IDEA GROUP PUBLISHING
701 E. Chocolate Avenue, Suite 200, Hershey PA 17033-1240, USA
Tel: 717/533-8845; Fax 717/533-8661; URL-http://www.idea-group.com

ITB12865

This paper appears in the book, *Emerging Trends and Challenges in Information Technology Management, Volume 1 and Volume 2*
edited by Mehdi Khosrow-Pour © 2006, Idea Group Inc.

How to Integrate Public University Web Sites and Embed Learning Management Systems

Univ.-Prof. Dr. Axel C. Schwickert, Chair of Information Systems and Management, University of Giessen, Germany, Licher Str. 70, D-35394 Giessen, Germany, P: +49 (641) 99 22 611, F: +49 (641) 99 22 619, axel.schwickert@wirtschaft.uni, giessen.de

Dipl.-Kfm. Bernhard Ostheimer, Chair of Information Systems and Management, University of Giessen, Germany, Licher Str. 70, D-35394 Giessen, Germany, P: +49 (641) 99 22 611, F: +49 (641) 99 22 619, bernhard.ostheimer@wirtschaft.uni-giessen.de

1. PROBLEM.: HETEROGENEOUS WEB SITES AND LMS

Within a university, there are often several hundred independent web presences, representing various levels of hierarchy within the organization. "Technology follows organization!" – is the principle according to which a large number of public web presence islands represent the organizational units of the university, which are highly decentralised and frequently to some extent autonomous (as illustrated in fig. 1, Schwickert 2004 a).

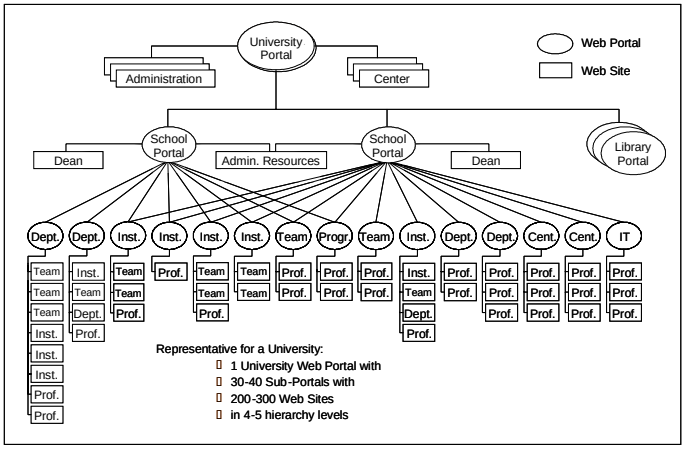
The organizational, management and task structures within a university are mostly highly decentralized. Consequently the organizational units can make decisions and act with a high degree of autonomy. The result of this is that the layout, design, and navigational and functional concepts of web sites vary greatly within a university. There is no doubt that a patchwork of public web sites can not project a professional image of the university as a whole to the outside world. One problem is, therefore, that a corporate design needs to be integrated into the numerous university public web sites and aggregated information needs to be efficiently accessible.

Universities have by now realized that the quality and efficiency of their research and teaching can benefit from a supporting program of online elements. This requires electronic teaching and learning environments – "learning management systems" (LMS) – which are available to students and researchers online in the Web.

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 schools and departments of a university operate separately from eachother. Financial, personal and technical resources are implemented to introduce and operate these LMS islands, to a great extent 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 on interdisciplinary programs 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 many others.

Consequently, alongside the integration of navigational and functional concepts and a corporate design into university web sites, there is also the problem of establishing how and which LMS is best suited to the teaching areas of the university. The two problems have a great deal in common: the addressee and the medium, i.e. the students and the Web.

Figure 1. Typical structure of a classical university web presence



2. OBJECTIVE: CORPORATE WEB SITE FARM WITH EMBEDDED LMS

The web portals of all the schools are listed in the university web portal. 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, enable navigation inside of the university. All the information and functions which concern the schools internally are presented at the schools' portals and, if necessary, more detail on subordinate web sites. The entire web portal and web site structure of a university is structured in hierarchies and networks according to the subsidiarity principle: each organizational 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 organizational 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 organizational 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 organizational unit maintains a certain degree of individuality, e.g. by using its own pictures, colour combinations, forms of content etc. Owing to the fact that autonomy is important for the university organizational units' self-esteem, it would not be a good idea to force all the web sites to become totally uniform. Experience has shown that the schools, departments, research institutes and even work and research groups very much appreciate individually customizable university web-styleguide-templates, because producing such a template would require technical know-how that the organizational units as a rule don't have.

Looking at the university as a whole, it emerges as a clearly structured (for academic and organizational content) and homogeneously designed mass of web portals and web sites - a "corporate web site farm". The

technical production of such a web site farm requires a web content management system, which makes it possible to allocate the responsibility for the content and functions of the individual web sites top-down to the organizational units, to whom the web sites "belong". Equally, the web content management system must be able to aggregate the accountability for higher responsibilities bottom-up to superior organizational layers within the university hierarchy.

Ideally, a student should be able to find all the descriptive information and interactive functions which are relevant to his/her individual program and classes in the school's web portal (enrolment, hours, places, lecturers, description of content, tasks required, literature recommendations and others). This information should be made available not only to registered students, but also to people interested in studying, in order to contribute effectively towards the acquisition of more students. School or department portals group together general information that the student needs for planning his/her 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 the schools 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 organizational forms of learning with the aid of electronic media. At university schools 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 his lectures requiring presence. Moreover, the students can discuss the contents of the lecture with eachother 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 "research and teaching" of a university. For the e-learning program the lecturers require practical technical instruments, teaching materials that have been prepared specially for e-learning and the relevant didactic qualifications.

The Web already integrates a broad palette of e-learning instruments in the online area, serving as a technical basis. A common characteristic of the majority of LMS is that there is a limit in functions on both electronic and blended learning for students and lecturers, i.e. internal university addressees. Their e-learning requirements can not 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. The symptoms of this type of disintegration are unfortunately too often evident online: schools/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, 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 etc. 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 etc. 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 organizational 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 the data is being kept separately.

Within a university "corporate web site farm" which is clearly structured from an academic and organizational 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 over.

3. SOLUTION: AN EXTENDABLE WCMS WITH PLUG-IN LMS

For the eBusiness presence of an organizationally decentralized university, the presentation of a collection of general information and links to the decentral organizational units is the basic task of a portal, which constitutes the common public starting point for the entire decentralized group of organizations. Beyond its function of branching out, the portal is all the more useful for visitors, if more individual information and functions on the decentralized organizational units can be consistently integrated into the portal. In time-saving "one-stop visits" to the portal, visitors should be able to inform themselves as comprehensively, concisely, clearly and reliably as possible on the entire decentralized group of organizations. In decentralized organizational 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 decentralized organizational units is configured for the operator with selectionable information and functions. In a multi-layer decentral organizational environment the WCMS must be able to amalgamate a variable number of hierarchy-based or network-based portals in a united portal structure.

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-Universität (JLU) Giessen and the WCMS "web portal system" (WPS) in operation there will be bescribed as an example for the objectives described (WPS 2005 a). The WPS has been operating successfully since April 2002 for the portal of the entire School of Business Management and Economics at JLU and its currently 25 individual organizational units (WPS 2005 b). By mid-2005, the WPS was implemented for all the areas of three other schools 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.

The central starting point for every school is a web portal which navigationally integrates all the web sites of its organizational units and aggregates its public contents. A school portal, for example, lists all the courses offered by its organizational units in a course directory for the entire school. 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 organizational 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 school course directory is, for example, only of use, if it really does list all the school's courses. This is where the role of the WPS as a basis becomes clear: each decentral organizational unit keeps its individual contents up-to-date and records them all in the WPS and the contents are then centrally aggregated by the WPS for the entire school completely automatically. The responsibility for the "quality of the portal" is thus largely handed over to the organizational units (Schwickert 2004 b).

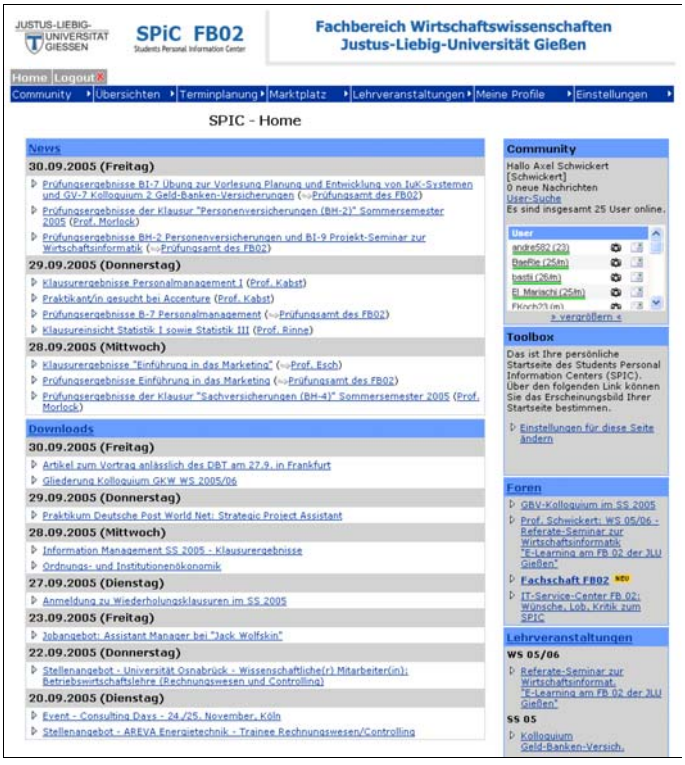
The extendability of a WPS for a university portal structure is scalable from two perspectives. On the one hand, the WPS can gradually be extended to the university's decentral organizational units. Several

WPS, for example, for different schools can be technically operated parallel and ensure that content, function and navigation are aggregated not only within the school, 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 organizational unit a multitude of prefabricated and ready-to-use functions for the production and filling of its public web site, for example: newsboards, a download center, online editions, online forums, marketplace and shop solutions, administration of lists of people, publications, projects and links, administration of courses and special events, online enrolment, online evaluation as well as site, page, template and menu editors. Authorized administrators can control whether and which organizational units can go online with individually designed web sites, or whether all the web sites of a school, for example, must use a uniform corporate design template.

Moreover, the quantity of functions can be scaled by the selective activation of integrated LMS functionalities, as soon as the public portal / site structure has been established in the university's organizational units. The WPS produces these LMS functionalities by optionally plugging in SPIC (Students' Personal Information Center) and TAC (Teachers' Administration Center).

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

Fig. 2. SPIC/TAC environment at JLU Giessen



The SPIC /TAC environment is illustrated in fig. 2. A student occupies the courses he is attending in the current semester in his SPIC environment (by enroling online either with or without authentification), puts together his timetables and appointments, subscribes to the relevant newsboards, downloads, forums and evaluates his courses.

The lecturer is offered extended functions for his courses in the TAC environment. With these functions, the lecturer can activate online enrolment for his courses if he 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 authentification within the framework of the PKI (Public Key Infrastructure) at JLU Giessen (Treber 2004). The lecturer can configure the system according to his 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 his courses.

The introduction of SPIC for the students of the School of Business Management and Economics started in December 2004 and ran very smoothly without any instructive measures. There are currently (January 2006) 2,450 active registered SPIC users – this constitutes approx. 95% of the students enroled in the school. At the time SPIC was introduced, all the courses (approx. 300 in the 04/05 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.

Since the introduction of the WPS and the SPIC/TAC, new structures have emerged automatically as regards 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 organizational units (professors, research institutes, work groups, 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 his own content and putting it online.

4. CONCLUSION: TECHNOLOGY ENABLES ORGANIZATION!

If each author is personally responsible for putting his content online – i.e. with no further editorial checks - there is, in principle, the danger that the quality of content suffers. Experience in the schools of JLU Giessen using WPS has, however, 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 schools concerned has improved categorically in comparison to the quality of the content before the implementation of the WPS.

Alongside the impact on the quality, a considerable impact on quantity can be observed for the schools' portals and sites. Monitoring the publishing process has proved that the quantity of published news, downloads, info pages, forums, announcements, directories etc. has multiplied and continues to grow in all the schools. In the same way, the number of visitors to the public portals and individual web sites is permanently rising. Here the performance of the website 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.

Finally, 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 "web master", 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 orrganizational units with their own web site start using the WPS as application-service-providing-solution in the school, they no longer need their own system administrator and save costs for the individual maintenance and servicing of redundant system technology within the organizational units. Initial acquisition and customization costs and a limited running expense for the maintenance of the system software (LAMP) for the WPS are covered by a multitude of organizational units. The simplicity of the publishing process per WPS largely makes it no longer necessary to employ experienced technicians. Personnel costs for this – mostly for student jobs – can, as a result, be reduced considerably.

As regards the portal, costs have also dropped, 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 sub-portals 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 cost reduction induced by the WPS in the field of web content management pays off the necessary investments of the school within 2 years and largely overcompensates for the running costs induced by the WPS.

REFERENCES

SCHWICKERT, A. C., 2004 a: Dezentrales Web Content Management, in: Geberl, S.; Weinmann, S.; Wiesner, D. F. (Hrsg.): Impulse aus der Wirtschaftsinformatik, Physica-Verlag, Heidelberg 2004, S. 247-260.

WPS 2005 a: Informationen zum WPS online unter http://www.web-site-engineering.de/, 03. Oktober 2005.

WPS 2005 b: Der Fachbereich Wirtschaftswissenschaften an der JLU Gießen online unter http://wiwi.uni-giessen.de/.

SCHWICKERT, A. C., 2004 b: Schwickert, Axel C.; Grund, Henning: Web Content Management – Grundlagen und Anwendung mit dem Web Portal System V. 2.5, in: Arbeitspapiere WI, Nr. 3/ 2004, Hrsg.: Professur BWL – Wirtschaftsinformatik, JLU Giessen 2004.

TREBER, U., 2004: Treber, Udo; Berg, Jan H.; Schwickert, Axel C.: Smart-Card-Anwendungen am Fachbereich Wirtschaftswissenschaften der JLU Giessen, in: Arbeitspapiere WI, Nr. 7/2004, Hrsg.: Professur BWL – Wirtschaftsinformatik, JLU Giessen 2004.