Chapter XI
Integration of Public University Web Sites and Learning Management Systems

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ABSTRACT

Internet technology has found its way into all areas of business and research. The World Wide Web is also used at universities to achieve different goals. On the one hand, it acts as a means of outer appearance, on the other hand, as an instrument of knowledge transfer and knowledge examination. Of course other purposes in addition to those named above do exist. Often different systems are used to achieve the different goals; usually, Web content management systems (WCMS) are used for the outer appearance and learning management systems (LMS) for transfer and examination of knowledge. Although these systems use the same medium (i.e., the WWW), it can be stated that often there is a heterogeneous landscape of systems. Resultant is the object of investigation of the present chapter. The chapter analyses the challenges concerning the integration of public Web sites and LMS a typical European university has to face.

INTRODUCTION

Internet technology has found its way into all areas of business and research. The World Wide Web is also used at universities to achieve different goals. On the one hand, it acts as a means of outer appearance (target groups are potential, current, and former students, researchers, lecturers, press, the interested publicity, etc.), and on the other hand, as an instrument of knowledge transfer.
and knowledge examination (target groups are potential, former, and current students and lecturers). There exist other purposes in addition to those named above.

Often different systems are used to achieve the different goals; usually, Web content management systems (WCMS) are used for the outer appearance and learning management systems (LMS) for transfer and examination of knowledge. Although these systems use the same medium (i.e., the WWW), it can be stated that often there is a heterogeneous landscape of systems. Resultant is the object of investigation of the present chapter. The chapter analyses the challenges concerning the integration of public Web sites and LMS a typical European university has to face.

The research framework used for this investigation thus can be divided into two categories regarding the system types used: WCMS and LMS. In praxis, there is more than one system per system category implemented at a university because of the organisational conditions explained in this chapter.

BACKGROUND

To analyse the object of investigation for the present chapter systematically, it is necessary to consider the typical organisational conditions at a European university. A typical European university consists of a large number of hierarchically ordered or networked organisational units such as, for example, the central administration, library, departments, departments, research institutes, and programmes (Bajec, 2005). Each organisational unit presents itself and provides information specific to the unit on an individual public Web site in the Internet. All these Web sites can be accessed by directly entering the URL or navigating through the university’s Web portal. In many cases several hundred independent Web presences represent various levels of hierarchy within the university’s organisation. ‘Technology follows organisation!’ is the principle according to which a large number of public Web presence islands represent the organisational units of the university, which are highly decentralised and often—to some extent—autonomous (as illustrated in Figure 1) (Schwickert, 2004).

Within a university, organisational, management, and task structures are mostly highly decentralised. Consequently, the organisational units can make decisions and act at a high degree of autonomy. Resultant is that layout, design, and navigational and functional concepts of Web sites do greatly vary within a university. There is no doubt that a patchwork of public Web sites cannot project a professional image of the university as a whole to the outside world (Ostheimer, 2007). This results in the problem that a corporate design needs to be integrated into the numerous university public Web sites and aggregated information needs to be efficiently accessible.

The quality of a university is communicated by and reinforced through public Web sites to the general public. The quality, however, originates from the core business of a university: research and teaching, which can be divided into disciplines, subjects, and programmes and then can be managed in independent departments, departments, research institutes, and so forth within a university. Universities have by now realised that quality and efficiency of their research and teaching can benefit from a support programme of online elements. This requires electronic teaching and learning environments, that is, ‘learning management systems,’ which are available to students and researchers online (Claussen, 2004, Grohmann, 2006).

The fact that the university’s core business units can, as described above, largely make decisions and act autonomously has led to a situation where several LMS in the various departments and departments of a university operate separately from each other. Financial, personal, and technical resources are implemented to introduce and operate these LMS ‘islands,’ to a great extent
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Figure 1. Typical structure of a university’s Web presence

Redundantly. Different systems also prevent network effects which would be beneficial for the experience and learning curves of the operators and users when working with the LMS within a university. As a result, the growing number of students attending interdisciplinary programmes in particular, where different subjects and courses are involved, are confronted with several LMS, mainly open source systems such as Moodle, StudIP, Ilias, ATutor, OpenLMS, and others (Bett & Wedekind, 2003; Claussen, 2004; Dittler & Bachmann, 2003; Schulmeister, 2005).

Consequently, in addition to the integration of navigational and functional concepts and a corporate design into university Web sites, there is also the question of how an LMS is established and which LMS suits best the university’s teaching areas. The two problems have a great deal in common: the addressee and the medium, that is, the students and the Web.

To sum up, the following challenges can be filtered from the analysis of the object of investigation:

- In a university there are often several hundred Web portals and Web sites, which differ greatly regarding design, navigation, and features, and which represent several levels of hierarchy within the organisation. This does not present an advantageous picture of the university to the outside world.
- In the organisational units of the university’s core business of ‘research and teaching,’ several LMS are operated independently...
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alongside each other. This is economically inefficient and prevents network effects within the university.

EMBEDDED LMS IN CORPORATE WEB SITE FARMS

The university Web portal lists Web portals of all departments. The function of the university portal is, on the one hand, to present the university as a whole to the outside world and, on the other hand, to enable navigation inside of the university. All information and features which concern the departments internally are presented at the departments’ portals and, if necessary, more detailed on subordinate Web sites. The entire Web portal and Web site structure of a university is structured in hierarchies and networks according to the subsidiary principle, that is, each organisational layer and unit is (solely) in charge of the area for which it is competent and responsible. The entire Web portal and Web site structure (for academic and organisational content) should be designed as completely as possible in accordance with the university’s corporate design. For this reason, it is necessary that the university provides its organisational units with a design template, which can be used throughout the university to integrate the corporate design. It is also taken into consideration that, within this framework, each organisational unit maintains a certain degree of individuality, for example, by using its own pictures, colour combinations, forms of content, and so forth. Owing to the fact that autonomy is important for the university organisational units’ self-esteem, it would not be a good idea to force all the Web sites to become totally uniform. Experience has shown that departments, research institutes, and even work and research groups very much appreciate individual customisable university Web-styleguide templates because producing such a template would require technical know-how that the organisational units as a rule do not have.

Taking the university as a whole into consideration, it emerges as a clearly structured (for academic and organisational content) and homogeneously designed mass of Web portals and Web sites, that is, a ‘corporate Web site farm.’ The technical production of such a Web site farm requires a WCMS, which enables the allocation of the responsibility for the individual Web sites’ content and functions top-down to the organisational units, to whom the Web sites ‘belong’ (Nakano, 2002; Zschau, Traub, & Zahradka, 2002). Equally, the Web content management system must be able to aggregate the accountability for higher responsibilities bottom-up to superior organisational layers within the university hierarchy. The WCMS should reinforce the organisation’s flexibility (Ostheimer, 2007).

Ideally, a student should be able to find all the descriptive information and interactive functions which are relevant to the student’s individual program and classes in the department’s Web portal (e.g., enrolment, hours, places, lecturers, description of content, tasks required, literature recommendations, etc.) (Conrad & Donaldson, 2004). This information should be made available not only to registered students, but also to people interested in studying at the university, in order to contribute effectively towards the acquisition of more students. Department or department portals group together general information that the student needs for planning studies in course, room, and enrolment directories. Specific information on the courses can be found at the subordinate Web site of the body offering the course (institutes, professors, lecturers etc.), as long as the relevant Web site complies with the standards of the superior Web portal as far as design, navigation, and functionality are concerned.

The students learn in departments of a classical university either by attending courses which require presence, or by working alone as an
individual learner, or working cooperatively in groups. The term ‘e-learning’ aims to support these three organisational forms of learning with the aid of electronic media. At university departments with a high proportion of courses which require presence, e-learning programs are generally combined to offer ‘blended learning.’ For example, a lecturer makes downloadable digital material available for self-study to accompany the lectures requiring presence. Moreover, the students can discuss the contents of the lecture with each other or with the lecturer in Web forums. The sum of all the parts is more than a traditional lecture; ‘electronic’ learning therefore becomes ‘extended’ learning. E-learning is thus primarily effective internally for a university and targets in the first place registered students and lecturers who are active in the core business of ‘research and teaching’ of a university. For the e-learning program the lecturers require practical technical instruments, teaching materials that have been prepared especially for e-learning, and the relevant didactic qualifications.

The Web already integrates a broad line-up of e-learning instruments into the online area, which are serving as a technical basis. A common characteristic of the majority of LMS is that there is a limit in features on both electronic and blended learning for students and lecturers, that is, internal university addressees. Their e-learning requirements cannot be fulfilled by a public Web presence, which is separated from the e-learning environments for students and lecturers, both technically and in terms of content and design (Schmidt, 2003). The symptoms of this type of disintegration are unfortunately too often evident online: departments/institutes operate Web presence islands with public contents and functions and link up within this public Web presence to an LMS, which is completely separate in terms of content and function and optically different as well.

Teaching at universities, in particular, with its high proportion of courses requiring presence involves a mix of information, communication, and cooperation, which, on the one hand, deliberately contains public elements and, on the other hand, contains specific elements that are deliberately only intended for registered students. Thus, for example, courses with descriptions of the content, references to sources, a large quantity of dates, places, lecturers, university regulations, ECTS information, and so forth can generally be seen at the provider’s Web site and in central directories. Discussion forums, course evaluations, examination enrolments and results, digital reading materials, and so forth for the same courses should, however, be deliberately made accessible to (registered and possibly paying) participants of the relevant courses only, in a limited access LMS. The separate operation of an organisational unit’s public Web site and its LMS will therefore inevitably lead to discontinuities in media, recording data several times, redundancies, and inconsistencies, due to the fact that data are being kept separately.

Within a university ‘corporate Web site farm,’ which is clearly structured from an academic and organisational point of view and homogeneously designed, students and lecturers should be able to transfer transparently between optically, navigationally, and functionally adapted e-learning environments. The WCMS and LMS which are used for the technical production must be based on a common database so that the public and protected contents can be used consistently many times and beyond.

The chapter’s key objectives are:

• The university requires a homogeneous ‘corporate Web site farm.’ The technical production of this requires a WCMS, which can allocate the responsibility for content and functions within the university hierarchy top-down and aggregate bottom-up.
• The public corporate Web site farm and the LMS in operation should be integrated so that public and protected contents are presented
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A classical university can be seen as a predestined area for the implementation of this kind of ‘extendable’ WCMS. In the following description, the Justus-Liebig-University (JLU) Giessen, Germany and the WCMS ‘Web portal system’ (WPS), which is used there, will be described as an example for the objectives described above (WPS, 2006). The WPS has been working successfully since April 2002 for the portal of the entire Department of Business Management and Economics at JLU and its currently 25 individual organisational units. By mid-2005, the WPS was implemented for all the areas of three other departments and two research institutes of JLU. In total, more than 150 portals and Web sites are currently being produced, filled with content and operated by the WPS at JLU.

A Web portal which navigationally integrates all the Web sites of its organisational units and aggregates its public contents can be considered as the central starting point for every department. A department portal, for example, lists all the courses offered by its organisational units in a course directory for the entire department. The same applies for the people, publications, rooms, materials, forums, and a lot of other information. In order to successfully aggregate all the contents, it is necessary that the organisational units that are assigned to the portal autonomously fill their own decentral Web sites with contents using the WPS, thus making the contents available to the central WPS database. A department course directory is, for example, only of use if it really does list all the department’s courses. This is where the role of the WPS as a basis becomes clear: each decentral organisational unit keeps its individual contents up-to-date and records them all in the WPS and the contents are then centrally aggregated completely automatically by the WPS for the entire department. The responsibility for the ‘quality of the portal’ is thus largely handed over to the organisational units (Schwickert & Grund, 2004).

SOLUTION: EXTENDABLE WCMS WITH PLUG-IN LMS

For the e-business presence of an organisationally decentralised university, the presentation of a collection of general information and links to the decentral organisational units is the basic task of a portal, which constitutes the common public starting point for the entire decentralised group of organisations. Beyond its function of branching out, the portal is all the more useful for visitors, if more individual information and functions on the decentralised organisational units can be consistently integrated into the portal. In time-saving ‘one-stop vi-sits’ to the portal, visitors should be able to inform themselves as comprehensively, concisely, clearly, and reliably as possible on the entire decentralised group of organisations. In decentralised organisational environments, a WCMS must be able to ensure the efficient production and top-down classification of individual single Web sites and, in addition, bottom-up integration for consistent portals.

From an economic point of view, the speciality of these tasks is justified by the fact that the content integration of various individual Web sites should enable the portal to operate as efficiently as possible in an automated manner with only a limited number of manual interventions. From a technical and functional perspective, a WCMS must ensure that the portal with decentralised organisational units is configured for the operator with selectable information and functions. In a multilayer decentral organisational environment the WCMS must be able to amalgamate a variable number of hierarchy-based or network-based portals in a united portal structure.

together and consistently on a homogeneous interface. The LMS offer the students the exact contents and functions that they require for their individual study situations with a uniform set of operating procedures.
The extendability of a WPS for a university portal structure is scalable from two perspectives. On the one hand, the WPS can gradually be extended to the university’s decentral organisational units. Several WPS, for example, for different departments can be technically operated parallel and ensure that content, function, and navigation are aggregated not only within the department, but in the central university portal. Implementation covering all the areas of the university is therefore not necessary. Alongside scalability in the areas covered, the quantity of functions offered is also scalable. The WPS offers an organisational unit a multitude of prefabricated and ready-to-use functions for the production and filling of its public Web site (e.g., newsboards, a download centre, online editions, online forums, marketplace and shop solutions, administration of lists of people, publications, projects and links, administration of courses and special events, online enrollment, online evaluation, as well as site, page, template, and menu editors) (Claussen, 2004; Grohmann, 2006; Rosenberg, 2006). For each organisational unit a certain selection of these functions can either be put into use or closed down. The editors, as authorised administrators, can control whether and which organisational units can go online with individually designed Web sites, or whether all the Web sites of a department, for example, have to use a uniform corporate design template.

Moreover, the quantity of functions can be scaled by the selective activation of integrated LMS functionalities (Ostheimer, 2007) as soon as the public portal/site structure has been established in the university’s organisational units. The WPS produces these LMS functionalities by optionally plugging in the students’ personal information center (SPIC) and teachers’ administration center (TAC).

- SPIC is the personalised environment for a student, enabling the student to occupy and track courses. Each student can register as a SPIC user via a link on the public portal/site and maintain the student’s own SPIC environment. SPIC registration and SPIC access are, for example, integrated in the department’s portal at the Department of Economics at JLU Giessen.
- The TAC is a personalised environment for a lecturer, enabling the lecturer to manage the course program. The WPS administrator gives the lecturer the relevant TAC authorisation for the courses. The lecturer can also go through the TAC user account via the public portal/site to reach the lecturer’s own personal TAC environment.

The SPIC/TAC environment is illustrated in Figure 2. A student occupies the courses the student is attending in the current semester in the student’s SPIC environment (by enrolling online either with or without authentication), puts together timetables and appointments, subscribes to the relevant newsboards, downloads, forums, and evaluates the student’s courses.

The lecturer is offered extended functions for the lecturer’s courses in the TAC environment. With these functions, the lecturer can activate online enrolment for the courses if the lecturer wishes. Either admission for the course is unrestricted, or participants have to give information in several steps, such as password, real name, or even smart card authentication within the framework of the public key infrastructure (PKI) at JLU Giessen (Treber, Berg, & Schwickert, 2004). The lecturer can configure the system according to the lecturer’s requirements, either unrestricted public lectures or a controlled group of participants. The lecturer can include general information, newsboards, downloads and uploads, forums, bookmarks, evaluations, and ECTS descriptions for each of the courses. The lecturer can either be permitted to use or denied use of each individual TAC function for each course.

Beyond the functions relevant to the administration of teaching, the WPS offers in addition a broad palette of community functions.
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for registered SPIC/TAC users. Each user can participate, using several profiles and names, in various forums, discussion, and study groups via integrated instant messaging, and also run buddy groups and place classifieds.

All the information, content, and functions offered on the courses can either be made available only in personalised environments, or alternatively in public Web sites and portal aggregations for the relevant organisational units, too. The WPS thus seamlessly integrates the WCMS and the embedded LMS functions for public and protected areas of a university in the Web. In this way, the university avoids operating several unlinked systems parallel.

The introduction of SPIC for the students of the Department of Business Management and Economics started in December 2004 and ran very smoothly without any instructive measures. There are currently (June 2007) 2,900 active registered SPIC users and this constitutes approximately 98% of the students enrolled in the department. At the time SPIC was introduced, all the courses (approximately 300 in the 2004/2005 Winter term) and the relevant contents and functions were already available for the students in SPIC. Feedback from the students and lecturers was positive in every respect. Ultimately, the comprehensive coverage of all the courses, the integrated community functions, and the intuitive operability of SPIC contributed decisively towards the extremely quick adoption of the system by students and lecturers.

Since the introduction of the WPS and the SPIC/TAC, new structures have emerged automatically regarding the necessary allocation of
the tasks of recording and maintaining content within the university. The simple and intuitive operability of the system enables people in the individual organisational units (i.e., professors, research institutes, work groups, and office of the dean) to carry out Web publishing, without having any technical know-how. The number of people responsible for the content has increased to such an extent that the people producing the content are also those that record and maintain it in the system. The processes of Web publishing have also inevitably changed. Whereas previously technically experienced Webmasters were occupied with formatting and releasing contents, leading to bottlenecks, now each author can and should be responsible for the author’s own content and put it online.

To sum up, the solution’s key messages are:

- The Web portals and Web sites can be quickly and efficiently restructured into Web presences for the general public which are homogeneous in terms of content, function, and design. Each organisational unit is in charge of its own Web site; they are not forced to comply with a central WCMS solution, but the responsibility is allocated step-by-step and optionally.
- Owing to the fact that the WPS automatically aggregates content, Web portals emerge that contain a wealth of information which is up-to-date at all times. Individual Web sites can be added and organised in hierarchy-based or network-based portals or be ‘closed down’ at all times. Any number of portals within any number of layers of hierarchy can be created.
- The LMS interfaces are transparent and integrated in the public portals and sites with access only for authorised users. LMS-relevant data are recorded in the system only once and multiple uses of this data are consistently and precisely defined.
- All WCMS and LMS functions of the WPS can be individually activated or deactivated for each user group and organisational unit. Each WPS user can therefore be assigned a personalised quantity of functions.

CONCLUSION: TECHNOLOGY ENABLES ORGANISATION!

If each author is personally responsible for putting content online—that is, with no further editorial checks—there is, in principle, the danger that the quality of content suffers. Experience in the departments of JLU Giessen using WPS has shown the contrary. Empirical research into the user behaviour of people working with WPS clearly indicates that people are all the more careful when publishing ‘their own content.’ The addressees of the contents, chiefly students, confirm that the quality of the content in the departments concerned has improved categorically in comparison to the quality of the content before the implementation of the WPS.

Furthermore, the impact on the quality and a considerable impact on quantity can be observed for the departments’ portals and sites. Monitoring the publishing process has proved that the quantity of published news, downloads, info pages, forums, announcements, directories, and so forth has multiplied and continues to grow in all the departments. In the same way, the number of visitors to the public portals and individual Web sites is permanently rising. Here the performance of the Web site is reinforced by success: more and better contents make a visit to the site more interesting; as more visitors are recorded at the site, it becomes more ‘effective’ and interesting to publish information on the site.

Besides the ‘time to Web’ has also been significantly reduced due to the use of the WPS. The complete publishing process with the WPS has been automated with the use of user-friendly Web
forms. Owing to automation and the fact that there are no more bottlenecks with the ‘Webmaster,’ who was responsible for producing, updating, and publishing individual pages as well as the whole Web site in the conventional publishing process, the time lapse between the production of content and its publishing has been reduced considerably.

The positive impact on quality, quantity, and time largely leads to a reduction in costs. When organisational units with their own Web site start using the WPS as application-service-providing solution in the department, they no longer need their own system administrator and save costs for the individual maintenance and servicing of redundant system technology within the organisational units. Initial acquisition and customisation costs and a limited running expense for the maintenance of the system software for the WPS are covered by a multitude of organisational units. The simplicity of the publishing process per WPS largely makes it no longer necessary to employ experienced technicians. As a result personnel costs for this—mostly for student jobs—can be reduced considerably.

As regards the portal, costs have also decreased, due to the fact that filling and maintaining the portal is carried out by the WPS with more than 80% completely automatically drawn from the contents of the connected subportals and individual sites. Only a few pages with static information are produced manually in the portal. In comparison to a portal which is produced manually or only partly automated, the portal master has a lot less work, because the content is aggregated by the WPS. In the areas where the WPS is in operation at JLU Giessen, it has been established that the reduction of cost induced by the WPS in the field of Web content management pays off the necessary investments of the department within 2 years and largely overcompensates for the running costs induced by the WPS.

Up to now WPS and SPIC/TAC have made an integrated system environment available, making it possible to produce consistent public portals and sites as well as closed areas for teaching administration. In 2007, an extension of the functions provided by the WPS is on the agenda with learning support for the students in the form of ongoing online examinations. WPS interfaces will be added to the SPIC/TAC, enabling the lecturers to supplement their blended learning program of presence courses and WBT with interactive versatile online exams and tests. Students’ learning success will be individually available for each student and teachers get aggregated overviews of their students’ learning progress. The objective is to have created an e-university platform with the WPS, which is flexibly scalable in terms of capacity and functions. Via this platform, the university will be able to consistently produce and efficiently operate its entire public Web presence, its closed teaching administration, and blended learning.

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