

A Learning Management System to Support Face-to-Face Teaching Using the Microsoft Office System

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Abstract: A low-cost, effective learning management system to support face-to-face teaching using standard Microsoft Office System software is described. This paper goes on to discuss the implementation, hosting, content creation and usage issues encountered during an 8-month trial that covered two full teaching semesters at Bond University. Bond University, based on the Gold Coast, is Australia's first private university and specializes in small-class and face-to-face education. The learning management system called the SharePoint Alliance (SPA) was used to support this quality teaching and learning environment. We comment upon the effectiveness of SPA and how far it was able to support the needs of a learning management system by simply extending the standard information management software environment of a university.

Introduction

The two leading examples of a learning management system (LMS) deployed across the world's higher education institutions are WebCT (*WebCT*, 2005) and Blackboard (*Blackboard Academic Suite*, 2005). From their own product descriptions the supplier companies extol the fact that an integrated LMS is an enterprise level system. Such systems by implication therefore require very significant support in terms of technical design, administration and training staff in addition to content design and creation teams for the support of the teaching staff. It is not surprising that recent experience shows the LMS to be the most important information system on a university campus after the payroll system!

As proponents of the intelligent deployment of straightforward off-the-shelf software the authors have been using the Microsoft Office System SharePoint technology (*Microsoft SharePoint*, 2005) for a wide range of different purposes (Herring & Rees, 2001). The uses range from innovative collaboration environments (Herring, Rees, Loch, & Rhodes, 1998) to distributed software engineering (Herring & Rees, 2001) and research into military command and control systems (Barros, Herring, Hildebrandt, & Rees, 2000).

With the release of Microsoft Office System 2003 the SharePoint technology was significantly enhanced. The existing portal server became SharePoint Portal Server 2003 (SPS) with a design that can scale across a large enterprise, yet with the capability to be effective for situations where only tens of users are involved. SPS needs Windows Server 2003 as the operating system together with the SQL Server 2000 database. At its heart SPS uses a free software enhancement for Windows Server 2003 called Windows SharePoint Services (WSS) that provides an extensive set of features to provide highly interactive collaborative web sites. The WSS web site feature set provides substantial overlap with the requirements of an LMS and this is discussed in detail in a later section below. It appears that SharePoint is viewed as a tool only suitable for the corporate environment for teams engaged in commercial activities such as production, sales and marketing. The authors attempt to show that SharePoint technologies are much more flexible and can find a role in LMS systems including the primary one of delivering educational materials in an effective manner for teaching and learning.

With the imminent launch of Office System 2003, the Brisbane office of Microsoft Australia launched the Spotlight on Office 2003 software competition to show power users of the new software. The authors teamed up to enter "Education Services" as a contestant. The Education Services system consisted of a managed Sharepoint Portal

Server and custom applications developed by G-Netech Pty Ltd. Bond University developed course-specific Windows Sharepoint Services sites and used them as part of the trial. Deployed during May through September 2003 just prior to the Office System 2003 launch in October that year Education Services was selected as one of three finalists in the competition and also won a prestigious Asia-Pacific Solution Developer Award.

This paper first compares the features that SharePoint technologies provide out of the box with the features of an LMS showing the significant overlap. Next the basis of the SharePoint Alliance (SPA) Trial conducted at Bond University is discussed. One of the authors taught a sample university subject using SPA and the experiences and outcomes are described in some detail. The paper ends with a discussion of the SPA Trial results with suggestions for improvements if the approach is adopted.

SharePoint and Learning Management Systems

Bond University is Australia's first private university established in 1989. Bond has about 3,000 students across 5 faculties and prides itself on high-quality, small-class teaching. Any adoption of an LMS is intended to act as an out-of-class supplement to the face-to-face teaching that all students receive in class. Only a tiny fraction of subjects are offered in a distance learning mode to some overseas students. Mainly static web sites are currently used to support classes in a somewhat ad hoc manner. The LMS is intended to replace this teaching support with a consistent, interactive collection of educational materials accessible online in 24x7 mode.

When Bond University began the process to choose an LMS a conventional Web-based Teaching and Learning Working Group was established (one of the authors was a member). The authors put forward the Education Services enhancement to SharePoint before the group as a contender for the LMS. As part of this process group members were asked to draw up a wish list of LMS features. Table 1 shows the wish list of features augmented with comments indicating whether WSS and/or SPS can support each feature.

Table 1. Author's Wish List of LMS Features

	Feature	WSS Support	SPS Support
1	Structured access to and search of repository of learning materials with upload capability	Full support via document libraries per class	Institution-wide repositories
2	Cross-site searching for learning object names and content	Full support per class site	Institution-wide search
3	Fine-grained secure access based on user roles (staff, tutor, student, class representative, and so on) down to individuals	Full support	Full support
4	Subject events (schedules) for class times, assessment deadlines, reminders and so on	Full support per class	Some support; extension required
5	Notices: announcements, news, task lists, surveys	Full support per class	Full support across institution
6	Discussion groups: inter-class communications, frequently asked questions	Full support	Full support at institution level
7	Notifications of web site changes: additions, modifications, deletions	Full support via email alerts	Full support at institution level
8	Class lists and group membership (tutorial, workshop, presentation)	Some support via users and Contacts lists	Full support via Active Directory
9	Assessment submission and marks reporting	Very limited support	Simple workflow for document submission only
10	Template based creation of subject web sites and web site components	Full support	Full support
11	Real-time class communication; instant messaging, audio, and video	Some support via MS Instant Messenger integration	As per WSS

It is interesting to contrast this list to one given in Wikipedia (*Managed Learning Environment*, 2005), only discovered after Table 1 was first drawn up. Note that Managed Learning Environment (MLE) is the preferred term but with a note of several other equivalent terms, LMS being one of them. Only feature 9, assessment support, is missing from the SharePoint support and to a lesser extent feature 8, full support of class lists. However, it is recognized that assessment support and centralized grade books play significant roles in teaching and learning. Class list management too is one of the larger administrative tasks for teaching staff, and any support of this activity is to be welcomed.

Well before the SPA trial, the main topic of this paper, was put in place, the author of Table 1 also provided a sample WSS web site that was derived from the Spotlight work mentioned above. A screenshot of the home page of the sample site is shown in Figure 1.

The screenshot shows a SharePoint web site with the following structure:

- Navigation Bar:** Home, Documents and Lists, Create, Site Settings, Help. Up to Comet Research Server.
- Header:** Sample Subject Site based on INFT12/72-235 Internet Technology 2. Home. Modify Shared Page.
- Left Sidebar (Quick Launch):** Documents (Shared Documents, Lecture Slides, Workshops, Assessment, Review Questions, Sample Documents, Workshop Sample Documents), Pictures, Lists (Class List, Tasks, Subject Calendar, Hints on Using This Site), Discussions (General Discussion, FAQ), Surveys (Workshop Tests, Use of SharePoint on Alan).
- Main Content Area:**
 - Sample class communication and document management portal for the XML subject.
 - Announcements:**
 - Complete the Anonymous Survey about this Alan Site** (26/04/2005 20:00) by COMET\administrator. Includes a link to a survey form.
 - FAQ List Up and Running** (26/04/2005 20:00) by COMET\administrator. Check out the FAQ discussion list for answers to important questions.
 - Writing XML files to your 'write' folder** (26/04/2005 20:00) by COMET\administrator. Check out the FAQ list for a test page to make sure your saveFile.asp page is working, and the permissions on your 'write' folder are working properly.
 - Subject Calendar:**

Title	Location	Begin
Workshop 1	Teaching Lab 6	26/04/2005 10:00
Main Lecture	Lecture Theatre 2	27/04/2005 10:00
- Right Sidebar:**
 - Links:** Subject web page on Tide server, Online Textbooks, JavaScript in Real World XML, Chapter 6, Handling XML Documents with JavaScript in Real World XML, Chapter 7, W3C Schema Validator.
 - Hints on Using This Site:**
 - Use Email Alerts** (26/04/2005 19:59) by COMET\administrator. To be informed when information is added or changed on this site use the 'Alert Me' action from within a list. Choosing the 'Send a Daily Summary' is recommended except for important lists where you might choose 'Send e-mail immediately'.
 - Making the Most of My Site** (26/04/2005 19:59) by COMET\administrator. Use the link to My Site at the top right of most pages to create your own collection of documents and links, and to manage your calendar and email alerts. My Site can become your central repository of all the information you need to study at Bond University.

Figure 1. Sample WSS Teaching Site.

Several of the important LMS features are shown in Figure 1 which is split into three vertical columns. On the left appears the main content navigation showing document libraries (repositories) for various types of class materials, subject calendar, outstanding tasks, class list, discussion forums and surveys. The central column shows the important announcements with automatic expiry dates and the upcoming events in the subject calendar—vital information for the students. On the right is shown a series of useful hyperlinks to both internal and external teaching resources and some hints. As is typical of all WSS sites a search box appears at the top right.

Thus the lists and links in Figure 1 exhibit all the LMS features of Table 1 except for 3, 9, 10 and 11. Feature 10, site templates, is available and could have been used to build the sample site. Feature 9, the weakest SharePoint feature, is discussed further below. Even feature 11, live communication, is supported to some extent in Figure 1. Where the Windows Messenger symbols appear to the right of user names the user can click to contact that user with Windows or MSN Messenger.

Nevertheless it can be seen that the SharePoint technologies otherwise provide the bulk of the features one would expect to find in a full-featured LMS. It was on this basis that some staff at Bond decided to instigate a trial of SharePoint with a view to determine its suitability primarily for teaching delivery, but also for the related teaching preparation and administration processes.

SharePoint Alliance Trial

A small steering group of staff formed the Bond University-G-Netech SharePoint Alliance (SPA) trial to take place over two teaching semesters (042 and 043) between May and December 2004. [Bond University operates three full teaching semesters each year so that a 6-semester university Bachelors degree can be completed in two calendar years.] With staff and equipment resources not being available from the Technology Services office at Bond it was decided to outsource the hosting of the SPA trial to a local IT company, G-Netech Pty Ltd. Four Faculties, Business, Law, Humanities and Information Technology, contributed the very modest costs of the SPA trial.

Eventually staff in Business, Information Technology and Humanities used SPA for teaching or coordinating student work. During the trial period the university was being audited by the Australian Universities Quality Audit organization and some material pertinent to this administrative task was also entered into the SPA portal. A number of staff used additional SPA sites for planning and preparation of information content of various kinds.

Bond University contracted with G-Netech Pty Ltd to provide a managed server at a cost of USD 750/month to host the SharePoint Portal. The server used was a standard Dell dual-processor, one gigabyte RAM, 73 gigabyte RAID disk system as typically used for hosting. Setup and installation of all required software required less than one man day of labor. Microsoft provides universities with heavily discounted prices that make this enterprise level system extremely attractive to deploy. The annual cost for an SPS license is about USD 3,750. From a systems administration perspective once the portal is initially set up the administration of the information structuring and content creation can be delegated to a group of end users. Using the role-based security of SharePoint the senior user group can in turn delegate further thus spreading the administrative load and providing administrative control at the appropriate positions within the information hierarchy.

Portal Level Features and Extensions

According to the Wikipedia definition ‘portlets are reusable Web components that display relevant information to portal users’. SPS supports the portlet concept but refers to them as “web parts”. SPS and WSS are delivered with a standard set of about 20 useful web parts such as document lists and even calendars that can be arranged in layout rows and columns making up a page. Web part glue facilities are also incorporated so that web parts can be linked together with the output of a web part being input to another. Simple glue can be applied without programming. More powerful web parts must be coded to work with the web part object model.

The two SharePoint technologies acting together provide the dual architecture that is typical of enterprise portal software that is used to implement an LMS:

- The outer or community level where institutional information is located plus an information set potentially customized for each individual user.
- The inner web site where users locate information and interact with tools specific to a teaching class, educational activity such as content preparation and planning, or administrative process.

In the case of Blackboard, for example, these functions are embodied in two separate major modules that are almost separate products in their own right. In the case of SharePoint, the community level is a single product,

SharePoint Portal Server 2003, and the inner web sites sit above the IIS web server and constitute an additional software layer for which there is no charge.

SharePoint Portal Server provides a number of important features at the university community level controlled by an administrator with portal responsibilities:

- The overall portal information structure is made visible via institutional areas and regions, and a single sign-on gives access according to each user's role.
- Each page at the top portal level varies dynamically according to individual user role so users see a view personalized for them.
- Users are provided with their own web site called "My Site"; users can copy and link to resources and learning objects and create and upload their own web part content.
- Cross-portal news and announcements targeted at particular user audiences defined by the institution.
- Information islands located in individual web sites are aggregated to provide a cross-portal search with users only able to access information specific to their role.

One of the authors acted as the portal administrator for the SPA trial but with less than 200 portal users the news feature was used only a little and searching was allowed across the whole portal content. The single sign-on, My Site and portal user roles were exercised more fully.

As mentioned above software developers can build custom web parts to provide virtually any functionality both in terms of integration within the SharePoint system or to interface to external systems. An example customized web part was developed by one of the authors to permit a consolidated event calendar view for each user. The motivation for this was to give students the ability to see all of their lectures, labs, and any other appointments on a single event list in one view within their My Site pages. This demonstrated the flexibility of extending the system to provide new learning management specific features.

Another example of extending the Office System was the development of an "Office Research Pane" within Word that provided the ability for a user to query the Bond University Library catalogue directly. Figure 2 shows how a query to the library information system appears within Word Research Pane. Students can easily follow the hyperlinks associated with the library resources and insert references into their Word documents with one click.

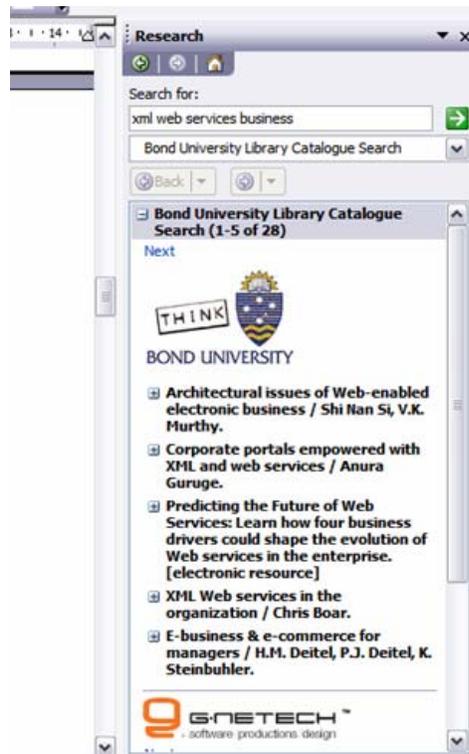


Figure 2. Bond University Library Catalogue Search in the Word Research Pane.

One of the new applications in the Office System suite is InfoPath. InfoPath is an XML-based “smart” forms creation and deployment application. InfoPath is integrated with SharePoint Form libraries into which the form templates are placed. Clicking on an InfoPath form opens a web page in which the user can enter the data required by the form. A submit button uploads the form contents to the Form library. From here users can view and manipulate data originating from InfoPath forms. An InfoPath assessment and submission form was developed to demonstrate this capability and to allow students to submit details of an assignment and attach the assessment document set to the form.

Finally, a Word “smart document” was developed that showed how it is possible to build, submit and mark assessments. The assessment is created as a Word document with specially marked smart sections where students enter their answers. On completion the students upload their documents to an assessment document library. There the assessor opens these smart documents in Word. The smart code assists the marker by reading correct answers from a database and displaying them in a form in the Word task pane with fields for the assessor to allocate marks for each answer section and enter comments. A submit button merges the marks and comments into the students’ original documents which are placed in another document library from where the students can download them. These two extensions helped to fill the gap in SharePoint assessment support.

Sample Subject on SPA

Where the primary teaching delivery is face-to-face in small classes the need for high-cost multimedia-based interactive educational material is substantially reduced. The instructors provide the teaching interaction, do the demonstrations, act the roles, encourage student group activity, and so on. Of course some external, electronic resources are used and need to be available on the course web site.

The first author created 4 course web sites during the trial, 2 in each semester. The features used were substantially those shown in Figure 1:

- Document libraries for course description, lecture slides, lecture notes, tutorial and workshop handouts, assessment sheets, marks, data files and all other documents used in the course. Students mostly receive printed copies of these materials.
- Lists for class members (own contact records maintained by the individual), class calendar, upcoming tasks.
- At least two discussion groups, the unmoderated General Discussion group and a moderated FAQ group for more formal queries.
- A number of surveys to elicit student opinion (one about the SharePoint site) and for simple, supervised online test submission.
- Hyperlink lists to internal and external educational resources.

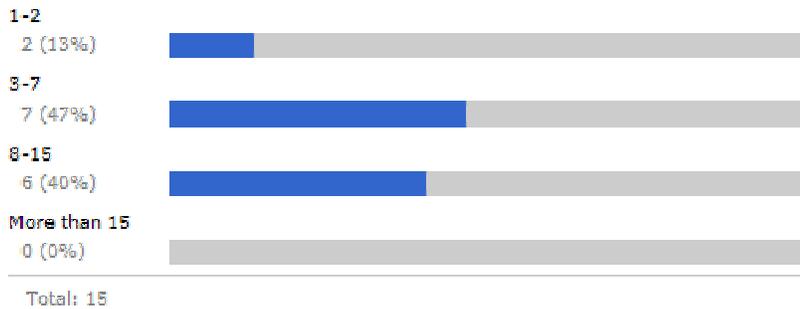
For instructors, document library and list creation is as simple as clicking on the “Create” link at the top of the course home page and selecting from the list of options that includes a custom list creation mechanism. Each library and list is a new web part and can be placed in any web part page. Libraries also become web folders so that Windows Explorer can be used to drag and drop documents between folders on the instructor’s local machine. All Office applications can open and save directly to web folders, while most Windows applications exhibit this behavior as well. Little or no staff training is needed as this is a simple extension of the normal document management activities on any Windows machine. Creating announcements, new class events, tasks, links and other lists is a simple matter of filling in a form for each item. Microsoft Excel is fully integrated with SharePoint and can be used to download or upload any list. Teaching and learning content creation could not be simpler.

Of course many of the same benefits apply to student access to the teaching web sites. Their ability to change lists and document libraries on the course site is appropriately restricted, but on their own My Site they have access to much the same functionality. In common with most of the popular LMS software no student training is needed apart from the occasional demonstration in class to overcome the usual initial reticence to alter information on a web site.

In the opinion of the instructor probably the most useful feature of SharePoint is the email alert capability. For any list or library the user can nominate to be informed by email of changes in content. The email can be sent immediately, or most usefully, in a daily or weekly summary consolidated for all nominated lists. Hyperlinks in the email take the user directly to the list(s) in question so that the new information can be viewed. The benefits to students, too, should be obvious, and in several surveys students nominated this feature as the most beneficial. However, despite constant urgings not all students by any means expended the effort (only 3 clicks per list) to switch on email alerts.

The end of semester surveys yielded detailed results that shows strong student support for SharePoint as a beneficial learning tool. Only a few representative samples can be presented here due to space limitations. A class of

1. About how many times per week on average did you access the course web site?



19 students where 15 responses to the online survey were received gives an indication of how often students accessed SPA (the screenshot is taken from a graphical survey report generated by SharePoint itself): Assuming a 5-day studying week the results indicate the site was accessed 1-2 times each day.

Again from a survey students were asked to rate from 1 (low) to 10 (high) how well SPA supported various class activities, the results were: communicating with the lecturer 7.9, communicating with classmates 6.7, during practical assignments 7.7 and overall 6.8. Staff-student communication came top with a somewhat surprising practical assignment support a close second. This latter result is probably due to the general discussion group where students often help each other (usually in the early hours of the morning just before an assignment deadline), and FAQ discussion group where the instructor answers questions about problems with the practical assignments.

When asked about the good features of the SharePoint sites the top three in order were email alerts, document libraries and class calendar. The three least useful features in order were My Site, web page layout and login problems. It was disappointing to see the apparently very useful My Site not being used. A possible explanation is the short time limit of the SPA trial, and the students knowing that the My Site information they gathered was only temporary. The login problems stemmed from the need to allocate students additional user accounts for the SPA trial—out Technical Services group were not willing to allow the on-campus authentication system to be accessed from the external G-Netech hosting site. The problems with the web site layout are more puzzling since the site templates have been carefully designed. A possible explanation is that once a document in a library or an additional web part page is opened the connection with the web site can be lost unless the content creator is careful and consistent.

The built-in SharePoint log analysis can be a useful educational tool for the instructor. A part of the access log for the web site over the semester is shown in Figure 3. A student with a very low access count compared to other students might need some help, especially one with a negligible value in the last month! Note that the instructor in this example, mrees, has the highest access count.

User	Total Hits	Recent Month
gnetech\jostensj	355	84
gnetech\jwatson	123	2
gnetech\jwinberg	223	73
gnetech\kkha	482	402
gnetech\mdavidse	976	383
gnetech\mrees	1038	341
gnetech\omisje	423	140
gnetech\wlee	557	257

Figure 3. Web Site Access Log Over One Semester.

Probably the primary use of the log data is to determine which pages are the most popular so that the most valuable resources can be identified. Other interesting data gathered shows the students' choice of operating system and web browser on their own machines.

Conclusions

Over the SPA trial 6 coordinating teaching staff created 9 teaching sites that were used throughout one full semester. About 15 other staff members, administrative and teaching, were allocated SPA accounts, and they

experimented with SharePoint for short periods. Apart from student teaching SPA was used for course planning and preparing educational content as well as some administrative tasks such as the quality audit.

The majority of the teaching staff reported their satisfaction with SharePoint although they were not able to carry out student surveys. It should be remembered that the use of SharePoint as an LMS reported here is very specifically as a supplement to face-to-face teaching which is the main delivery paradigm. At Bond SharePoint was trialed as a more collaborative, interactive and easy to populate with content version of the existing static web sites. To this extent the SPA trial was successful.

Surprisingly considering the corporate origins of SharePoint the administrative experiment with the quality audit was not a success. The intention was to present documents about the audit on a web site and then survey all staff to determine that they had accessed the documents. The need to allocate new accounts to up to 400 staff was not a barrier. Despite the ease of creating the survey itself, the inability to incorporate the survey web part into another page satisfactorily was the eventual stumbling block.

There is considerably less doubt of the usefulness of SharePoint as a collaborative intranet for designing courses by teams of teaching staff (Dain, 2003). SharePoint is also valuable for forging a community of practice and expertise as described in (McFerrin, Tewson, & Wallis, 2003). Such a collaborative environment encourages the sharing of ideas and exemplars.

It should not be forgotten that the major defect in SharePoint as regards its use as an LMS lies in the lack of a centralized grade book and compelling features for online testing, the submission of assessment and marking. The authors did show that a relatively small development is needed to start to add customized assessment features using InfoPath forms and Word smart documents. Further development of more powerful assessment web parts would further improve SharePoint's standing as a complete LMS.

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