

Course Management System (CMS) Evaluation and Strategy at UBC: A Viewpoint from the Faculty of Science

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Abstract: A course management system such as WebCT, Blackboard, Moodle, or Sakai is a set of tools for the online delivery of (some) course content. Many academic institutions, including UBC, have found a CMS to be a mission critical application, commanding high usage, and demanding high availability. Students benefit from having a set of online notes, tutorials, and other Web-based resources. Some faculty members, however, question the pedagogical value of CMSs, and wonder if the investment of faculty time and money might be better spent in other ways to improve teaching and learning.

Increasingly, students demand access to course materials and instructor/TA support on a round-the-clock basis. What is not always apparent is the amount of instructor time needed to produce the CMS content, and to support the online environment. Academic/staff support is often inadequate, as reduced budgets and increased workloads take their toll on those individuals as well.

This paper deals with the evaluation of a CMS, and the CMS direction in which UBC is heading. We discuss teaching and learning, as well as historical, political, monetary, and technical issues. We summarize the challenges faced at UBC with respect to the current WebCT CE 4.1 environment (with over 20,000 users and 900 courses), present alternatives to CE, and summarize recommendations for the future of CMSs at UBC. Our analysis may be of value to other institutions dealing with similar issues, and may help provide some direction to those planning for a CMS. We also hope that the designers of CMSs will take some of our comments to heart. To highlight the concerns that faculty members in UBC's Faculty of Science have with respect to CMSs, and WebCT CE in particular, we include survey questions and results. We conclude by commenting on the Sakai initiative—an open source alternative to enterprise CMS systems.

1. Introduction

A course management system is a software package that facilitates and hosts the online distribution of course materials such as lecture slides, course outlines, course notes, tutorial notes, lab notes, assignments, solutions, quizzes, practice questions, student grades, etc., and facilitates discussions (bulletin board postings), online quizzes, and assignment submission. Usually, many courses are hosted on an institution's CMS Web pages. A CMS aims for high rates of availability and concurrency, and provides secure and private access (for authorized students, instructors, TAs, and technical or administrative staff). A CMS usually provides a set of tools to design, upload, and download course content, and has a broad range of utilities for backup, recovery, and reporting. Examples of CMSs include WebCT, Blackboard, Sakai, and Moodle; and there are numerous smaller or home-grown products. WebCT CE (Campus Edition) Version 4.1 is the current production system at UBC, and will be the focus of quite a bit of this paper. (As a side note, Blackboard recently acquired WebCT. The merged company plans to support both products for the foreseeable future.) CMSs are ubiquitous, mission critical, and here to stay.¹

2. Background: WebCT CE at UBC

WebCT was developed at UBC. It started out as an ambitious project in the mid-1990's, pioneered by UBC Computer Science Instructor Murray Goldberg.² Because of Murray's vision and our department's relationship with WebCT, we received a perpetual campus-wide license for the non-enterprise version of WebCT. In fact, WebCT's Canadian development office is on the UBC campus, and has employed numerous co-op students and graduates from our Computer Science program over the years.

As of early 2005, UBC's ITServices group hosts (on a single server) over 900 WebCT-enabled courses taken by up to 30,000 students per year—approximately 20,000 of whom use the system each week.³ To put these users in perspective, about 48% of UBC's students are in the Faculty of Science, 25% are in Arts, and 7% are in Applied Science (e.g., engineering). In terms of active courses hosted on WebCT, 146 are in Arts, 81 are in Science, 62 are in Applied Science, 41 are in the Sauder School of Business, and 33 are in Agricultural Sciences⁴. The number of courses varies (we've heard estimates of up to 2000 "courses"), but many of these courses are copies of production courses (e.g., for development, testing, or archival), or are for courses that exist but are not being offered in the current school term, or are for running "surveys" rather than hosting traditional courses. Nevertheless, WebCT is very actively used, and many of our students and faculty have become dependent on WebCT for various aspects of course delivery. In fact, so many of our students and faculty have become dependent on WebCT, and nearly round-the-clock availability, that WebCT is considered a *mission critical* application.

In a recent survey, Scott Leslie⁵ mentions that 19 out of 27 post-secondary institutions surveyed in British Columbia use WebCT; 5 have smaller, homegrown systems; and 6-8 are doing some work with Moodle (a smaller scale CMS). Because we need to deal with large-scale systems at UBC, we omit Moodle from further analysis, but have no doubt that it is a very good system for smaller environments. Leslie added that universities should not be afraid to invest serious money in a CMS. He notes that many universities have no problem spending millions of dollars on PeopleSoft applications (e.g., HR, payroll, purchasing), but then balk when it comes to a CMS.

3. Advisory Committee on Educational Technologies in Science (ACETS)

In early 2004, a CMS Steering Committee was formed by the Academic Programs and Information Technology groups of the office of the Academic Vice-President. The goals were to determine the key tasks, constraints, and support requirements of UBC's CMS strategy over the next 3-5 years³. Besides performing an assessment of CMS usage at UBC, and understanding the business drivers, a number of needs or issues were identified with respect to any CMS used at UBC:

- Reliability
- Support for pedagogic innovation
- Efficient and easy-to-use tools
- Content sharing
- Clearly defined user roles (e.g., instructor, TA, administrator, help desk), with appropriate security and easy-to-use interfaces for each such role
- Branding (e.g., UBC, Sauder School of Business) and multi-institution support
- Scalability and integration

A number of alternatives were considered, not just by the steering committee, but by other groups on campus. These alternatives included:

1. Migrating to the enterprise version of WebCT (i.e., Vista)
2. Moving to a different enterprise CMS (e.g., Blackboard)
3. Moving to an open source alternative (e.g., Sakai)
4. Not pursuing a single CMS solution, but rather letting individual departments or faculties decide on their own preferred method(s) of online course delivery. This may be a collection of products, each perhaps having unique strengths or selling features making it more suitable for certain types of courses. (We note that the University of Toronto officially supports five CMSs. UT believes that *content should drive the technology, not the other way around.*⁶)
5. Not pursuing an enterprise CMS solution at all

Because of standardization, student expectations about online resources, an existing CMS investment in online course contents, and arguably a general level of satisfaction for models of online content delivery, the latter option was not considered. Also, the status quo was not a long term option for numerous technical reasons to be discussed later in this paper. The bottom line was that we needed to move beyond WebCT CE 4.1. The default option was Option (1). This seemed like a natural decision, given the investment that UBC faculty have already put into developing online content using WebCT products. UBC's relationship in the history of WebCT may have been an additional, intangible factor—but presumably it was in WebCT, Inc.'s interest to maintain a healthy relationship with its oldest customer.

With respect to the Vista decision, there was great concern among faculty members in the Faculty of Science that no formal approach had been taken to evaluate other Course Management Systems. Thus, in early 2005, the Dean's office in the Faculty of Science formed the Advisory Committee on Educational Technologies in Science (ACETS) to evaluate the CMS strategy for the Faculty of Science, and to provide advice and direction to department heads, faculty, students, and staff on the effective and efficient use of educational technologies. Ian Cavers, Associate Dean of Science, chaired the committee, and additional leadership was provided by France Gagnon (and later researcher Leah Macfadyen) of the Science Centre for Learning and Teaching (Skylight) within UBC's Faculty of Science. ACETS had faculty members representing all departments within Science.

A key goal of ACETS was to form a consensus within the Faculty of Science's nine departments to tell the Academic Task Force (and other interested parties within the University) what we were looking for in a CMS in terms of *teaching* and *learning*. If WebCT Vista was the best product, then so be it; but if not, we wanted to make sure that we said so before committing to a multi-million dollar project. Part of our goal was to encourage the university to undergo a *needs assessment* before committing to any particular platform, but if there was not time for a in-depth plan, then at least we wanted to make sure that we forwarded the most important concerns or issues. After all, given a relatively short time window, a full needs assessment would require setting up a matrix of needs and capabilities/shortcomings for several competing products, with a thorough evaluation. We were also prepared to consider a proposal whereby a given faculty/department could opt out of WebCT, or perhaps host its own version of WebCT (rather than use one centralized model supported by ITSservices for everyone across campus). There was some merit to opting out because of current scalability and performance concerns, and a desire to streamline administrative and support requirements by bringing them down to a local environment. Pricing models for Vista presumably would reflect the number of users;

consequently, it would not be unreasonable in principle to run multiple copies of Vista (or CE or another CMS).

It was of great concern to ACETS that WebCT Vista had been chosen without any serious consideration of alternatives *and without sufficient input from faculty, students, and support staff*. ACETS was concerned about the small number of faculty members on the steering committee, and the lack of student representation. We also felt that the needs assessment should factor in: the time spent by instructors in utilizing the CMS, how efficient that time was, and how effective the CMS was for different types of course delivery and learning. For example, in the Mathematics department, there is a real need for software that is capable of displaying mathematical equations—a feature not available on most CMSs. The Chemistry department wants to be able to display chemical structures. The Computer Science department wants to be able to display specially formatted code (i.e., computer programs).

Besides pedagogical considerations (i.e., how various products enhance learning), there is also the issue of flexibility of the product, future enhancements, and how *usable* the student, instructor, TA, administrator, and support personnel interfaces are. Furthermore, how would our investment be protected if we needed to move to a different CMS in the future? Could we easily export our courses from WebCT, and import them on another CMS?

4.1 WebCT CE: Usability Issues

We have been using WebCT for many years at UBC. In the extensive survey that we ran among faculty members in Science, over half of the respondents mentioned one or more (and often many) of the following problems with the CE product:

- Slow updating of pages
- Not very user-friendly
- Awkward file structure, with too many steps (mouse clicks) to perform basic course management functions
- Not flexible enough
- Features difficult to implement
- Posting material is troublesome
- Time consuming
- Not easy to link content pages to the calendar function
- Setting up quizzes is time consuming
- Not easy to learn
- Grading support limitations
- Many technical problems
- Not easy to use for large classes
- Lack of proper support
- Unable to share content
- Discussion forum is unfriendly

4.2 WebCT CE: Technical Issues

In this section, we turn to the technical challenges or obstacles faced by UBC's current CMS environment (i.e., WebCT CE 4.1). In fairness to WebCT, Inc., we preface our comments by noting that code base and architecture of CE 4.1 and its predecessors were not meant to support the number of users and courses that we have at UBC.

First, CE was hitting a performance or scalability ceiling. UBC experienced a number of outages, many of which were believed to be related to the large number of users and courses that we needed to support simultaneously. In fact, during peak times, it was not unusual for CE to take 30 or more seconds to respond to a single mouse click. This made it *very* frustrating for students and instructors—especially since many functions in CE require many keystrokes. Lengthy backups added to the performance bottleneck since they compete with other WebCT users for CPU cycles, locks, and disk access—even though the backups take place late at night or on the weekend. (Many of our students and instructors are quite active on WebCT late in the evenings and on weekends.)

Second, WebCT support for CE would be discontinued by early 2007, thereby accelerating the decision to move to an enterprise system. (WebCT's enterprise version of CE, at the time, was called Vista.)

Third, CE is not a database-driven package; rather, it is based on flat files. A better environment is one that is backed by a production database management system (DBMS) such as Oracle, DB2, SQL Server, etc. A DBMS would definitely help with integrity, concurrency, scalability, and backups, and would support dynamic Web pages using stored templates. With respect to integrity issues, we have had a number of reports about corrupted data in CE. A DBMS would protect the integrity of data, and efficiently handle locking of shared data by concurrent users. Also, a DBMS facilitates reporting because data that needs to be tracked is organized in a repository, and then easily extracted or summarized. Reporting programs can more fully exploit database-backed information captured by the CMS—data such as student usage information (e.g., pages visited or downloaded), student progress (e.g., grades across all course activities, level of participation in online groups, number of postings made or read, etc.), performance monitor data, auditing information (including access logs), and so on. Such reports can be useful because some courses require students to read posted documents, download lecture slides, try the sample exercises/quizzes, read the bulletin board “at least once per day and preferably more often”, etc. Students who are falling behind can quickly be identified by the instructor, and supportive action can be taken.

Fourth, there are privacy implications associated with student data, and of course, in keeping assignments, quiz results, and solutions private. We have had reports of users being able to see other users' data, possibly via cacheing errors or manipulating the URL, and we have personally observed situations where students have had access to documents not made available to students (e.g., assignments from previous terms that were supposed to be off limits to current students, but some students actually started working on them, much to our surprise). To the best of our knowledge, WebCT has resolved these issues.

Fifth, starting in 2005, UBC faced the additional issue of adding a satellite university to the current UBC system. UBC added a Kelowna campus (in BC's Okanagan Valley; hence, the acronym UBC-O). UBC-O will add many more undergraduates to WebCT, hosted at UBC-V (Vancouver), further increasing the load. Additional government objectives of adding up to 25,000 students to BC's post-secondary institutions by 2010 will further add to demand, as a good fraction of these incoming students will come to one of the UBC campuses. UBC's Trek 2010 mission/vision statement states: “The University of British Columbia will provide its

students, faculty, and staff with the best possible resources and conditions for learning and research”.⁷ Furthermore, UBC wants to provide “greater recognition for outstanding teaching, co-operative education initiatives, the creative application of new learning technologies, civic and professional involvement, and community-based scholarship”.⁸ Mention is also made about lifelong learning. A.W. Bates and Gary Poole note that, “The lifelong learning market for formal university and college courses is at least as great as the market for students leaving high school for university and college”.⁹ Such statements add greater importance to the role of a CMS, and to distance learning.

Sixth, there is the issue of being able to host multiple sections of the same course—sharing some content, and keeping other content unique to each concurrent instructor’s section. The role of templates is important. A template for a course allows different instructors to tailor parts of their courses the way they want them, while still retaining common course material. Any changes to the common material would be reflected on all instances of the sections for a given course. There are even cases where it would be beneficial to share some content across multiple courses and even faculties/departments (e.g., CPSC 304, CPSC 404, and COMM 437 are all database courses, and may have some common content that would be beneficial to each of the courses). Given how large some UBC courses are, in terms of students, it makes sense to share content and macro-manage a series of sections. In conjunction with the above, it is important that a CMS also allow for clearly defined and enforced *user roles*. For example, an instructor’s role is different than a TA’s role, which is different than an administrator’s role, which is different than a help centre role, and so on.

Seventh, UBC needs to integrate its CMS with other major software applications such as a single sign-on/authentication system, the Student Information System, the campus-wide Library system (e.g., access to university-wide licensed digital libraries), etc. Integration, centralized control, cost, and support issues are some reasons for why ITServices has historically run a single version of WebCT. A CMS should allow for plug-ins and integration. For example, UBC developed a product called CTConnect to tie some of these production systems together with WebCT CE. The Faculty of Arts has developed plug-ins for generating interactive timelines with audio and visual effects, foreign language character stroke recording and playback, multimedia learning/object authoring tools, vocabulary memorization games, etc.¹⁰

Considering all these technical issues, we feel that the case is strong for an enterprise-level CMS. The bottom line is that WebCT CE 4.1 was at its capacity and was near the end of its existence at UBC ... and more courses and users were on the way; thus, a new software solution was needed.

5. Upgrade WebCT CE to WebCT Vista?

UBC was faced with making a decision on an enterprise CMS to replace CE. The natural choice was WebCT Vista, the enterprise version of WebCT; however, it would not be given for free to UBC because it was a departure from the CE model. Vista is essentially a re-write of CE, and WebCT, Inc. indicated that it would be discontinuing support of CE, effective early 2007. There would be no more upgrades, enhancements, or bug fixes to CE—just workarounds (and possibly only *known* workarounds). Even if CE support were to continue, and if WebCT were not phasing out CE, UBC was at the stage where it really had to go with an enterprise version of the software, for numerous technical issues highlighted previously. Incidentally, by “enterprise system”, we are referring to a large-scale system that is capable of supporting a large number of users, usually with centralized control, while maintaining high levels of reliability and availability (e.g., by load balancing across multiple servers).

Before settling on an enterprise system and determining a migration date, our current CE 4.1 platform needed to remain operational. As discussed in a previous section, performance and reliability were already serious concerns with CE at UBC, and we were expecting even more users for the coming school year. Thus, a first priority was to ensure that CE remained operational.

ITServices came up with a number of scenarios to minimize outages, especially lengthy ones. One alternative was to purchase additional hardware, install the required software, and if required due to a serious production outage, have this new hardware and software kick in (after moving the courses, in some order of priority, to the new machine). A second, and better, alternative was to split the existing CE system into two pieces, and move courses to one system or the other. This is in fact what happened, and UBC now runs two CE systems: the existing production system for most users and departments, and a less powerful “contingency” server hosting Dentistry, Education, Law, the MBA program, Medicine, and UBC-O. About 20-30% of the courses reside on the smaller server.

6. Costs

In year 2005 dollars, UBC’s Vista licensing, operational, and support costs (including instructor support) were estimated to be in the order of \$7 million over 5 years, of which approximately \$2 million was considered to be the Faculty of Science’s “share”. It was apparent to the Faculty of Science that this \$2 million would inevitably be \$2 million that would have been allocated to other projects within the Faculty of Science; so, Science viewed it as real money.

It should be noted, that there are only a few enterprise CMS products: WebCT, Blackboard, and Sakai (up and coming). We estimate that costs with Blackboard would be similar, but we were prepared to consider and evaluate Blackboard as an enterprise system for UBC. (For reasons below, it turned out that this evaluation was unnecessary. Furthermore, in October 2005, Blackboard, Inc. merged with WebCT, Inc.) Also, an open source product like Sakai could save the university over \$500,000 on perpetual license fees.³ Of course, hidden costs include support and training costs/time. Any cheaper platform needs to consider the total cost of ownership (TCO), not just licensing fees. (Some experts use a rule of thumb that 20% of the TCO of a CMS is related to licensing expenditures.¹¹) The Sakai open source project discussed near the end of this document has no licensing fees, but the operational and support costs remain.

Gartner Group reports that only 2% of institutions find that e-learning is cheaper to *develop* than traditional instruction, whereas 35% of institutions find that e-learning is cheaper to *deliver* than traditional instruction. (Conversely, 77% find that e-learning is more costly to develop, and 21% find that e-learning is more costly to deliver.)¹²

Finally, it is important to realize that many departments within UBC (including those in Medicine, Dentistry, Arts, Science, and Agricultural Science) have already made substantial investments in people time for developing WebCT course content; hence, a preference for WebCT is expected—all other things being equal. We note, however, that surveys reveal that most students are satisfied with *any* online delivery vehicle, regardless of whether that be WebCT or some other CMS—as long as the online content is easily accessible (and some basic tools like grade reporting and a bulletin board are available). In some cases, secure and private Web pages are required to maintain IP rights, especially when posting publishers’ material or solutions. Our

experience is that WebCT is easy for students to use, but considerably more effort is required on the part of instructors.

7. Should We Adopt a Standard CMS? Should Instructors be Required to Use a CMS for Content Delivery?

Many faculty members within Science believe that any online solution that provides for the delivery of content (e.g., standard HTML on personal or course Web pages) would be suitable. In fact, many faculty members resent being tied to a CMS, and put up their own Web pages with links to classroom materials. Some instructors prefer this option since it can be a lot less work (i.e., far fewer steps and mouse clicks) to set up and update. Also, the instructor and students are assured of having online material available in a more timely fashion, that is, without having to rely on busy support staff or cumbersome administrative or security procedures—any of which can take days to do, especially on a weekend, at the start of a term, or during the Christmas holidays. (UBC is closed between Christmas and New Year's—making it very challenging to get WebCT course material ready for when students arrive on the first school day in early January. We can't get it done before Christmas because many of us are busy marking exams just before Christmas, and haven't had the chance to move on to the next term's set of courses.) We have experienced cases where students were delayed from accessing WebCT by several days because of problems with adding and authorizing users; but, this is more of a local issue than a problem with WebCT. Even something as simple as a student switching lecture or lab sections can cause a student to become inactive in a given WebCT course (because of the programming interface between WebCT and our registration system, and the need for some manual intervention). At UBC, instructors typically cannot add TAs or students (who perhaps are having registration problems or are auditing the course); such requests must go through a support person. These are some of the reasons why some instructors feel strongly about not using WebCT (or another CMS).

So, why would an instructor who knows how to create Web sites/pages use a CMS? Three reasons stand out: (1) providing a secure/private bulletin board, (2) posting student grades, and (3) posting solutions or private content. Some instructors are literate in Web technologies, and can create their own solutions to (1)-(3). In fact, several instructors in our Computer Science department have their own password-controlled Web sites, and can extract and send out personalized grades via scripts and e-mail. Secure bulletin boards are harder to create, but most instructors are happy with using newsgroups, and don't mind if outsiders read the postings. Some instructors use Wikis in their courses, which is a good idea for those courses that require multiple students to contribute to a single document.

Having said that, many instructors are already carrying large workloads, and asking them to set up and maintain their own Web sites (especially if they're not HTML or Web-literate) can be time-consuming at best, and unreasonable at worst. Again, we see a dichotomy in CMS viewpoints: for students, a short learning curve with a modest interface; and for instructors, a much more time-consuming situation with many required steps and a very cumbersome interface (for WebCT CE). It would be wise to increase faculty resources, and relieve instructors from some of these time-consuming, manual processes. Ideally, a more intuitive interface with fewer steps would go a long way in dismissing instructors' complaints. Fortunately, the newest enterprise product from WebCT (CE 6.0, which is now a replacement for Vista) appears to be a big step forward in this regard.

8. Increasing Student Expectations

No discussion of CMSs would be complete without discussing whether or not a CMS benefits learning, and whether it does so sufficiently, to provide an appropriate rate of return on the investment in time and money. It is a growing trend in the Computer Science department, for example, that some students expect almost 24x7 availability of instructors and TAs. In fact, some students get quite upset when their questions/requests are not satisfied within a short period of time, even on evenings/weekends. We have observed strongly worded student postings because of the lack of a “fast” response. We realize that students are under more stress and pressure than ever before; however, we feel that using technology (such as a CMS) raises student expectations.

Years ago, students typically relied on very limited office hours of instructors, and an hour or two of review sessions before midterms or final exams. Now, some students expect *all* of the following from instructors: regular office hours during school days, review sessions, sample midterms and final exams with full solutions posted online, e-mail accessibility during the day and on evenings and weekends, and prompt responses on online course bulletin boards at any hour. Years ago, it took more effort (or was impractical) for students to obtain prior course material such as assignments and exams. Also, solutions to assignments were not as readily provided. For example, students had to make an effort to go to the library to borrow or photocopy them, or the solutions were posted behind glass in a common area, and few students made the effort of copying them manually. Now, with e-mail, instant messaging systems, student-created Web sites, and CMSs, it is very easy and convenient to send/download directories of assignments and course components, in electronic form. We are of the opinion that a course needs to have fairness built into it. It is not appropriate for some students to have access to previous course material and solutions, while others do not. Many instructors, for example, reuse their assignments; however, in some courses, instructors are taking the initiative of not reusing assignments, or simply making all assignments and solutions available to everyone. This means that we, as instructors, need to develop new assignments, solutions, marking schemes, and exams on a term-by-term basis. Although this is one more way that technology improves the lives of students, it adds additional hours to an instructor’s workload.

Another observation is that even instructors who go out of their way to put up sample questions and answers, additional notes, special “handouts” or examples, and respond liberally and enthusiastically to e-mails and bulletin board postings, are often rewarded with requests for *even more* information, sample questions, solutions, and instructor accessibility.

Because tenure decisions for non-research faculty at UBC are based on the ratings that students provide near the end of the term (via Faculty of Science Instructor Evaluations, for example), we feel that this is an additional source of pressure for junior/untentured faculty, who now feel somewhat compelled to go beyond the call of duty. Even for tenured faculty, such rising expectations of students can add additional pressure and time to already busy faculty members.

Solutions to the problems mentioned in this section are the subject of debate,¹³ but one solution might be for each faculty member to decide what his or her “boundaries” are with respect to work-life balance. For example, by appropriate TA delegation (this is, of course, dependent on getting quality TAs) and by setting and advertising reasonable boundaries on office hours, e-mail response times, level of bulletin board interaction, etc., students are more likely to respect the instructor’s boundaries. And, as long as stellar evaluations from students are not a requirement for tenure, a responsible instructor should be fine.

In summary, a CMS provides a good platform for students to acquire all sorts of relevant information for a course; however, the instructor should be aware that a substantial amount of work may go into maintaining an accurate and useful Web site, and that student expectations may be unrealistic. The instructor needs to deal with those issues in order to avoid burnout. Also, instructors (especially untenured faculty) that do not use a CMS may feel pressure to conform to “the rest of the department”, and students may feel that the instructor needs to “get with it” to provide a more modern way of teaching.

9. Pedagogical Concerns

To the best of our knowledge, CMSs have not been evaluated internally at UBC to determine *how effective* they are in meeting the dual goals of teaching and learning. Granted, students enjoy the convenience of an easy-to-use CMS, but there are arguments from faculty (see the comments later in this document) that suggest that students are less inclined to attend class, use library resources, buy the textbook (let alone read it), etc., if a substantial amount of course material (and good examples, past exams, sample solutions, etc.) are available to them online.

Furthermore, with many copies of code to common programming exercises available on the Internet, this makes it more challenging to create new assignments that are unlikely to be copied. Some students no longer take the time to try to debug their code, or learn (on their own) how a software tool works (e.g., from the manual, or the textbook); rather, they turn to Google to look up potential solutions, or post bulletin boards requests for help the minute they don’t know how to do something. We are not saying that help shouldn’t be forthcoming, but many students now rely on others to solve their problems; and fortunately, or unfortunately, some peers are quite accommodating.

We have also observed gradual decreases in attendance in many of our lectures—again partly due to the number of online resources (like lecture slides and course notes), meaning that some students find fewer reasons to come to class. And, when a student misses class for whatever reason, the student expects to find the latest notes online (which has been happening with some instructors who use tablet PCs to create and display in-class notes, which are later posted online). We have also had students come to our office hours, equipped with a digital camera, to take snapshots of the instructor’s notes.

It is no secret that the quality of textbooks is getting better all the time, and that publishers are using new vehicles to provide “added value” to the students’ experience. For example, some publishers provide supplementary online notes, CDs, DVDs, online/interactive quizzes, and other value-added services. For example, some publishers are promoting infrared or RFID “clickers” (personal response systems) to engage students during lectures, to reinforce learning. Furthermore, the Google phenomenon has led to an explosion of knowledge and teaching materials, and many institutions post their course Web pages online (an example is MIT’s open course initiative¹⁴).

When we look back on our own undergraduate operating systems course from the 1980’s, for example, and place the course notes side-by-side with the material we are now teaching, we find that we are literally teaching twice as much material in the same kind of course over 20 years later. However, because of better textbooks, the Internet, Google, and all kinds of learning tools (including CMSs), we conjecture that the amount of *effort* that a student requires to succeed is approximately constant (i.e., consistent with that in the 1970’s or 1980’s).

The bottom line is that teaching and learning are changing—in some ways for the better, and in some ways for the worse. More formal studies need to be made to determine the effectiveness and efficiency of online resources, and learning outcomes.

10. CPSC 221 WebCT Vista Pilot—January-April 2005

Prior to the formation of ACETS, our Computer Science department’s Computing Committee had already formed a subcommittee to discuss some of the key features desired in a CMS, and how to develop a set of WebCT procedures/protocols for support within the department (e.g., creating an online course instance, removing old/confidential course contents and bulletin board postings, registering TAs and students, denying student access until the instructor gives the go-ahead, and setting up guest accounts). We concluded that a minimal set of requirements for a replacement to WebCT should include a way to protect Web pages to maintain IP rights; a protected, non-anonymous, threaded, searchable bulletin board; and protected grades (perhaps a set of Perl scripts parsing an exported Excel spreadsheet, with e-mail capability). Also, we committed ourselves to a WebCT Vista pilot for CPSC 221 (a course on discrete mathematics and data structures) during the January-April 2005 term. A second section of CPSC 221 ran in parallel using the current production environment: CE. Since the author of this paper is experienced in WebCT, and likes most of its technology (despite some personal complaints about bugs and usability, among many other things), the fit was good. We managed both of these WebCT courses (on CE and Vista)—making sure that a similar environment (e.g., lecture slides, tutorial notes, course notes, online discussion (bulletin board) postings) was established for each section.

Numerous bugs were reported to the ITServices group that was handling technical support for WebCT Vista. During the term, we composed over 30 pages of detailed material on bugs, poor interface issues (e.g., unintuitive design), student complaints, step-by-step instructions on how to reproduce errors, responses from ITServices (during problem investigation), incomplete WebCT features, etc. These reports were carefully written documented, sent to ITServices for their review, and hopefully the relevant issues were passed on to WebCT, Inc., either for bug fixes or for suggestions on how to improve future releases of WebCT.

While it is true that Vista has overcome some of the previous problems that we've been complaining about for years with CE, it is also true (from our experiences in the pilot), that there are many new problems. Even before completing our CPSC 221 Vista pilot, it was clear to the students, instructor, and ACETS, that Vista was not ready for production use at UBC. Our class size was small (about 20 students, with 14 responding to the detailed questionnaire that was handed out near the end of the term), but most students were well-versed in WebCT, having used CE before. The following tables highlight their responses:¹⁵

Comparison of WebCT Vista Features to WebCT CE—Student Responses

	Vista is a Lot Better	Vista is a Little Better	Vista is about the Same	Vista is a Little Worse	Vista is Much Worse	Not Applicable or No Answer
Online discussions (posting comments, questions, and responses)	1 (7.1%)	8 (57.1%)	1 (7.1%)	3 (21.4%)	1 (7.1%)	0
Online and downloadable	0	1 (7.1%)	2 (14.3%)	6 (42.9%)	5 (35.7%)	0

lecture slides						
Online course notes, readings and links to other course material	0	5 (35.7%)	4 (28.6%)	4 (28.6%)	1 (7.1%)	0
Keeping track of grades on assignments, labs, and midterms	0	3 (21.4%)	6 (42.9%)	3 (21.4%)	2 (14.3%)	0
Online access to general course information (syllabus, announcements)	2 (14.3%)	2 (14.3%)	6 (42.9%)	1 (7.1%)	1 (7.1%)	2 (14.3%)
Online solutions to assignments	0	3 (23.1%)	6 (46.2%)	4 (30.8%)	0	1 (7.1%)

“Based on the trial you have experienced in this course and your past experience with WebCT CE how pleased are you with the overall Vista experience?” Student responses:

Very Satisfied	Somewhat Satisfied	Neutral	Somewhat Dissatisfied	Very Dissatisfied	No Answer
1 (7.7%)	2 (15.4%)	6 (46.2%)	2 (15.4%)	2 (15.4%)	1 (7.1%)

The executive summary that we wrote concerning the CPSC 221 pilot was: “From the survey results, it appears that there is no compelling reason to adopt Vista at this point. The Vista functionality and interface is somewhat worse than WebCT CE. In only two of the six major categories [of the survey] did the students feel that Vista was [at least] a little better than WebCT CE. Only 23% of the students who participated in the survey were either very satisfied or somewhat satisfied with their overall Vista experience. The vast majority of students (57.1%) do not care what online course resources technology is being used as long as they get what they need from it.”

Lastly, we share some debriefing highlights of previous Vista pilots that were conducted outside of the Department of Computer Science, in the 2004-2005 timeframe. Participants felt that the tools were easier to use, set up, and deliver; however, the interface was slow. For instructors (i.e., course designers), the “Build”, “Teach”, and “Student” modes were confusing and inconsistent. There were lots of bugs, and needless to say, frustrated users and instructors.

In summary, from an instructor’s point of view, the interface was surprisingly poor, considering all the complaints that WebCT must have gotten from their CE customers over the years. This is one area that we had really hoped would be better.

11. Summary of Faculty Responses to a CMS

In mid-2005, ACETS ran a broad survey of faculty members’ opinions towards CMSs, and in general, towards online course resources. In this section, we share some of the results of this survey.¹⁶ There were also questions about WebCT CE because it was the official production CMS at UBC that many instructors had at least some experience with.

In summary, 52% of faculty members in Science responded to our extensive survey. This represents 186 out of 355 members, not counting non-tenure track faculty. The average teaching experience among respondents was 14 years. All of the departments in the Faculty of Science were represented:

Departments in the Faculty of Science	Respondents
Botany	20
Chemistry	26
Computer Science	31
Earth & Ocean Science	36
Mathematics	28
Microbiology	5
Physics & Astronomy	17
Science One (an integrated/intense program for first year students)	1
Statistics	3
Zoology	19
Total	186

The majority of participants have positive attitudes toward new educational technologies: 92.4% are receptive to new educational technologies. More faculty members (14.1%) consider themselves to be on the cutting edge (i.e., “venturesome”) with respect to the adoption of new educational technologies, than were skeptical about adopting such technologies (7.1%).

When asked about what the most important features of a CMS were in their teaching, respondents ranked these features as most important:

Important Teaching and Administrative Features	Respondents	%
1. Online access to general course information (syllabus, course calendar, announcements)	88/172	51.2
2. Online access to course notes and downloadable lecture slides	75/151	49.7
3. Links to other course relevant Websites	41/142	28.9
4. Sample exams and quizzes (for study and review purposes)	35/150	23.3
5. Student posting of materials for sharing with faculty and other students	21/102	20.6
6. Online discussions (posting comments, questions, and responses)	24/128	18.8
7. Database of students’ grades (assignments, labs and mid-terms)	21/114	18.4
8. Online solutions to assignments	25/137	18.2

Other highlights of the survey:

- 93.9% of respondents use the Internet for course resources
- 45.3% believe that it is important to put “some effort” into online course resources; and 32.0% said it was important to put in “a lot of effort”
- 72.5% were satisfied or very satisfied with the online course resources used

- 40.8% indicated that the use of online course resources is essential
- 20.0% considered the use of online course resources to be non-essential
- 52.6% said that WebCT CE is cumbersome, slow, difficult to learn, and has a poor user interface
- 41.7% said that they do not use, or want to use, WebCT

The following online activities were believed (by faculty members) to lead to significant improvements in learning:

- Providing students with access to sample exams and quizzes (72.0%)
- Providing links to other course relevant Web sites (70.2%)
- Providing students with online access to course notes and downloadable lecture slides (62.2%)
- Providing students with online solutions to assignments (56.0%)
- Providing for online discussions (bulletin board) (54.8%)
- Providing students with online access to general course information (50.6%)
- Permitting students to post materials for sharing with faculty and other students (37.2%)

Satisfaction Level of WebCT Overall

	Very Unsatisfied	Unsatisfied	Neutral	Satisfied	Very Satisfied
Count	21	28	67	32	4
Percentage	13.8%	18.4%	44.1%	21.1%	2.6%

Satisfaction Level of Departmental WebCT Instructional Support

	Very Unsatisfied	Unsatisfied	Neutral	Satisfied	Very Satisfied
Count	9	33	78	39	8
Percentage	5.4%	19.8%	46.7%	23.4%	4.8%

Satisfaction Level of Departmental WebCT Technical Support

	Very Unsatisfied	Unsatisfied	Neutral	Satisfied	Very Satisfied
Count	7	30	68	44	18
Percentage	4.2%	18.0%	40.7%	26.3%	10.8%

Our own experience in interacting with numerous faculty members throughout the Faculty of Science is that most faculty members truly do have the interests of students at heart, and want to provide the best educational experience they can to students—within certain parameters, not the least of which is the incredibly long work weeks that many faculty members have.

12. Survey Feedback from Faculty (Quotations)

We include the following sample of instructor responses from the Faculty of Science either because they provide a good cross-section of opinions about WebCT, CMSs in general, or pedagogical concerns with the notion of online content. We believe that some of these quotations are particularly revelatory or instructive, and help to underline some of the themes that we have

addressed in this paper. (Some minor editing changes have been made to spelling and grammar, but the quotes appear in their original context.)

12.1 Pedagogical Issues

- “Online materials encourage students to miss lectures and thus decrease their learning.”
- “I don't think it's a good idea to post lecture notes online, but there's a lot of pressure from students to do this, because it's the 'easy' option. Expecting students to write their own notes in class is by far the best way to learn the material for the majority of the students, because it ensures at least partial processing of the information being delivered. Printing out online lecture notes is a poor substitute.”
- “I'm extremely concerned that UBC might commit a large amount of resources on a one-size-fits-all solution. My needs are radically different than those of someone in another area, as are my students' comfort with various technologies. Should we adopt No. 2 pencils as the standard University-wide writing implement? What about the artists who need greater flexibility in their implements? ... Should we adopt Windows XP as the standard University-wide computer operating system? What about researchers with specialized computing needs, who need to run unusual, specialized computers? In every case, the correct response is to allow our world-class faculty the freedom to choose the most appropriate tools for their own tasks. So then, why should we standardize on a University-wide online course system?”
- “My current view is that investing in electronic resources is not the way to enhance University education. Money would be far better invested in TAships and infrastructure to support student laboratories or tutorials. I find it appalling that students enrolled in science, Biology specifically, only experience one or two laboratory courses. Practical exercises and one-on-one contact are essential to achieve the best possible learning environment. TA-led discussions in a tutorial are hands-down superior to delayed online discussion forums that have no required participation. Students need to have physical contact with a facilitator/TA/or Prof to feel engaged and in some cases be 'forced' to participate and expand their own knowledge. Sitting in a computer lab, or at home, does not achieve this essential interaction. For the most part, much of the electronic posting of material really only serves to placate students and does not provide the necessary challenge to further student education. In fact, I think it serves to make student engagement more difficult. I like being able to post notes, articles, etc., and have discussion boards for my course, but this should never come at the cost of quality, hands-on education. More money must be invested in TAs and laboratories.”
- “WebCT is not good for Math. We have our own typesetting languages (Latex, Tex) and that is what we need to be able to use.”
- “Being able to draw chemical structures is important for an online service to be useful. If this does exist, it is not well-advertised. I've asked (within the Chemistry department) on several occasions, and have been told this doesn't exist.”
- “WebCT does not reflect many of the common teaching practices that I have used for many decades. Coupled to this is the fact that ITServices has little or no knowledge of how faculty teach, and they have an overly bureaucratic view of things (often the response is 'contact your departmental WebCT person', who is already overloaded with work and does not work 24/7, so it can be days before a solution is found if a problem arises Friday evening on a long weekend.”

12.2 General Comments

- “I am a nearly fanatical proponent of computer and Internet technology in education, but I am equally opposed to UBC becoming dependent on any one CMS. I will NEVER use Vista, no matter what happens!”
- “I have been with WebCT from the beginning and every incarnation gets better.”
- “I have never used it for my courses. The server was too slow when I tried it several years ago. Also I did not like the interface, and there were too many clicks to do simple things. The on-line help at the time was not good.”
- “I would be satisfied with access to a Web server for course content, a system to provide grade information to students, and a bulletin board for questions.”
- “This is my first year using WebCT. I think placing lecture notes, assignments, labs, sample tests, etc. on the Web has greatly aided in the organization of my course.”
- “Any move to increase the use of online resources should contend with the following issues (among others): 1. Why Hold Classes? If all the content is online, why should students bother showing up to lectures? Every lecturer needs to have an answer for him/herself, of course, but this is an area in which the Faculty of Science needs to show some leadership. 2. Who Owns the Content? Related to point 1: if I’m going to put myself out of a job by cooperating in the design of a really outstanding online course, I will need adequate compensation in my unemployed future. Or, maybe the human touch really is important to animate student learning even when the hard core of facts is online ... but who will be the human providing that touch? I'd rather retain that role and not be implicitly ceding it to UBC for resale and outsourcing. 3. Inertia Effects. Putting together really nice online materials takes a lot more effort than crafting a nice one-off lecture. I do it anyway, and sometimes I can re-use my work in later years. But the temptation to rely on last year’s notes instead of preparing a whole bunch of new material is strong. Will excessive reliance on the Web paradoxically reduce the flexibility and dynamism of our courses because of the overhead requirements on faculty time? 4. Cost. As noted for a previous question, the dollar amounts going to WebCT are already astounding and the proposed amounts are outrageous. The homebrew free approach is working well for me and many of my friends and colleagues.”
- “I have used WebCT as an on-line course management resource for 3 years and have found the experience to be mostly satisfactory once certain parts of the program have been explained to me. An on-line course management system is an excellent resource to have and can help significantly in centralizing course material and distributing them. However, I do not necessarily feel that UBC needs to stay with WebCT, especially given the dramatic cost increase associated with the proposed version replacement. If an open-source or similar version of an on-line course management system existed at a significantly reduced cost, I would be strongly in favour of pursuing this option.”
- “The idea of spending \$7 million over five years to have access to the system is absolutely ludicrous! There are similar, although perhaps less powerful, systems available at little or no cost. Certainly before any outlay of funds at this level is made there has to be a campus-wide discussion about how effective web-based teaching approaches actually are as opposed to more ‘traditional’ classroom teaching. Also unless any system that ends up getting adopted at UBC is going to be FULLY utilized by a very large proportion of teaching faculty (my impression is that many people who currently use WebCT are only using a few of its capabilities), it simply cannot be justified. Most of the most useful and valuable aspects of Web-based teaching can be used for free via course Web sites.”
- “Web pages, email, and newsgroups are sufficient. Fancy things like submitting homework online have no conceivable use in mathematics whatsoever. Any money spent

on such things is a big waste. Any restriction of the freedom of system to use would be a disaster.”

12.3 CMS Support within the University

- “There is little if any support within the department (due to funding), and peer-counselling is sporadic at best. I think some faculty rely on one or two of their tech-savvy grad students to maintain Web sites! I have not had time to make use of [training].”
- “There is virtually no support for technology in teaching.”
- “[I would like] training for TAs and instructors, and a 1-hour turnaround anytime that I have a problem that can easily be resolved (like adding a student to WebCT). I think that a lot of our staff is overworked as it is, so adding more things to their list of responsibilities doesn’t get much of an enthusiastic response from them. This can be frustrating. For example, I’ve stopped reporting some problems because I know it’s a waste of my time to carefully document them, etc., and often nothing happens. I guess what I’m saying is that the university has to start providing more support services if it expects instructors to meet student expectations these days.”
- “Somebody to help me set up Web pages, post notes, etc. on the Internet would be extremely helpful. More sophisticated media, like WebCT are extremely user unfriendly, complicated, impenetrable, and there is ZERO human help available to me.”
- “ONLINE instructional or technical support provided by our department??? Who are you trying to kid?? NONE EXISTS in my department. I will assume some exists in the Faculty of Science, but I have not had time to figure out how to get it.”
- “I am unsatisfied because I feel I am totally on my own and it was only through major complaining that we were able to get someone hired very part time. I don’t feel capable of handling the technical issues and often ITServices was not quick to respond to requests. I often feel that I would be less stressed if I could do some of these things myself (e.g., adding students); but, on the other hand, that would be one more thing that I would have to do and don’t really have the time for!”
- “This is a joke, right? I am unaware of ANY support from the Faculty of Science. Am I missing something that others are getting? I am not sure what the first question means. Do you mean help from my department to teach ME about online tools, or do you mean help from my department to put together, manage, and staff online course tools (i.e., someone who puts the content on under my guidance, rather than me, or someone who knowledgeable monitors student questions and answers them instead of my being online 24/7)? In either case this is very, very minimal (almost nonexistent).”

13. Sakai

The Sakai project is an open-source CMS providing collaboration tools for teaching and research. Sakai is a framework that consists of a set of tools and services. Although components of it have been used for years in institutions such as Stanford, MIT, and Carnegie-Mellon, it is only relatively recently that the CMS components are being packaged together. Release 1.0 occurred in 2004; release 1.5 occurred in Spring 2005; 2.0 was planned for June 2005; and 3.0 was planned for Spring 2006 (with a rollout in time for the 2006/2007 school year). As of mid-2005, the only major production implementations of Sakai have been at the University of Michigan (25,000 users; 1000 courses, 2000 sections) and Indiana University (4000-5000 users, but IU has over 100,000 students across 8 campuses)^{11 17}. Other pilots and smaller scale production environments were running at various institutions worldwide. However, it is interesting to note that there are *no*

examples of institutions migrating from a commercial CMS to Sakai. All of the above institutions had their own in-house CMS products. Thus, there is an element of risk in trying to migrate from large-scale commercial systems to Sakai.

The key development teams are at the following institutions: the University of Michigan, Indiana University, MIT, and Stanford. So far, 27 FTE positions have been committed towards development. In June 2005, the University of Toronto announced that it was adding 5 FTE positions to the Sakai project. A \$2.4 million grant from the Mellon Foundation, and a \$300K grant from the Hewlett Foundation have been used to bankroll the effort. Institutions that wish to be part of the developer community pay an annual membership fee of \$10K (\$5K for small institutions), with a 3-year commitment, to be part of the Sakai Educational Partners Program (SEPP). As a sign of the level of interest in Sakai, about 430 people attended the SEPP meeting in Toronto in June 2005. A meeting later that year was expected to attract close to 1000 individuals. SEPP allows institutions to participate in the developers' and users' group meetings, conferences, and workshops; exchange software; have access to other Sakai resources (although anyone can freely download Sakai); etc.

The philosophy behind Sakai includes: modularity, and portability of code. The advantage here is that adopting institutions are not locked into a proprietary technology that is dependent on a particular vendor. Should that vendor go broke, sell out, or jack up its rates, then an institution's course development efforts would not be lost. The course can continue to run without significant changes. There is no licensing fee for Sakai.

One concern that a Sakai SEPP participant had about the Sakai project is the "management of egos", as some participants have the attitude they are smarter than their colleagues at other institutions (e.g., that their design or implementation (of a particular component) is superior to the design or implementation of another). It is hoped that everyone will be on the same page, to provide overall quality, with a common goal of providing the best solution (pedagogically and technically) for the most users.

14. CMS Selection Criteria

The University of Toronto put together a checklist or script for potential CMS vendors to use to demonstrate their CMS product to UT.¹⁸ This makes it clear, right from the beginning, the types of things that UT expects from a good CMS. Vendors must demonstrate that they can actually perform the itemized tasks, and do so reasonably efficiently. Not only must the vendors demonstrate functionality of their product, but usability, as well. Some of the tasks included on UT's detailed checklist are:

- Set up a new user
- Verify authentication
- Reset an instructor's or user's password
- Create a home page for a given course; add lecture slides (in PowerPoint), a course outline, required readings, assignments with due dates listed, tutorials, etc.
- Populate the class with 50 students from an external file
- Add/delete students by hand
- Assign students to tutorial groups
- Assign TAs; create accounts and passwords for them

- Set up a bulletin board and forums for messages; create a thread; create a message; post an attachment; send a note to the class; set up a live chat
- Create a grading scheme with assignment and exam weightings; enter grades; calculate grades according to formulas of the instructor's choice (e.g., must pass the final exam in order to pass the course); scale grades with a bell curve; import/export grades to/from an Excel spreadsheet

We plan to evaluate Blackboard, Sakai, and new versions of WebCT, in a similar manner. ACETS began drafting a script/checklist similar in style to UT's, but tailored for the features that were most important to UBC. For example, interoperability or integration with other campus systems (e.g., library, student information system, security portal) was also important.

15. Longer Term Considerations, Future Outlook

The Faculty of Medicine at UBC makes archives of WebCT courses available to its current and past students. The idea here is to provide such individuals with high quality resources, wherever they may be working or interning. Thus, even at remote locations, students will have access to large repositories of medical information (including multimedia resources) that they are at least partly familiar with, from their medical school training.

The use of a CMS to provide archives of courses is especially appealing to students on a co-op term, or now in a permanent job setting. Typically, the protocol at UBC is that once a student is no longer registered in a given course (e.g., he/she withdraws or finishes the course), then the student no longer has access to those online resources. We see a need for such information to be made available to students. For example, maybe a student took a course in database systems, and years later, finds that the Oracle notes, tutorials, examples, and other resources from his/her undergraduate database course would be particularly useful.

The issues to implementing online archives are multifold. First, the CMS would need to support far more users than the current system. This implies more resources are needed. Second, what is the obligation of an instructor in keeping these courses current? Almost all of our courses in Computer Science, for example, are constantly undergoing renovations and improvements. Sometimes the material has errors in it, and these are usually fixed as soon as practical. Also, what happens if the Oracle version 7 material is superseded by more relevant Oracle version 10 material? Do we remove the old, less relevant material (including complete examples that do not apply to Oracle 10) that past students used in their courses? Do we provide notes for Oracle 10 that we then migrate to all archival copies? Should we have a single archive of the course, including many archived bulletin boards? Do we support alumni e-mail requests for "how to" information? (We periodically get such requests from past students.) These are all issues to consider. Perhaps a subscription model might be in order to offset the cost of additional resources, including human resources.

Another potentially good idea is to create an e-Portfolio for each student. Thus, each student maintains a repository of his/her courses, with all the course outlines, course notes, assignments, tutorial/lab information, solutions, programming assignments and examples, sample exam questions and answers, etc. Thus, it is a "log" of their undergraduate academic history. They can use this to show to potential employers, or to undergraduate advisors in a new institution that may give them transfer credit for certain courses, or to use as supporting documentation when applying to graduate schools, etc. There is, of course, the danger of substantial plagiarism, as a

few mouse clicks (or a shared password) could be disastrous from an instructor's point of view. Many schools are finding plagiarism to be highly problematic, and resort to programs like Turnitin (from turnitin.org) or MOSS (Measure of Software Similarity, from the University of California at Berkeley, to determine the similarity of C, C++, Java, Pascal, Ada, ML, Lisp, Scheme, etc. programs among groups of students). Incidentally, Turnitin can be integrated with WebCT and Blackboard.

The use of personal response systems (i.e., "clickers") in the classroom have some merit, and could be integrated with a CMS. A clicker is a remote control device that permits students to answer multiple choice questions from their seats in the classroom, and scores are aggregated (not necessarily for marks, but some instructors are using them for marks), thereby giving instructors a better feel for how their students are doing. It also engages students in the classroom, thereby providing motivation for students to attend and participate.

Other features to look forward to include podcasts, Webcasts, downloadable audio/video archives of lectures or supplementary materials, the use of PDAs or laptops in a wireless classroom setting, etc. We envision a future where fewer students will appear in lecture halls, and more learning will take place at a distance. Part of this is motivated by the long commute times that many of our students experience, the high cost of suitable housing in the UBC area, the fact that some of our students have part-time jobs or children, or are on co-op terms in another town (and want to take a course while away), etc.

We expect a greater market for pre-packaged, online course content (e.g., e-Packs: publisher content modules that are Web-ready), and an integration of material from textbook publishers, personal response systems (i.e., "clickers"), and other such value-added tools to enhance learning. We also envision a mixed-mode of teaching where "classroom contact is reduced but not eliminated and the rest of the time is spent by students (and instructors) online".⁹

16. Conclusions

A few months after we completed our Vista trial, WebCT announced a major shift in its direction. Vista would no longer be the enterprise product to replace CE, but rather CE was undergoing substantial revisions to allow it to act as an enterprise system, with more robust features, and a surprising and substantial improvement to its user and instructor interfaces. This new release would be CE 6.0. Furthermore, they incorporated some of the design features that we were looking for, and have been mentioned throughout this document. Some of WebCT's senior people came in to demo the product to an audience from ITServices, the Office of Learning Technology, ACETS, several Dean's office representatives, and other interested individuals.

ACETS discussed the changes that CE 6.0 would provide, and most participants felt that this was a substantial improvement. While a number of the suggestions on our wish list were not implemented, it clearly was a step in the right direction. Furthermore, the cost for CE 6.0 was considerably less than that for Vista. Given our investment in WebCT course development so far, the favourable pricing structure, and the improvements in the product, we decided to proceed with CE 6.0—at least for the next few years. During this time period, we will continue to follow Sakai, attend and contribute to workshops, and perhaps evaluate Sakai with one or more trials at UBC. As mentioned, UBC is a member of the Sakai SEPP and we intend to be an active voice in the direction of Sakai.

Gartner Group recommends that institutions such as UBC plan for a long-term e-learning commitment “but for the next couple of years continue to sign short-term contracts while your e-learning environment continues to evolve”¹². Because it is unclear which technology will be best, or which new CMS products will enter the marketplace, this will give us time to see how CMSs, in general, evolve. It will also give us a chance to see the impact, and pros and cons, of Sakai.

We prefer easily exportable and importable course content, so that an instructor’s work can move from one platform to another, just in case we change our CMS (and to avoid being locked into a particular CMS), or because a new instructor might want to use the material for an existing course, but with a different CMS.

We were thinking about evaluating Blackboard as well; however, a short while later, Blackboard announced that it was merging with WebCT. It will be interesting to see the changes made to WebCT and/or Blackboard. Would Blackboard, Inc. eventually eliminate one of their products (e.g., WebCT)? How committed is the company to future enhancements of WebCT CE?

Throughout this paper, we have mentioned the dichotomy in CMS perspectives: a relatively easy student interface, and a more time-consuming burden from the instructor’s point of view. Faculty opinions are mixed, with many instructors realizing that a CMS is beneficial from a student’s point of view, when considering the “big package” (i.e., course grades, secure/private bulletin boards, the posting of confidential or esoteric material, the convenience of a single sign-on, a similar look-and-feel, and possible links to student information systems or library resources. Nevertheless, it is important for all faculty members to have an online presence (e.g., course notes or handouts, a bulletin board, etc.)

Revisiting the issue of mission critical systems, we note that other academic institutions also list a CMS among their mission critical systems. For example, Purdue University runs 7 copies of WebCT (i.e., on 7 servers) for 50,000 users spread among 4 campuses. WebCT is #3 on Purdue’s list of mission critical IT systems, putting it ahead of finance, purchasing, HR, etc. (#2 is e-mail, and #1 is the network).¹⁹ And, what would Purdue do differently if it had to implement a CMS all over again? John Campbell states that they would spend more time on training and on their technical staff, and spend less time “talking”—as their discussions were too political, and there seemed to be no end to them. Campbell remarked that it is important to let people know that their opinion *matters*, but then move on. He added that the number one decision made by Purdue to advance their CMS cause was to give it mission critical status.

At UBC, we are committed to using WebCT CE 6.0. This provides a preservation and continuation of the investment we have made in developing course materials for prior versions of CE. We are fairly pleased with the improvements made to CE, and will gain from the technical and architectural improvements. Furthermore, this gives us a few years to observe trends in the marketplace, and to see how the merger between WebCT and Blackboard unfolds. It also allows us to keep an eye on the Sakai project. We intend to be involved in Sakai’s SEPP initiative, thereby letting us get involved in some of the decision making, or at least discussions, regarding the evolution of Sakai. Ideally, courses will be interchangeable between the various CMSs, thereby allowing faculty the freedom to choose one or the other technologies. Of course, faculty are also permitted to avoid using a CMS, but are encouraged to maintain some kind of online presence.

Additional TA, instructional, and technical support would go a long way towards bridging the growing gap of student expectations and instructors’ delivery. We conjecture that value-added services (e.g., mentoring, career advice) will become increasingly valuable to students. If an

instructor can free up 3-6 hours per week on a course, then those hours could be used for more important things like sleep, providing career advice to students, helping them make wise choices in course selection, getting deeper into the course material, helping students who are struggling, providing more creative material in our courses, researching new methods of effective delivery, etc. We are optimistic about the role of technology in providing each student with a meaningful educational experience.

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