Web Based Learning and "Off-the-shelf" Software: towards a Typology of VLE Interfaces

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1 Introduction

Despite the recent advances in web pedagogy on design and use of Web-based Virtual Learning Environments (VLEs), the transition from a face to face and paper based model to a computer based interactive model is frequently carried out under the assumption that development of online materials is frequently nothing more than "digitising" existing text and lecture-based courses. The assumption is that what is needed is to inscribe into online resources tacitly held models of teaching and learning refined for traditional media [1]. The predominant development model is based on dynamic text, through which the students can navigate and investigate a world of hyperlinked entries.

However a variety of VLEs have been developed recently which have evolved beyond the "put your lecture notes on the web" approach. They are used for independent or resource-based learning. Some of these simply focus on content presentation (of varying levels of interactivity) of the learning materials, while others follow a holistic approach, combining content with communication and assessment (self or Course) tools.

2 Virtual and Managed learning environments: a distinction

VLEs are online domains that permit synchronous, collaborative interaction among instructors and students, while also providing asynchronous learning resources for individualised use by students at any time [2]. Thus web based VLEs can be defined as strictly server-based environments which do not require any software on client machines and are also accessible by any Internet enabled PC.

VLEs can be integrated with management information systems to create a managed learning environment (MLE). The term MLE is used to define the whole range of information systems and processes of an institution (including its VLE) that contribute directly or indirectly to learning and learning management [3]. This definition implies an interaction between the online and offline components of an MLE and positions the VLE as a subset within the set of components of an MLE.

3 Custom built and "off-the self" VLEs

A web based VLE can be custom made by combining an HTML editor (for creating online content) and communication software. These components are often complemented by

assessment software, databases for tracking student progress and other course management tools. However, an increasing number of commercial tools for developing interactive web-based courses are currently being used in further and higher education.

The advantages of using these ”off-the-self” VLEs are:

- The cost is lower than prototyping, implementing and evaluating a custom made learning environment
- As widely available commercial products these VLEs encourage standardisation and collaboration between teaching and learning communities who use common online learning tools

However there are also disadvantages:

- It can be difficult to choose the most appropriate environment as it is accepted that most commercially available VLEs are likely to lack key functional features
- They can be unstable and suffer from functional inconsistencies
- They can be inflexible to customise/adapt to the needs of the institution where they are used. They do not always allow course designers to customise the VLE interface, or to isolate or emphasise functions and facilities they consider important for their student communities.
- The web version is frequently inferior to the client-server one, in that not all the functions of the client-server mode are accommodated.

4 VLE interfaces: conceptual representations of a real campus

VLE interface design uses a variety of metaphors to help new users become comfortable with the online space and able to conceptualise this new environment [4]. The common overall metaphor is that of a virtual campus (a campus in cyberspace which can be as labyrinthine in its infrastructure as its physical counterpart). It can contain:

- VLE registration and authentication portals where a student’s identity is checked and entry permission is given
- virtual classrooms and labs
- real time meeting rooms (chatrooms)
- noticeboards, whiteboards, etc
- virtual libraries in which the students can carry out extensive searches and from which material can be taken (”downloaded”)

Table 1 gives a breakdown of the VLE interface architecture in terms of its temporal and spatial properties.

This VLE metaphorical architecture dictates an interface design which obeys the spatiality of resources. Students have to enter virtual buildings to access course material, take tests in virtual exam rooms and also participate in the interaction activities of a virtual community.

Thus the interface also includes portals and navigational schemes which facilitate transition between online facilities.

Table 1: Spatial and temporal properties of a VLE interface

Spatial	**Temporal**
Lecture theatres/seminar rooms	Self-paced material /pace determined
Dynamic online course content	”externally”
Meeting rooms/chatrooms	Asynchronous communication activities
Digital libraries	Synchronous communication activities
Authentication portals	Student progress tracking over time
administration databases	
Exam rooms/self or course assessment	

This paper focuses on three commercially developed VLEs which the author has used as an educator and developer/implementer: FirstClass, Lotus LearningSpace and, WebCT. The comparative table (Table 2) does not aim to show how these three fare against each other, as there have been comprehensive technical studies which have evaluated features of the most popular learning environments ([5], [6]). The aim of these studies was to recommend and advise educators on how to choose the most appropriate VLE. The paper draws from the comparison of the interface of the three to build a typology of VLE interfaces. The main criteria for this classification are:

- The content
- The extent of Computer Mediated Communication (CMC) and collaboration
- How the VLE supports the tasks that course developers and educators have to carry out in setting up a course and
- How it attempts to provide a student centred, rather than a teacher centred, learning environment.

The paper also discusses VLE interfaces from two different viewpoints. Firstly, from the point of view of the teacher/developer, it considers features such as system support for integration of dynamic features and customisation. As Persico and Manca [7] point out, the interface of such systems should not be evaluated on the basis of the individual designer’s decisions, but rather according to the degree of adaptability of the interface metaphors. Secondly, from the point of view of the student, it describes aspects of the environment which enhance interactivity and communication, for example, navigation, synchronous/asynchronous communication, sophistication of the assessment tools, annotation tools, and how the VLE engenders a virtual sense of presence.

5 General description of the three systems

FirstClass (FC) (Fig 1) is a computer conferencing system which can be used:

- with a client-server architecture where users have a client on their computers to access the server set up by the institution
- through a web browser from any computer the user chooses to use.

The interface of FC consists of a desktop containing icons of folders (or conferences). The contents of these folders can be other conferences (subconferences). It is up to the course

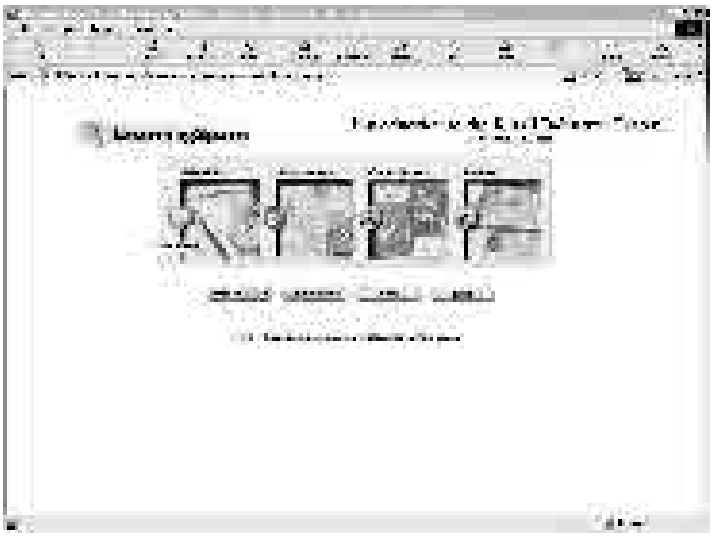

Fig 1. FirstClass (Open University, T171: You, your computer and the Net, 2001).

designer or educator to decide whether these conferences are assigned to specific topics or whether they are assigned to the use of a specific group of participants who have the permissions to use them.

Lotus Learning Space (LS) (Fig 2) is a VLE that permits synchronous/asynchronous, collaborative interactions in combination with course content access. It can be used either on the web or through a proprietary client.

WebCT (WCT) (Fig 3) is VLE that permits synchronous, collaborative interactions, while also providing access to learning resources and materials for use by students at any time. It does not have a proprietary client version.

At a first glance it is probably unfair to compare FC to other two VLEs which both support the web design tasks that course developers and sometimes students carry out, but FC offers more functionality in terms of conferencing systems than the other two VLEs.

6 Course content

Commercial VLEs allow relatively easy creation of course content. It depends on the developer and the course author to decide how this content can be structured online. There are two predominant paradigms for structuring online content documents: content that follows a ”narrow-deep” model, i.e. few navigation options on each page leading to long interactions [8] as opposed to a broad-shallow structure (bigger number of navigation options leading to shorter interactions).

Course content design can take advantage of all the dimensions that the web offers by embedding:

– hyperlinked cross-reference networks through the course material
– resources such as pdf, flash, shockwave streaming audio/video and VRML files [9], via the appropriate server.

Both WCT and LS support relatively easy integration of multimedia such as simulations, microworlds and other dynamic features to content pages.

6.1 Security

All three VLEs allow secure environments of varying levels of privilege.

7 Asynchronous and synchronous communication tools

FC, LS and WCT give access to asynchronous/asynchronous communication tools, via web based conferencing, email and online chat.

Conferencingis asynchronous and is web based if it uses servers and web browsers to access these servers as opposed to non web based ones. However according to Woolley [6] this is not a clear distinction as developers of conferencing software adapt their products to the web and the result is hybrid products that use the Web to a greater or lesser extent.

A common form of dialogue in web based conferencing systems is a threaded discussion which usually adopts a tree structure or a linear structure where there is an initial starting message to which all the responses are attached. In addition responses are classified in forums (which can also be called bulletin boards, discussions or conferences). This is far from an ideal representation of what constitutes a dialogue, because the user can get easily

Fig 3. WebCT (Middlesex University, Global Campus, 2000).

lost in a series of threaded conversations where it is not clear how each message is linked to and/or generates others. In addition, the intended hierarchy of emails in a forum interface does not necessarily constitute a conversation flow.

Another source of confusion is that unlike their client based email systems where the screen is automatically updated, in a web based conference changes and responses to messages can only be displayed when the user ”refreshes” (Internet Explorer) or ”reloads”(Netscape Navigator) the web page. This may confuse the inexperienced web users as they expect an automatic updating of the web based conferencing system as soon as a message arrives or is sent. In this aspect client versions (FC, LS) of conferencing systems are superior to web based ones.

FC, LS and WCT forums are similar in presenting the participant with the above threaded hierarchy of messages, the difference being that in FC all the conferences are well defined by a folder structure. These folders-conferences make sense to the user as they follow the metaphor of the Windows/Macintosh folder which the user opens by double clicking and are easier to navigate.

Email is asynchronous and allows private interaction between students and instructors.

Online chat is synchronous and adds a real time dimension to the student-tutor or student-student communication. It follows a model of succession of text sentences. It can be limited and less powerful as a tool compared to asynchronous communication as the user has to be ”there” to participate at a specific time.

Table 2: Web Based VLE components

.Virtual Learning Environments	Lotus LearningSpace	FirstClass	WebCT
Customisable interface	X	√	X
Support for multimedia integration	√	X	√
Security	√	√	√
Conferencing system (text-based forums)	√	√	√
Teleconferencing	√	X	X
Video conferencing	√	X	X
Online chat	√	√	√
Whiteboard	√	X	√
Email	√	√	√
Self-Assessment	√	X	√
Glossary tool	X	X	√
Help	√	√	√
Student presentations	√	X	√
Student profile	√	√	√
Progress tracking	√	X	√

8 Assessment

Both in LS and WCT students can use tools for assessment (whose typical model is multiple choice questions). WCT offers a facility of setting up quizzes of automatically marked questions and open ended questions can also be included as part of the course assessment.

9 Help

This consists of online or offline (usually textual) support for students. Ideally it should be customisable so that the instructors can determine/change its content. All three systems provide a help facility both for instructors/developers and for students.

10 Secondary features

An increasing number of features are incorporated in VLEs such as whiteboards, student presentation areas (including student profiles) and glossary (module related or global), Table 2. These may be of secondary importance compared to primary VLE components such as course content, conferencing and assessment tools, but they can be useful in increasing motivation, in building up and bonding the virtual student community. In addition, these tools can potentially increase user control over the environment.

11 Navigation

Navigation is an important aspect of VLE interfaces since there is the danger of the user becoming disorientated within the VLE "closed system" or getting lost between levels of information and facilities.

Many of the usability considerations for commercial web sites are applicable to VLE interfaces and navigational schemes in VLEs obey general web usability considerations. They should have features for [10]:

- moving up and down one or more levels in the information architecture from the current page
- visualising the relationship among the pages visited by the user.

11.1 Presence

Research has shown the importance of feedback (particularly audio feedback), interactivity and navigation [11] in increasing the notion of presence the user has while interacting with a virtual environment.

Presence is a conceptual component of the environment where the user feels immersed or present in the environment and reacts ”realistically” to virtual events. Thus, a virtual environment is successful if the students are able to feel that they are within the environment rather watching pictures of it [12]. A VLE interface has the potential to convey a level of personal presence if it provides:

- Powerful navigation features that allow the user to make informed transitions between levels of information without feeling disorientated.
- Easy access to communication tools that open the portals to the VLE's virtual communities of which the user will feel an active member.
- Activities that encourage exploration of the environment and interactive features which establish user control over the environment
- Feedback which motivates, encourages participation and diminishes the feeling that the user operates alone in the environment

11.2 VLE interfaces: usability and learning

Commercial VLEs are sold to educators as empty shells in which they must create content and structure. This structure depends on educational considerations, course objectives and individual specifications each institution has.

However, there are aspects of VLE interface design that enhance interactivity and help students to manage the complexity of VLEs. Thus a VLE should provide:

- Adaptable, easy to customise interfaces. This adaptability should apply not only to the course content but also to the other VLE components. Defenders of the limited customisability of some VLE interfaces support the view that non customisable interfaces promote uniformity among courses [13]. However, the educator should determine those functions and features that enhance the learner experience.
- Tools for the developer to embed interactive applications and enhance interactivity by the integration of computer based learning tools such as computer simulations, interactive animations, videos or graphs.

- A selection of synchronous/asynchronous CMC tools which the instructor can include or disable according to educational goals.
- Hyperlinked cross-references which should be set to represent semantic networks of knowledge as well as intuitive navigational routes through the course.
- Tools by using which the student "owns" the environment, such as facilities for annotating course material, learning journals, personalised media libraries tailored to the individual needs of the student.
- An interface, which should not emphasise/underline, the software's corporate identity by displaying corporate logos and identifiable corporate identity tags.
- Powerful search engines to assist navigation and content searches
- A self-efficient environment which should not force the user to download add ons and plug ins for the VLE interface to be fully functional.

In general, VLE interfaces tend to replicate the traditional campus structure (as LS and WCT do). This might be an obstacle in exploring the full VLE potential and other representations should be explored.

Access to the VLE functions (especially animation, video and audio) can be impeded by substandard technology (e.g. slow modems) or busy networks and consequently undermine the impact of the interface, especially for users who access the environment from home or work. However, the next few years will certainly be an exciting period for the Web based VLEs, as restrictions on average wait between pages and response time in communications will be alleviated.

Finally, VLEs have been mostly designed with distance learning in mind. However they can be potentially valuable for resource based learning for campus based students. VLE interface design must cater for both setups taking into account that for the campus based students interfaces should promote integration of online and offline facilities and offer a holistic view/ conceptualisation of the institution's MLE as a set of complementary and exciting options.

12 Conclusion

The paper attempted an analysis of strengths and merits of three commercial VLEs and drawing from that a classification of VLE interfaces. The primary aim was not necessarily to find the best of the three but to establish some common understanding of what the ideal VLE interface would look like.

The paper also touched on instructional design and HCI issues by looking at the three VLEs: e.g. to what extent does the interface have to convey characteristics of the environment of which it is a metaphor, such as the metaphor of the classroom as a set of folders/icons on the student's desktop.

It also investigated such issues as the use of multiple representations in the form of computer simulations, animation, audio and video and looked at guidelines and issues to consider when designing VLE interfaces.

Virtual learning environments are different enough to conventional interfaces as they have to achieve a balance of usability and learning. This balance points towards the use of flexible and customisable interfaces where the educator can determine those functions and features that enhance the learner experience.

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