

## The ABC-eBook System From Content Management Application to Mash-up Landscape

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**Abstract:** This paper presents a complete new application for creating content for teaching and learning purposes at universities in the meaning of eLearning2.0, the ABC-Manager. The paper focuses on the advantages of the tool as well as its didactical background in comparison to other common CMSs. The current use of the ABC-Manager as an integrated part of the e-Learning strategy of Graz University of Technology (TU Graz) especially in the face of its online version (eBook of the TU Graz TeachCenter) is discussed. Furthermore an adequate scenario for the use of the ABC-eBook System embedded in a mashup environment following the principles of Web2.0 is recommended.

### Introduction

#### In times of Web2.0

In times of Web 2.0 (O'Reilly 2006) efforts are made to make it as simple as possible to support user "YOU" to create and manage online content for a web portal. Not only personal information should be provided and treated but also the one for educational intention (Ebner 2007). The range between private and educational information becomes blurred evidently exercised by using the possibilities of mash-ups (Kulathuramaiyer, Maurer 2007). Creating and managing such content should be as simple as the ABC, instinctually and without any special system-syntax needed; a content management system that has its priority on creating and not on developing or programming.

#### What should a Content Management System (CMS) really do?

CMSs are applications that basically help users, authors to create, edit, mix, store, work with or embed content predominantly online. The meaning of a CMS has changed during the years subject to the evolution of e-Learning platforms. Today's CMSs often offer a variety of additionally to the assigned use of managing content; nearly by default they have a user administration area and tools for communication as well. This overload may mirror in a lack of its fundamental effort. To produce good and high quality information it is necessary to concentrate on the content itself but not on the creating of it (Holzinger 2002). Any complicated tool or syntax makes it harder or impossible for a non professional computer user to handle it. WYGIWYS-systems are to be preferred. The tool must be as intuitional and easy to use as possible. Web2.0 applications shall be includable because internet users are finally

used to it. Templates and possibilities for automated output variations help to reduce unessential workload and optimize therefore the workflow.

There are three different ways of working with content management systems (Web 1):

- **Server Sided CMS**

All procedures and operations that are in context with site keeping and actualization needs a server-sided script language that communicates with a database to manage the treatment of its content. Such systems automate main parts of the workflow and make it easier to handle.

- **Client Sided CMS**

Creating content is fixed to a local user computer that runs special software that includes all necessary processes for handling and managing the workflow. After creating and designing information locally, main parts have to be uploaded to the content holding server via FTP. It is often used in combination with systems that includes large media files in its content.

- **Hybridization of Server and Client Sided CMS**

This form mirrors the main parts of server sided and client sided content management systems. User rights were used to manage the system and the content. Only main parts were accessible for the user to treat his workflow and other parts were only in use by an administrator. There could be a local interface or software plug-in where you create content and after that where you upload it to your content management system automatically.

### ***Mashup systems - a new way of managing content?***

The definition from Wikipedia says: “In technology, a mash-up is a web application that combines data from more than one source into a single integrated tool; an example is the use of cartographic data from Google Maps to add location information to real-estate data from Craigslist, thereby creating a new and distinct web service that was not originally provided by either source” (Web 2). Whereas usual CMSs mainly focus on the creation of “own” authored content, the content of mash-ups are put together from different sources by linking or embedding them. Very often it is no longer obvious that the information or application you get on a website is in fact a mash-up. The technology behind may be public interfaces, APIs, RSS feeds or web services. One disadvantage is evident: if the source changes or dies that part of the mash-up does it too. It is a new way of managing content but it is a very flexible and changing one what may include a more encouraged monitoring at the time.

## **The TU Graz eLearning system**

### **“The Power of the People”**

With this mission statement the Department for Social Learning (Dept. SL) has been set into being on the 1st of September 2006 as a part of the Computer and Information Services (CIS) of TU Graz. The group focuses on the possibilities of networked based, communication guided teaching and learning processes to become sustained integrated into TU Graz. Computer Supported Collaborative Work – simply called e-Learning – is one chance to support the individuality of the learners study as well as to enable, coach and attend a customized offer of modern facilities for teachers to teach. This concept excellently fits into the principles of TU Graz to encourage its students und teachers with best didactical and up-to-date technological assistance for the study.

The educational concept of TU Graz is mainly structured into three layers depending on and connected to each other. On the basis of the internationally awarded university management software of the CIS, the CAMPUSonline – “EUNIS-Elite-Award” and “Award of the Austrian University Board” (Web 3, Web 4) –, an internet platform focusing on the teachers demands, the TU Graz TeachCenter (TUGTC) and a students portal, the TU Graz LearnLand (TUGLL) (Ebner, Holzinger, Maurer 2007) have been arranged completing each other. Individual projects with institutes and other universities as well as a tight cooperation with the LifeLongLearning (Ebner, Fickert, Nagler, Stöckler-Penz 2007) team of TU Graz top the initiatives of the Dept. SL.

### **The TU Graz TeachCenter – not just another platform**

The system of TUGTC goes back to the e-Learning landscape called „WBTMaster“ that has been programmed, tested and improved by the TU Graz Institute for Information Systems and Computer Media (IICM) by the team of

Prof. Nikolai Scerbakov under the direction of Prof. Hermann Maurer, head of IICM. The advantages of this platform unlike to comparable commercial systems or open source solutions are not only its autonomy to licenses, versions and update options but first of all its philosophy of modular structure. In practice this means that the platform can be individualized for each single course and therefore is highly adaptable to the requests of the teacher by adding teaching tools or removing them from the basic course equipment offered. Any item, any entity is meant to be a module. By setting a link to the module content different modules can be summed up to so called S-collections (structured collection) that themselves can be seen as single modules again. A module can be any piece of enclosed content as well as teaching tools like simple document management equipment (up- and download center) or popular options of communication (chat, forum) up to online applications such as testing areas. Administrative data (user's password and authorization) come from CAMPUSonline system; so only one time login is needed for both systems.

### **EBook at TU Graz TeachCenter**

One of the modular features described before is the so called eBook of the TUGTC. A single eBook can be seen as a number of multimedia elements (such as HTML documents, PowerPoint-slides, PDF-files, movies, etc ...) combined into reusable, navigable collections. The generation of an eBook is partly automated. The author uploads content-files to TUGTC. During the process of generation files including metadata about the structure and relation between the single content-elements are created. On base of these editable metadata-files a map of the eBook and the table of content are compiled. A final linking of the eBook with a course on TUGTC which embeds the eBook into an eBook environment completes the compilation. The eBook environment itself provides a convenient document accessing facilities (table of content, map, search, bookmark, etc.). Additionally an eBook provides such communication features as annotation and discussion plus conventional user-control features – statistics, map of visited pages, results of answering embedded questions and more. Even realtime online micro-blogging is possible. eBooks can be released in three different formats: internal S-Collections, SCORM (Web 5) packages and LRN (Web 6) packages.

## **The ABC-eBook System**

### **The ABC-System**

#### *How can you structure and create content for flexible usage in online and offline systems?*

Motivated by the initiative “New Media in teaching at universities and polytechnics in Austria” (NML) of the Austrian Federal Ministry for Education, Science and Culture (bm:bwk) in spring 2000 the TU Graz started the project “MultiMediaLearning” (MML) which lasted till the foundation of the Dept. SL in September 2006. The TU Graz Institute of Electrical Power Systems (IFEA) was one of the first partners of MML. Since spring 2001 IFEA has undertaken its own e-Learning strategy. The aim was to create a method for digitizing teaching content from hardcopy paper originals and for publishing it in an adequate way on learning platforms as well as for offline teaching and learning purposes. It was to develop a system that closes the gap between presenting and teaching content.

The so called “ABC-course system” with a specially designed layout for electronic lecture-scripts has been developed and evaluated by independent psychologists. The terming “ABC” relates to the way the content is structured according to its importance for the learner whereas “A” describes the main content, “B” helps to understand “A” better and “C” is defined as additional content which the learner does not need to reflect for examinations but is for deeper comprehension. “A”- and “B”-content are realised together within standardised ABC-screens written in HTML; “C”-content can only be reached over linking from an ABC-screen and may be anything from multimedia-files to internet-links or documents contributed by students.

A whole ABC-course consists of separate “ABC-screens” that are placed in the predefined ABC-course structure of directories over three layers. The root layer has all the chapters of a course. Each chapter consists of several modules (not to be mistaken for the “module”-character of the TUGTC structure), modules consist of units. The units finally hold the ABC-screens. The number of screens in one unit shall suffice for one lecture-hour and therefore depends on the content itself and on the lecturing “speed” of the teacher.

### ***What are the didactical advantages of the ABC-System?***

The uniform structure, the arrangement in three levels that fits in individual teaching habits, as well as the splitting and classification of content according to its importance and the high usability of the system at all allow a wide ranged application of the ABC-courses as for the lesson in classroom, for online variant, for offline CD-ROM version and for the hardcopy paper script (Fickert, Schmutzer, Nagler, Kamrat, Stojke 2004). The main benefit of the ABC concept is its modular character. It allows the course designer to update already existing courses or to create new ones very easily by mixing, changing and creating new single ABC-screens, whole units, modules or even chapters in general. It therefore follows the advantages of micro-content (Nagler, Ebner, Sherbakov 2007).

But there is more to be pointed out. The standardized design of an ABC-screen provides a couple of useful possibilities to optimize the structuring and presenting of the content. Each screen has fixed dimensions for to avoid scrolling within the content. Wildcards lead to a list of legends and a list of questions to the content of a screen as well as to a list of links, the corresponding C-content of a screen. Breadcrumb path on the bottom of the screen tells the position of the screen within the course. The finished course itself offers a few more goodies too. There are special screens: one screen sums up all the legends that occur in the single screens, the assessment screen does the same with all the questions in the course. Another screen lists all videos, one all downloads and a last one holds the literature referred. The CD ROM version contains search functionality and a menu that can be displayed alternatively as text or thumbnails as well as four different modes of presentation (standard mode, full screen, window mode and presentation mode).

### **The ABC-Manager Tool**

#### ***Why was there a need to develop a tool like the ABC-Manager?***

It must be mentioned that in its origins the ABC-system was a special solution following the requirements of one institute, the TU Graz IFEA. Although the generation of an ABC-course from single ABC-screens was automated as much as possible using the program "wbt2cd" the production of ABC-screens was definitely not. Therefore the producer of ABC-screens had to know HTML, CSS and JavaScript which also turned the mixing and changing of ABC-screens into a circumstantial handwork. The course structure and the content of the special screens had to be done by the author as well. In general the first step of creating a new course was to define the course structure by setting directories and then begin to fill them up with ABC-screens. A fact that often causes problems in case of changing the structure of a course afterwards. Even the creation of the PDF-version of an ABC-course by the program "wbt2paper" needed some special adjustment to be set by the author.

All in all the ABC-system worked fine at TU Graz IFEA and was highly accepted by them students (Fickert, Schmutzer, Nagler, Kamrat, Stojke 2004) but nevertheless was not ready for a university broad usage. With the formation of the Dept. SL e-Learning at TU Graz became centralized and officially serviced. Because of the decision for TUGTC with its eBook application the ABC-system exceeded its IFEA limited publicity by converting ABC-courses to TUGTC eBooks. The interest in ABC-system raised, the system needed to be reengineered and redesigned. The result is the ABC-manager. The ABC-manager primarily is a special server-sided CMS software application developed by TU Graz for creating and managing educational content online. A particulate offline version is to be programmed in future.

#### ***What is new about the ABC-manager?***

The idea of the ABC-manager is to create courses by selecting and arranging single screens from a screen-pool. A new user signs on the ABC-manager online and becomes classified by the system's root either as administrator or author with less authorization. The system generates only one pool for one administrator who is responsible for this pool. The administrator of a pool chooses further users to be co-authors of this pool. With the ABC-manager each step during the workflow of generating ABC-courses became simplified and independent from each other: one application for editing, assembling, generating and publishing ABC-content without knowledge of any programming syntax needed. The ABC-manager consists of an ABC-screen making page, an ABC-course making page and an ABC-course output making page. The advantages for the author are obvious: using the standardised easy to work with open source editor for the creation of ABC-screen content, the full text search engine for finding already



To work with the ABC-Manager the user only needs a browser that supports JavaScript. JavaScript is the most commonly used scripting language of the internet. It is used by millions of websites to extend them with additional functionality validate forms, detect browsers and much more. The ABC-Manager system itself is implemented on an Apache Tomcat server which is technically configured for full Java support, that means that a stable version of Sun's Java was installed and all necessary system paths were set. To create a better, faster and more user friendly web application AJAX was integrated. AJAX (Asynchronous JavaScript And XML) works with HTTP requests and has to be seen as an extension or a new way to use existing web standards. The combination of these standards results in high performance and high quality in usability and flexibility. To meet all requirements only web implementations are used that are standards and works on most browsers without installing any other application excluding Sun's JRE (Ebner 2007).

The ABC-Manager is a multi-user system. For each registered user an own ABC-Manager storing pool is generated provided if she/he is designed to be an administrator. Such a pool consists of the following main components:

- **ABC Templates**

ABC-Manager templates are used to store standard information about courses. This information consists of cascading style sheets, images or scripts.

- **Courses**

With the screens created by the ABC-manager and stored in the screen pool the user or lecturer is able to create various courses. The meta data of these courses is stored in this section.

- **Media**

Multimedia support for screens is stored in this special folder. Screens may include audio, video and will mainly consist of images. To simplify the media handling the user has only to choose the file from his system, upload it with ABC-file managing tool and after successful operation it will be automatically categorized to its media type.

- **Screens**

All existing screens and all new created ones are saved in that pool. Screens are saved in special xml format that is used by the ABC-manager. This enlarges the compatibility and fast integration to other systems such as TUGTC.

For creating, adding and deleting screens, multimedia files or other user taken content the Java Servlet technology is applied and classes are implemented to control and manage these requests. These promising technologies guarantee easy ad on extensions and simple and high quality support possibilities over years.

## **The ABC-eBook System**

### ***How is the ABC-System integrated within the TU Graz TeachCenter?***

The idea of the TUGTC eBook is to arrange a collection of multimedia files in a structure embedded in an online interactive environment. The idea of the ABC-system is very close to this. An ABC-course can be imported to the TUGTC and realised as an eBook very easily. The author of the ABC-course just uploads the course to TUGTC and chooses a directory where to save it; the rest that needed to be done has been described before. In the near future all these steps should become useless by connecting the ABC-manager CMS directly with TUGTC and just setting a link to an ABC-course stored within the ABC-manager system. The user of an ABC-eBook can use a variety of different options offered by the eBook environment. For the content of an ABC-course basically is HTML the user can add annotations and ask questions to any single HTML element, set bookmarks, start a forum and use a full text search. Furthermore there is a micro-blogging area on each screen for discussing the content instantly. These individual interactions can be made visible to any user of the eBook by choice (Fig. 2).

The screenshot displays the ABC-eBook interface. On the left is a navigation map with a tree structure of topics. The central area is titled 'Vektorkomponenten; Teil 1' and contains two diagrams of phasor systems. The top diagram, 'Das Mitsystem', shows three phasors  $U_1, U_2, U_3$  with a 'Zeitachse' (time axis) and associated equations:  $U_{1,Mit} = \dots = U^1$ ,  $U_{2,Mit} = U_{1,Mit} e^{j4\pi/3} = U^1 \cdot a^2$ , and  $U_{3,Mit} = U_{1,Mit} e^{j2\pi/3} = U^1 \cdot a$ . The bottom diagram, 'Das Gegensystem', shows three phasors  $U_2, U_1, U_3$  with equations:  $U_{1,Gegen} = \dots = U^2$ ,  $U_{2,Gegen} = U_{1,Gegen} e^{j2\pi/3} = U^2 \cdot a$ , and  $U_{3,Gegen} = U_{1,Gegen} e^{j4\pi/3} = U^2 \cdot a^2$ . The taskbar at the top includes buttons for LogOut, Forum, Map, Bookmark, Tutor, Edit, Search, Annotate, Prior, and Next.

Fig. 2: ABC-eBook; ABC-course realised online within the TUGTC eBook environment.

Navigation map of the eBook on the left, ABC-screen in the middle and right side, interactions in the taskbar above

**Is there a need for the integration of a mash-up system into the ABC-eBook?**

The ABC-eBook system at TUGTC is highly adaptable for to become a mash-up system. Authors or users will link their favourite images or video clips to the content of an ABC-screen may include geotagging data if wanted or discuss the content by micro-blogging. Such online added content is getting stored and may be interpreted as new "C"-content. In such a way the eBook becomes a steadily growing system. The revolutionary efforts of Web2.0 have become popular. Students are already used to work with it and organize their study in different ways than five years ago. An evaluation about the internet behaviour and the usage of mobile devices of study starters done in the beginning of winter term 2007 attests that statement and will be presented soon. For the ABC-manager system is going to be released as a beta version during the summer term 2008 there is no evaluation data about its usage and effectiveness yet but will be presented in future for sure.

**Summary and future**

CMS of today should fulfil requirements of Web2.0. Future eBooks will have functionality and user added mashups in the meaning of a personalized learning environment. The ABC-eBook makes it easy to create basic teaching and learning content for online and offline usage embedded in a well structured didactically mature environment. The system is adaptable for Web2.0 applications and yet has started to implement them. The content will become more up-to-date by real-time communication. It will increase the individuality of the content depending on the flexibility of the user; one big step forward to a personalized learning environment.

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