

# A Reference Model for the Evaluation of Information Systems for an Integrated Campus Management

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Integrated Information Systems, Integrated Campus Management, IT in Higher Education

## 1. EXECUTIVE SUMMARY

More and more higher education institutions are implementing so called integrated campus management systems to face the occurring challenges in the higher education sector and meet the demands and expectations from an IT-based point of view. Such a system facilitates a multitude of business processes for higher education institutions, which are often referring to the same data and should lead to universal, cross-functional business processes and their integrated IT support. Thereby, the question arises in which way and along which criteria to choose such a solution for an integrated campus management system.

### 1.1. Objective

Answering the following questions is the main objective of this article: Which functionalities are to be supported by a campus management system? Which are the requirements of a higher education institution for an integrated campus management system? How can the criteria be consolidated for the purpose of a software evaluation?

To answer these questions, we developed a holistic reference model for the evaluation and selection of an integrated campus management system. This reference model supports the structured and systematic selection of such integrated information systems in order to facilitate the strategic choice of software for supporting the business processes of a higher education institution. With this systematic software selection approach - including specific methods of project management - the implementation risk is reduced substantially.

For that, we firstly introduce the demand for an integrated campus management system as well as its typical functionalities. Afterwards, a process model for the information system evaluation is presented, which builds the basis of the framework. Criteria for the selection of a campus management system are being developed; therefore, the general criteria for a software evaluation process coming from the literature as well as specific criteria for integrated campus management systems are going to be compiled.

### 1.2. Conclusions

The main result is a reference model for the evaluation of an integrated campus management system which helps to encounter the strategic decision for such a system and meets the specific requirements of a higher education institution. The decision which campus management system is going to be implemented must not be an intuitive decision but has to be made according to specified and explicitly selected criteria.

## 2. INTEGRATED CAMPUS MANAGEMENT SYSTEMS

In the following, we present the demand for integrated campus management systems and depict the typical areas of responsibility and functionalities of such systems. Finally, selected campus management systems are introduced.

### 2.1. Demand

With the Bologna declaration, several aims for the further development of the European higher education area are committed. (*Bologna Declaration, 1999*) According to the consequent changes and the enlargement of the education a higher administration effort is arising. The higher education institutions and their administration must react with organisational and technological solutions to these complex challenges. (Eberhardt, 2003) The IT infrastructure of higher education institutions is often grown historically, and several isolated applications exist in the faculties or the administration, resulting in a high maintenance effort and causing high costs. With the help of modern information systems, higher education institutions can decrease their costs and increase their quality of service. Campus management systems can map the necessary structures and functionalities. Those integrated systems contain all areas like teaching, research and administration with all its core, control and support processes. (*eDeveloper, 2007*) Particularly in teaching and research there is an intensive competition about staff, students and financial resources. In the actual departments of the institution similar information is needed which is often based on the same data. Therefore, the necessity of an integration of several sources is becoming obvious. The aims are uniform, cross-departmental business processes and their integrated IT support.

### 2.2. Area of Responsibility

One can identify several areas of responsibility that can be supported by an integrated campus management system. The areas can be split up into student lifecycle, exam administration, other processes in teaching and academic courses and the administration processes: (*eDeveloper, 2007; Recommendation Software Selection, 2006; Campus Online, 2004*)

- keeping of master data (staff, students)
- student administration (enrolment → removal)
- exam administration (application, marks, reports and certificates)
- course administrations (courses, including descriptions, evaluations)
- resource administration (rooms, media resources)
- e-learning (structured information, communication and organisation platform)
- application management (organisation of marketing operations, correspondence)
- alumni (ongoing support services, networking)
- staff administration (academic/non-academic staff)
- finances (administration)
- document management (study and examination regulations, forms)

Additional functionalities for campus management systems are depicted in section 4. Such a system should also include - in addition to the above mentioned functions - interfaces for the integration with existent systems which are used furthermore as standard software (like accounting/financial controlling, human resources, and procurement), if these functions are not components of the integrated solution. (Brune, Jablonski, Möhle, Spitta, & Teßmer, 2009)

## 2.3. Software Solutions

Table 1 gives a brief introduction of several campus management systems. The presented selection is limited to integrated systems which offer a broad number of functionalities. By means of an online research 22 systems were identified. Most of the identified systems provide an English interface. We do not describe the functionalities of the systems according to the aim of this article to provide a reference model for the software selection.

**Table 1: Overview of European Campus Management Systems**

System (Vendor)	Website	Implementation country and further comments
<b>academyFIVE</b> (Simovative)	<a href="http://www.simovative.com">http://www.simovative.com</a>	Germany, UK and Austria
<b>Agresso Students &amp; Agresso Education Management System</b> (Unit 4 Agresso)	<a href="http://www.agresso.co.uk/Agresso/HE-Sector">http://www.agresso.co.uk/Agresso/HE-Sector</a>	International
<b>aranexCampus</b> (aranex)	<a href="http://www.aranex.de">http://www.aranex.de</a>	Germany
<b>Banner Unified Digital Campus</b> (SunGard Higher Education)	<a href="http://www.sungardhe.com">http://www.sungardhe.com</a>	International
<b>Cambridge Student Information System (CamSIS)</b> (University of Cambridge)	<a href="http://www.camsis.cam.ac.uk">http://www.camsis.cam.ac.uk</a>	UK (Origin and usage in University of Cambridge)
<b>Campus Management</b> (SAP AG)	<a href="http://www.sap.com/uk/industries/highered/index.epx">http://www.sap.com/uk/industries/highered/index.epx</a>	Germany
<b>CampusNet</b> (Datenlotsen)	<a href="http://www.datenlotsen.de">http://www.datenlotsen.de</a>	Germany
<b>CampusOnline</b> (TUGonline) (TU Graz)	<a href="https://online.tu-graz.ac.at">https://online.tu-graz.ac.at</a>	Austria EUNIS award 2003
<b>CAS Campus</b> (CAS Software AG)	<a href="http://www.cas.de/English/">http://www.cas.de/English/</a>	Germany
<b>CLX.Evento</b> (Crealogix Group)	<a href="http://www.evento.ch/">http://www.evento.ch/</a>	Switzerland
<b>HISinOne</b> (Hochschul-Informationssystem GmbH - HIS)	<a href="http://www.hisinone.de/english">http://www.hisinone.de/english</a>	Prototype Germany
<b>FACTScience</b> (QLEO GmbH)	<a href="http://www.qleo.de">http://www.qleo.de</a>	Germany
<b>Konosys Education</b> (E-Charlemagne)	<a href="http://www.e-charlemagne.fr/version_uk/kerpEduc.htm">http://www.e-charlemagne.fr/version_uk/kerpEduc.htm</a>	France
<b>Masaryk University Information System (IS MU)</b> (Masaryk University)	<a href="http://is.muni.cz">http://is.muni.cz</a>	Czech Republic EUNIS Award 2005
<b>PeopleSoft Campus Solutions</b> (Oracle)	<a href="http://www.oracle.com/applications/peoplesoft/campus_solutions/ent">http://www.oracle.com/applications/peoplesoft/campus_solutions/ent</a>	International
<b>SIGARRA</b> (Faculty of Engineering of the University of Porto)	<a href="http://www.fe.up.pt">http://www.fe.up.pt</a>	Portugal EUNIS Award 2001
<b>SITS</b> (Tribal Group)	<a href="http://www.tribalgroup.co.uk/ServicesAndSectors/Pages/servicesSITSVision.aspx">http://www.tribalgroup.co.uk/ServicesAndSectors/Pages/servicesSITSVision.aspx</a>	UK
<b>S-Plus</b> (Scientia)	<a href="http://www.scientia.com/uk/">http://www.scientia.com/uk/</a>	International
<b>Student Information Management System (SIMS)</b> (Cardiff University)	<a href="http://www.cardiff.ac.uk/sims/">http://www.cardiff.ac.uk/sims/</a>	UK
<b>Student Information System (SIS)</b> (Queen's University Belfast)	<a href="http://www.qub.ac.uk/directorates/InformationServices/">http://www.qub.ac.uk/directorates/InformationServices/</a>	UK
<b>University Study-Oriented System (USOS)</b> (University Centre for Informatization, MUCI)	<a href="http://www.usos.ukw.edu.pl">http://www.usos.ukw.edu.pl</a>	Poland EUNIS Award 2007
<b>UnivIS</b> (Config Informationstechnik eG)	<a href="http://www.config.de/UnivIS">http://www.config.de/UnivIS</a>	Germany

## 3. METHODOLOGY OF A SOFTWARE SELECTION

Basically, the decision to implement a system of a market leader does not constrain the success of the implementation. However, the impact of a failed software implementation on the business and the resulting costs can be enormous and indicate the importance of a structured software selection process. (Vering, 2007) The limitation to only financial criteria during the software analysis is insuf-

ficient. (Teltumbde, 2000) Taking into account the high number of affected staff, the high influence on the business processes and the impact on the different groups (e.g., students, lecturers) as well as the long effect period of such a decision the strategic character of the selection process is becoming clear. (Wiese, 1998) Furthermore, not only so-called hard facts have to be taken into account, but also soft facts. For that reason, the selection process of an integrated campus management system has to be structured and systematic; methods of project management have to be included. Such a structured method is presented in this section. The stated procedure model for a software selection shall be used as a conceptual framework for the selection project. The concept is based on the models of Vering (2007) and Wiese (1998). It contains four phases (Figure 1).

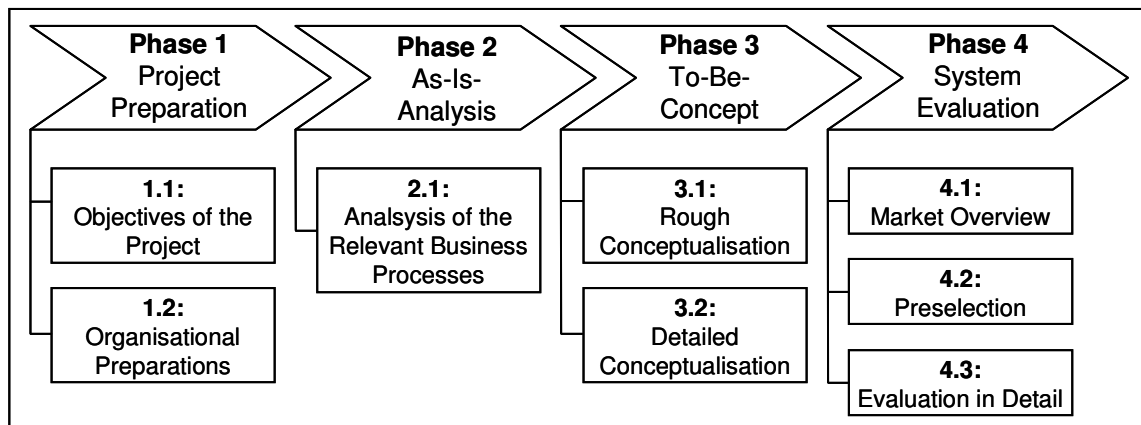


Figure 1: Selection Frame Concept (Vering, 2007; Wiese, 1998)

*Phase 1* contains basic steps of the project preparation. In a first step the objectives of the project are expatiated and substantiated. They are the basis for the subsequent derivation of the criteria for the evaluation of the software alternatives. In *Phase 2* the business processes of the higher education institution are analysed in detail. Concerning this, the areas which should be supported by the system are retrieved; in a second step the individual business processes (e.g., application) are examined in detail. In *Phase 3* the criteria for the software selection are constituted. By further detailing and operationalisation verifiable single criteria are derived from the system of objectives (Phase 1.1). During the phase of rough conceptualisation basic requirements (so-called knockout criteria) are evolved to facilitate a screening of potential software vendors. After that the detailed requirements for the campus management system are defined. The result of this phase is a detailed criteria catalogue (requirement specification) which builds the basis for the system evaluation of *Phase 4*. In this phase the actual system evaluation is following in terms of identification, analysis and assessment of the integrated campus management solutions. In a first step all possible software vendors and products are to be identified. They will be tested by means of the rough conception. The remaining systems are evaluated in detail in phase 4.3; the basis for that is the evolved criteria catalogue. (Sontow & Treutlein, 2007; Teltumbde, 2000; Vering, 2007) The result of phase 4 is a decision for a campus management system, which will be implemented at the higher education institution in a next step (which is not part of this article anymore).

#### 4. REQUIREMENTS OF AN INTEGRATED CAMPUS MANAGEMENT SYSTEM

The derivation of concrete requirements for an integrated campus management system arises from the definition of objectives which is determined in phase 1.1 (see section 0). The established system of objectives is gradually refined, until it has reached a sufficient level of detail. The criteria catalogue, which is the result of phase 3.2, is therefore derived hierarchically.

A possible system of objectives is depicted in Table 2. Consciously it is kept at an abstract level as it will be refined in phase 3. Furthermore, it is not supposed to pick up functional details to the system of objectives. The criteria were derived from the literature about software selection and implementation, especially in the area of enterprise resource planning (ERP) systems, as well as the current literature about campus management systems. (Alves & Uhomoihi, 2008; Aumann et al., 2007; *Recommendation Software Selection*, 2006; Fumy & Sauerbrey, 2005; Kirchner & Jung, 2001; *Campus Online*, 2004; Vering, 2007; Wei, 2007; Wiese, 1998)

**Table 2: Objectives of the Selection Project**

Basic Objectives	
Total costs/Efficiency	cost inspection, hardware requirements, different variants (customising etc.)
User-friendliness/Ease of use	simple usage of the system (web interface, multi-language etc.)
Data privacy and reliability	guarantee of data privacy and reliability of the system
Flexibility	adaptability, ability to a institution-specific configuration
Support	guarantee of user support and trainings etc. by the system vendor
Central data pool/basis	data basis of the system (especially the master data) has to be kept centralised
Integration with existing systems	existing systems which are going to be used furthermore have to be integrated through interfaces to the campus management system
Soft facts	appearance of the vendor, impression of the user interface (to the staff), etc.
Specific Objectives for Higher Education Institutions	
Mapping of the master data and the concurrent maintenance mechanisms	storage and maintenance of the master data of staff, students and alumni
Mapping of the business processes of the institutions	support of the required process structure and functionalities, decrease of the bureaucratic complexity
Identity Management	promotion of a single sign on (SSO) etc.

This system of objectives will be refined in the following sections. At the particular points, we will refer if the actual criterion is a knockout criterion according to the rough conception or if it is a criterion following the detail conception.

#### 4.1. General Criteria for Integrated Software Solutions

Taking into account the *total costs* of the system several points have to be considered: firstly, the costs of the software itself, but also annual expenses for maintenance and support of the software. One cannot neglect the staff costs for the implementation of the product and necessary trainings as well as a subsequent support and costs for required release changes, etc. Furthermore, the costs for the needed hardware are to be taken into account; possibly currently existing hardware can be used. For the *efficiency* the vendors have to be considered with regard to their existence at the market as well as the expansion of the segment 'higher education'. Also the further development of the product and the experience of the vendor with the implementation process (reference installations) are important. (*Recommendation Software Selection, 2006; Campus Online, 2004*)

Regarding to the *user friendliness* and *ease of use* the ergonomics of the system is a central aspect. Measurable criteria are the 'look and feel' of the user interface as well as an equality of the execution of similar tasks with other programmes, the clearly structured arrangement of control elements on an intuitively useable user interface, etc. Besides, the user is reliant upon support of the vendor. This implies an appropriate installation and documentation of the programme. Furthermore, the stability of the programme has to be guaranteed. (*Recommendation Software Selection, 2006; Kirchner & Jung, 2001*)

The *data privacy* and the *reliability* (i.e. the safeguarding against failure) are also important. Data privacy is regarding to the protection of the data against abuse, unauthorised access or usage as well as a change or corruption of the saved data. The data integrity has always to be guaranteed; this is taking into account methods of data backup (*knockout criterion*). Personal data are only to be transmitted encrypted (*knockout criterion*). The access and modification rights have to be managed through an identity management (see section 4.2). Especially for the web functionalities a secure transaction management has to be guaranteed. Furthermore, all duties of secrecy have to be fulfilled according to local legal practices (*knockout criterion*). Appropriate activities for the reliability of the system have to be considered (*knockout criterion*) to guarantee an adequate availability of the system. (*Campus Online, 2004*)

Regarding to *flexibility* the platform independence of the system has to be taken into account (*knockout criterion*), because it is often not clear whether all users are using the same operating system. Moreover, the system functionalities should be customisable to the special requirements of higher education institutions; possibly not all potential functionalities of the campus management

solution should be applied. The scope of operation should therefore be scalable (*knockout criterion*). Furthermore, the system should support several languages; especially in the course of increasing internationalisation (see section 2.1) this is an important criterion. (Kirchner & Jung, 2001; *Campus Online*, 2004)

After the implementation phase of the system an appropriate *support* by the vendor has to be guaranteed (*knockout criterion*). Besides, adequate trainings for the system should be provided for the particular user groups. (Kirchner & Jung, 2001; *Campus Online*, 2004)

A *central data basis* is an important criterion for the system (*knockout criterion*). To avoid redundancies the system has to provide access to a common database which is keeping the necessary data (master data, exam relevant data, etc.). It is important that not every user has access to the data, but only to the required data record according to the corresponding authorisation.

Even though it is the objective of a campus management system to support all business processes of a higher education institution, it can be necessary to *integrate existing systems* which will be used furthermore after the implementation of the new system. However, this is affecting systems such as accounting, human resources, or procurement and should be possible with the help of interfaces.

In addition to the above mentioned hard facts several *soft facts* have also to be taken into account. This is including factors which are emotional, dependent on persons and hard to perceive, like the appearance of the software vendor and the appeal of the user interface to the staff. These factors are harder to evaluate than the above mentioned hard factors; nevertheless it is important to ensure an intersubjective verifiability in the evaluation. For this reason, it is advisable to adhere to a structured procedure.

## 4.2. Requirements from Higher Education Institutions

The users of a campus management system can be divided into different groups. These are firstly students, lecturers and other persons involved in teaching, secondly, administration staff, alumni and - according to the scale of the system - also scientists, library staff and other staff. For all user groups the relevant master data should be kept that are needed in the particular business processes. It is recommended that the users can change their data themselves if necessary (e.g., address).

According to the above classification of user groups we will now exemplarily present the requirements to the functionalities of the system. Due to the increasing customer and service orientation also in the higher education section we will concentrate on the group of students. Due to limited space the other functionalities are mentioned in the general criteria catalogue in section 5. There they are given in a process oriented point of view, different from the following.

For a reinforcement of higher education institution in the competition and therefore the necessary increase of service quality a comprehensive offer of functionalities of the campus management system has to be provided to the students. This is requiring a complex structure of the system, but is also reducing the administration effort in teaching. It has to be possible for the students to inform themselves about the particular examination regulations. They need a structured summary of the requirements of their chosen degree programme including a summary of adduced and missing exams. The application to courses and the associated exams has to be possible, as well as the creation of a personal course schedule. If the dates of chosen courses or exams are changed, the students have to be informed automatically. Furthermore, the system should provide e-learning functionalities: it should be possible for lecturers to provide teaching material, also a submission of academic assignments should be possible. Besides, the course evaluation should be available in the system. Finally, the library functionalities are to be mentioned. Additionally, the integration of a content management system for the maintenance of the web sites of the institution should be taken into account. (Aumann et al., 2007; *eDeveloper*, 2007; *Recommendation Software Selection*, 2006; *Campus Online*, 2004)

All these functionalities should be accessible via a web portal. Every user should have his own account, with which he gets access to the services and information he is authorised for. (Aumann et al., 2007) Due to the time and location independence of the course and exam information and the self-services of the campus management system the planning and scheduling gets much easier for the students. Moreover, the realisation of a web application contributes to the platform independency of the system. The data security and privacy has always to be guaranteed (see section 4.1); it is

also important to assure the identity of the users, especially with legally valid transactions (e.g., exam application). This is also showing the necessity of an *identity management* to implement concepts and methods for the registration and administration of user identities. Every user gets a unique identity which can be partially imported from the master data of the system. Furthermore, authorisations in terms of roles, rights and group affiliations as well as the automatic allocation with the user identities are needed. The particular roles of the users' identities can be derived from the master data. Students can, among others, have the role of a course attendee to get access to the course materials. With the identity management the identification and authentication of the users is controlled. This should be implemented by a Single Sign On (SSO) to prevent from repeated login procedures. (Alves & Uhomoibhi, 2008; Fumy & Sauerbrey, 2005)

## 5. CONSOLIDATION

The criteria from section 4.1 and 4.2 are now compiled to a detailed catalogue (Table 3). The criteria are sorted hierarchically, the main categories are the objectives shown in Table 2. The classification of the knockout criteria according to the rough conception has to be verified by each higher education institution individually. After the definition the software products have to be evaluated whether they satisfy the criteria. Possibly several products are already excluded from the further evaluation.

**Table 3: Criteria Catalogue**

Total costs	Mapping of the business processes of the institutions
Software costs Costs for maintenance and support (annual) Staff costs (implementation, trainings and support) Costs for release changes/versioning updates Hardware costs	<i>Student management</i> <ul style="list-style-type: none"> <li>• building of personal schedules</li> <li>• notification about changes of dates</li> <li>• printing of enrolment confirmations</li> <li>• online enrolment</li> </ul> <i>Alumni management</i> <ul style="list-style-type: none"> <li>• administration of the alumni according to the degree programmes</li> <li>• information and communication platform</li> </ul> <i>Exam management</i> <ul style="list-style-type: none"> <li>• feeding of exams to the system</li> <li>• application for exams by the students</li> <li>• display list of attendee</li> <li>• entering of marks for the lecturers</li> <li>• display of exam results (single result for student, lists for administration staff and lecturers)</li> <li>• overview of courses/study achievements</li> <li>• preparation and printing of certificates and testimonials</li> <li>• printing of course certificates</li> </ul> <i>Course administration</i> <ul style="list-style-type: none"> <li>• feeding of courses to the system, mapping to lecturers</li> <li>• definition of constraints for the participation</li> <li>• interlinking with resource administration</li> <li>• creation of university catalogues</li> <li>• application to courses</li> </ul> <i>Document management</i> <ul style="list-style-type: none"> <li>• access to examination and study regulations</li> <li>• provision of forms etc.</li> </ul> <i>Resource Administration</i> <ul style="list-style-type: none"> <li>• room administration</li> <li>• administration of media devices, other resources</li> <li>• interlinkage of the resources with the course administration</li> </ul> <i>E-Learning</i> <ul style="list-style-type: none"> <li>• provision of course materials by the lecturers</li> <li>• communication platform for the students</li> <li>• submission of academic assignments</li> </ul>
<b>Efficiency</b> Development of the vendor at the market Expansion of the segment ,higher education' Further development of the product Experience of the vendor (reference installations)	
<b>User friendliness/ease of use</b> Ergonomics <ul style="list-style-type: none"> <li>• ,look and feel' of the user interface</li> <li>• intuitively useable user interface</li> <li>• clearly structured arrangement of control elements and its ability of configuration</li> <li>• behaviour about human errors</li> <li>• accessibility according to the guidelines of the W3C</li> </ul> User-friendly installation Programme documentation Stability	
<b>Data privacy and reliability</b> Guarantee of data integrity Automatic Backups Firewall Encrypted data transmission Control of access and change rights Secure transaction management Fulfilment of duties of secrecy (data protection and privacy) Guarantee of an adequate availability (reliability)	
<b>Flexibility</b> Platform independence Modular, customisable scope of functionalities Multi-language system	

<b>Support</b>	<b>Mapping of the business processes of the institutions</b>
Support after the implementation phase Offering of trainings	<i>Course evaluation</i> <ul style="list-style-type: none"> <li>• provision of an evaluation after completion of a course</li> <li>• reminder to the students</li> <li>• provision of the results to the lecturers</li> </ul>
<b>Central data pool/basis</b>	<i>Application management</i> <ul style="list-style-type: none"> <li>• overview/summary of initiated marketing campaigns</li> <li>• repository of, access to adverts, descriptions of degree programmes etc.</li> <li>• management of prospective students</li> </ul>
Keeping of a common, central data basis Access control to the central data basis	<i>Web portal</i> <ul style="list-style-type: none"> <li>• provision of a web portal</li> <li>• role-specific provision of the functionalities</li> </ul>
<b>Integration with existing systems</b>	Consideration of institution-specific characteristics Content management system Library (literature research, access to one's account) Human resource management Financial administration Supply management Hierarchical organisation directory
Interfaces for an integration of existing systems that should be used furthermore	
<b>Soft facts</b>	
Appearance of the software vendor Appeal of the user interface to the staff Differences in the use of the system (in contrast to the single systems used before)	
<b>Mapping of the master data</b>	
Central keeping of master data about the students, alumni and staff Maintenance mechanisms <ul style="list-style-type: none"> <li>• Independently by the particular persons</li> <li>• Centrally by e.g., administration staff</li> </ul>	
<b>Identity Management</b>	
Automatic building and maintenance of the identities Administration and allocation of the authorisations Role-based control of the access rights Unique identification of the users Single Sign On (SSO)	

In the next step, the software solutions have to be evaluated according to the criteria of the requirements catalogue (Table 3). For that, it is advisable to let the software vendor give a demonstration of their product. Not only the persons in charge of the project but also the staff that will be using the system later on have to be involved. An early involvement is not to be underestimated for the later identification with the new system.

For the evaluation method several alternatives are available, the utility analysis is a very common method. (Wiese, 1998) Nevertheless which scoring model is chosen, for every software alternative a total utility score is calculated, which builds the basis for a decision for a software alternative.

## 6. CONCLUSIONS

In this article we present a reference model for the evaluation of integrated campus management systems. The idea for an integrated information processing is certainly not new, but it is representing a current area of interest in the context of higher education. For the development of the reference model we therefore reviewed the literature about the evaluation of prevalent information systems (e.g., ERP systems). However, the main focus is lying in the derivation of a criteria catalogue which is answering the questions about the functionalities and the requirements of a campus management system. The criteria catalogue is derived from the objectives of the selection project. Firstly, general criteria for the evaluation of software solutions were presented. In a next step, specific functionalities for higher education were taken into account. These criteria were compiled into a detailed catalogue which is used for the actual evaluation of the system in the last step of the reference model. Not only the persons in charge of the project, but also the future users of the system have to be involved to prevent from later acceptance problems. This is also recommended in change management initiatives which should already be implemented in parallel. In the following process of the software choice a structured implementation process should be initiated which is including the abovementioned change management. Because such a system implementation is not the intention of the present article we refer to the common literature. (Degenhardt, Gilch, Stender, & Wannemacher, 2009; Janneck, Adelberger, Fiammingo, & Luka, 2009; Paton & McCalman, 2008)

The presented reference model is a first step to the structured evaluation of campus management systems; it is intending further research. In the next step the reference model has to be empirically verified and refined.

## REFERENCES

- Alves, P., & Uhomobhi, J. (2008). *Identity Management and E-learning Standards for Promoting the Sharing of Contents and Services in Higher Education*. Paper presented at the EUNIS 2008.
- Aumann, S., Fister, M., Gövert, N., Hüvelmeyer, J., Müller, N., Pirr, U., et al. (2007). *Personalisierte Webportale für Hochschulen: Arbeitsgruppe "Webportale" (Personalised Web Portals for Higher Education Institutions: Work Group 'Web Portals')*: Deutsche Initiative für Netzwerkinformation e. V. (DINI).
- Brune, H., Jablonski, M., Möhle, V., Spitta, T., & Teßmer, M. (2009). *Ein Campus-Management-System als evolutionäre Entwicklung: Ein Erfahrungsbericht (A Campus Management System as Evolutional Development: Experiences)*. Paper presented at the 9th International Conference on Business Informatics, Vienna.
- Degenhardt, L., Gilch, H., Stender, B., & Wannemacher, K. (2009). *Campus-Management-Systeme erfolgreich einführen (Successful Implementation of Campus Management Systems)*. Paper presented at the 9th International Conference on Business Informatics, Vienna.
- Eberhardt, T. (2003). *Informationssysteme für Hochschulen: Wettbewerbsvorteile durch interne und externe Rechnungslegung (Information System for Higher Education Institutions: Competitive Advantages by Internal and External Accounting)*. Wiesbaden: Deutscher Universitäts-Verlag.
- eDeveloper Basis für das erste integrierte "UNI-ERP" - Magic-Partner Datenlotsen mit Campus Management System erfolgreich (eDeveloper Basis for the First Integrated 'University ERP' - Magic Partner Datenlotsen Successful with Campus Management System)*. (2007).
- Empfehlung für die Auswahl eines Softwaresystems Prüfungsverwaltung/Campusmanagement (Recommendation for the Selection of a Software System Exam Administration/Campus Management)*. (2006): Helmut Schmidt University, University of the Federal Armed Forces Hamburg.
- Fumy, W., & Sauerbrey, J. (2005). Identity & Access Management: Schneller ROI und verbesserte Sicherheit durch effiziente Rechtevergabe und Zugriffskontrolle (Fast ROI and Improved Security via Efficient Allocation of Rights and Access Control). In B. Kuhlin & H. Thielmann (Eds.), *Real-Time Enterprise in der Praxis: Fakten und Ausblick*. Berlin et al.: Springer.
- Janneck, M., Adelberger, C., Fiammingo, S., & Luka, R. (2009). *Von Eisbergen und Supertankern: Topologie eines Campus-Management-Einführungsprozesses (About Icebergs and Super Tankers: Topology of a Campus Management Implementation Process)*. Paper presented at the 9th International Conference on Business Informatics, Vienna.
- Joint Declaration of the European Ministers of Education ('Bologna Declaration')*. (1999).
- Kirchner, L., & Jung, J. (2001). *Ein Bezugsrahmen zur Evaluierung von UML-Modellierungswerkzeugen (A Reference Framework for the Evaluation of UML Modelling Tools)* (Workingpaper No. 26): Institute for IS Research, University of Koblenz-Landau.
- Landes-Hochschul-Informationssystem Campus Online: Konzeption für ein landesweites Hochschulinformationssystem an den Hochschulen in Mecklenburg-Vorpommern (Higher Education Information System Campus Online: Conception for a State-wide Higher Information System at the Higher Education Institutions in Mecklenburg-Western Pomerania)*. (2004): Arbeitsgruppe Landes-Hochschul-Informationssystem.
- Paton, R., & McCalman, J. (2008). *Change Management: A Guide to Effective Implementation* (3rd ed.). London et al.: Sage Publications.
- Sontow, K., & Treutlein, P. (2007). Einsatz von Werkzeugen zur Softwareauswahl am Beispiel des IT-Matchmakers (Employment of Tools for Software Selection Showing the Example of the IT-Matchmaker). In J. Becker, O. Vering & A. Winkelmann (Eds.), *Softwareauswahl und -einführung in Industrie und Handel: Vorgehen bei und Erfahrungen mit ERP- und Warenwirtschaftssystemen* (pp. 109-127). Berlin et al.: Springer.
- Teltumbde, A. (2000). A Framework for Evaluating ERP Projects. *International Journal of Production Research*, 38(17), 4507-4520.

Vering, O. (2007). Systematische Auswahl von Unternehmenssoftware (Systematic Selection of Enterprise Software). In J. Becker, O. Vering & A. Winkelmann (Eds.), *Softwareauswahl und -einführung in Industrie und Handel: Vorgehen bei und Erfahrungen mit ERP- und Warenwirtschaftssystemen* (pp. 61-108). Berlin et al.: Springer.

Wei, C.-C. (2007). Evaluating the Performance of an ERP System Based on the Knowledge of ERP Implementation Objectives. *The International Journal of Advanced Manufacturing Technology (Online Publication)* Retrieved July 18, 2008, from:  
<http://www.springerlink.com/content/q127466147661610/>

Wiese, J. (1998). *Ein Entscheidungsmodell für die Auswahl von Standardanwendungssoftware am Beispiel von Warenwirtschaftssystemen (A Decision Model for the Selection of Standard Application Software by the Example of ERP Systems)* (Workingpaper No. 62): Department of Information Systems, Westfälische Wilhelms-Universität Münster.