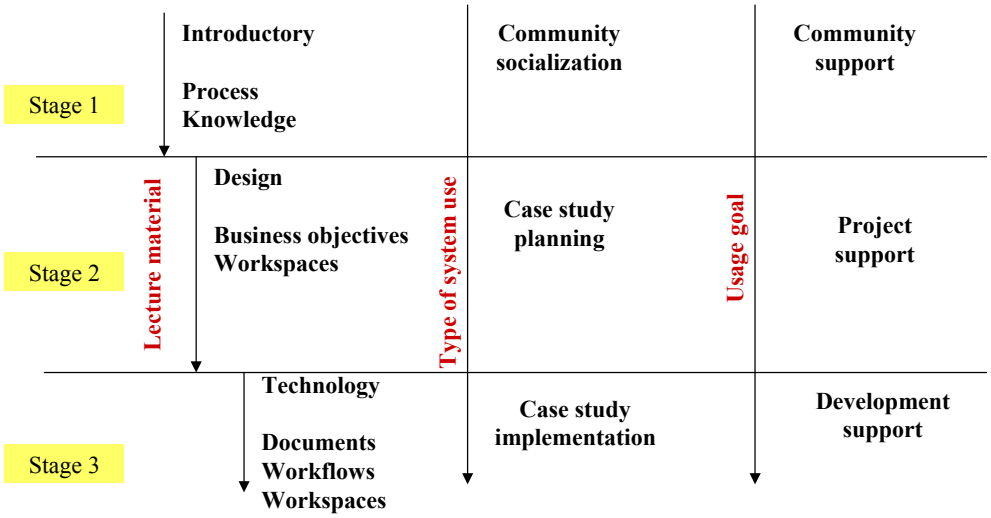

Figure 9: *Introduction into Teaching*

Lessons learned included design of workspaces to provide focused effort without the need of excessive navigation. Such focus is provided with our folders that focus on particular learning activities. Our earlier workspaces provided separate spaces for tutor assistance, cases studies and overhead and administrative matters. The subsequent navigation led to some dissatisfaction and the creation of the workspace shown in Figure 8 proved much more acceptable. This provides access to all these services but governance features and folders allow us to focus information for particular roles.

One interesting question here is whether such bodies of knowledge should be developed by the individual teachers as happens in most tertiary institutions. Teaching method and even material change when the teacher changes. Currently most subjects change once a teacher changes with knowledge often lost in the changeover. Knowledge management requires more structured processes for knowledge development as those now found in a number of industrial organizations (Hansen, et.al. 1999). Experience in industry has shown more effective ways through management of knowledge centers with precise roles

established for carrying out the variety of activities connected with knowledge sharing. The goal then is to have a group developing the knowledge while individuals or learning groups access the knowledge in a moderated way. Another issue is improved level of support to evolve workspaces as experience is gained in using them. Our future work here centers on agents that will provide both personal and workspace support.

A More Flexible Architecture

As a result of these experiences we are developing a more flexible architecture to support greater personalization. For this reason we are about to commence experimentation of a more flexible interface. Figure 10 shows an interface to support competency formation and adopt learning objects as the basis for constructing learning materials. . This uses our LiveNet system. The instructor develops a set of activities and presents them in a top level workspace for users. A user can then select any of the competencies for learning. Figure 11 shows access to three competencies all named as "learn-about-x ". It also allows groups to be set up for socialization or evaluation if needed in a teaching method.

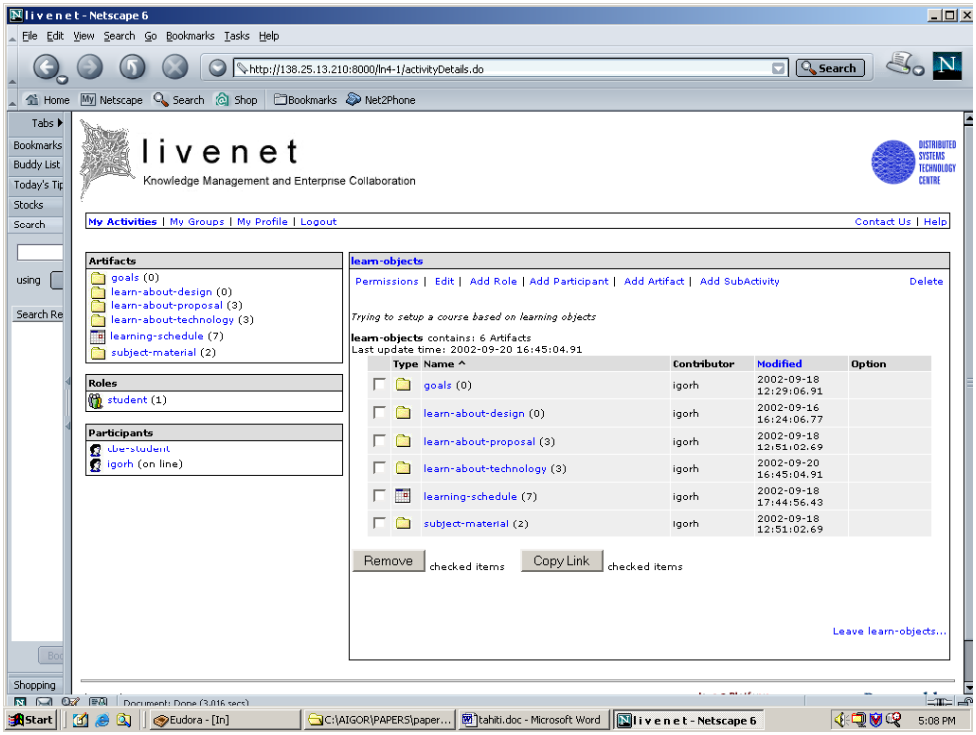

Figure 10: *Presenting the Learning Objects for Competencies*

The user on selecting a competency enters a learning space that will usually contain:

- A set of learning guidelines
- Discussion or chat-room support if the learning takes place in groups
- A calendar that specifies various goals to be met
- Access to relevant parts of the metadata structure.

8. Summary

The paper defined a framework for teaching technology within a business context. It suggested a flexible approach to customizing learning spaces to a learner need. The paper described a metamodel that classifies material found in electronic commerce into frames, which can then be used to personalize learning. The metamodel also provides a basis for a systematic approach to aligning technology to business needs using a design process. It stressed a competency driven approach where learners proceed through a selected set of activities to satisfy a learner need and illustrated a way of implementing it using web technologies.

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