Web Content Management Systems, a Collaborative Environment in the Information Society

Daniel MICAN, Nicolae TOMAI, Robert Ioan COROŞ
Faculty of Economics and Business Administration,
Babeş-Bolyai University, Cluj-Napoca, Romania
{daniel.mican|nicolae.tomai|robert.coros}@econ.ubbcluj.ro

The aim of the present paper is to analyze the main models of collaboration and the use of a Web CMS, in order to develop an online community. Taking into consideration the multitude of the existing Web CMSs on the market and their diverse functionalities, we conducted a prospective study that tests the development trends in the field, with the view of finding out which are the most important Web CMSs in practice, and which are the most important functionalities they have to possess, in order to develop a collaborative online community. The results of the study show that the most popular Web CMS is Joomla, and the most widespread programming language is PHP. Likewise, we consider that this study can help the entry-level web developers to get an overview of the most popular Web CMSs, and their functionalities.
Keywords*: collaboration, content management, web content management systems.*

1 Introduction

In the last years, the Internet has evolved greatly, monopolizing an increasingly large part of our daily life. The new technologies have created a dynamic Web that evolves continuously and adapt themselves on users' everyday life. The new types of web application reshape the models of online communication and collaboration, as well as the way in which the information is created, published and transferred. Moreover, an increasing number of people have changed their perception about using the Internet, and have started to actively participate in the new communities, using them as means of communication and collaboration, or as business platform that enables the promotion and expansion of new business models.

Due to the user's interaction with new forms of technology and the websites characteristic of capturing their feedback, resulted a set of new concepts. All these new forms of technology: blogs, sites like Wikipedia, social networking, along with the free circulation of information through communication programs in real time, e-mails, RSS, are designed to put in touch people from different locations regarding their common interests.

Lately, more and more companies focus on developing applications that allow users to socialize, to exchange opinions, views, share information, comment, and receive feedback from other members of the community.

Tim Berners-Lee, considered the inventor of the Internet, said in his book [1], that the web is more a social creation than a technical one. He also put emphasis on the fact that he developed the Internet in order to help people work together in a collaborative way.

A collaborative system is a system in which several users are engaged in a common activity, interacting and putting their efforts into pursuing a common objective. In order to aid the development of a society that is based on knowledge, a collaborative system must be oriented towards the user, providing a medium that permits efficient interaction and collaboration, without taking into consideration the location and the domain of the activity [8].

According to Brna [3], collaboration comprises a great number of characteristics, such as an agreement regarding reciprocal collaboration, the adoption of a common aim, the existence of a mutual understanding of the problem and finally, the issue of the progress and maintenance of the conviction that the common objective can be achieved.

2 Models of collaboration

Following Butler and Coleman [4], the most important means of collaboration are classified in five collaborative models, which they call: 'library', 'solicitation', 'team', 'community' and 'process support'. Figure 1 illustrates the way in which each of these models relates to each other, depending on two essential factors: the size of the population involved in the process of collaboration and the levels of interaction.

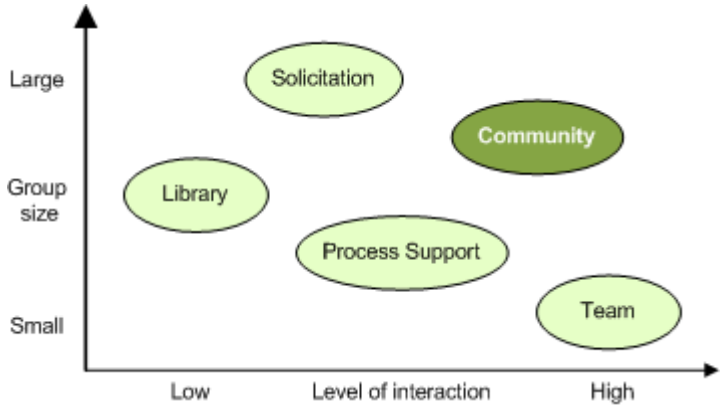

Fig. 1. Models of collaboration. Schematic representation adapted from [4]

As stated by Butler and Coleman [4], the most powerful model is the community one. This is used in order to facilitate the activities of the community and to ensure a high level of interaction among its members. The fundamental characteristics of the community model are:

- Members have a common interest, affinity and goal;
- Members of the community self-group themselves;
- Members seek to share information;
- Members seek to enrich their knowledge in their area of interest;
- A Community has to be relatively large in order to be self-sustaining; new information is always needed;
- Large communities are often moderated and the content is edited and reviewed;
- All the community members are encouraged to read and publish new content;
- Most of the members simply enjoy reading the content of others;
- Contributors usually make up around 10% of the community population;
- Most of the interactions are asynchronous; the discussions are realized on the basis of well-defined rules of behavior.

Moreover, for creating an online community, there are numerous applications on the market that can be used to this end, the most widespread being the Web CMSs that occupy a prime position in users' preferences [5].

3 Content Management

As maintained by JoAnn Hackos [7], content management presents a significant challenge for each organization that offers information to clients, employees, salesmen and partners.

It also plays an important role in the organization, classification and formation of informative resources, so that they can be stored, taken over, published and recycled, depending on users' needs.

In accordance with [2], the core objective in content management is to use technologies that aim towards data modification in order to store and display the content. The data consist of pieces of stored information that are inserted into tables or databases respectively. This information results from the data, as a consequence of a user's creativity and intelligence in combining and presenting them in a certain context. The basic information becomes actual content when it takes on an effective form, helping to achieve a certain goal. The value of the content is given by its utility, application, accessibility, usage in a particular context and its uniqueness. Hence, content management has an effect on the way people organize and develop their way of approaching an issue. That is to say, they must regard it from another perspective, adapting themselves to the new forms of technology and developing the way they perceive and solve these issues.

Content management is the process of collecting, managing and publishing content. The process of collecting allows people to create content or embellish it using existing sources. In order to store the content, it has to be converted into data that can be easily processed. The data, in turn, have to be structured and labeled with corresponding metadata. Thus, the metadata work in such a way that the context and comprehensibility of the information are explicit enough that the computer can process them. The metadata are simplified versions of the context and the comprehensibility of the information, insofar as the computer can both understand and process them [2]. After collecting, organizing and storing the required data in the system, the content can be published. In order to publish the content, the data have to be extracted from the system and processed, so that the resulting content serves the user's purpose.

Furthermore, the mode and format of the published content must confer functionality and utility.
In compliance with [7], the content, in order to be effective and satisfy the needs of the different types of users, must possess the following characteristics:
- Easy to find;
- Accurate and up-to-date;
- Detailed enough to satisfy the needs of the users;
- Well organized to facilitate fast searches;
- Availability in different languages;
- Linked to other relevant content;
- Targeted both at each person's needs and his/her level of knowledge.

The content must be structured according to the basis of an informative model and integrated into the content management system, in order to be easy to process and retrieve.

4 Web Content Management Systems

According to [2], a Web CMS is a system that collects stores and publishes content, offering various functionalities to the different categories of users.
The collection system is used in gathering information from different sources and processing them, resulting in format content that can be stored in the system. The management system is used to store and administer the formats. The publishing system extracts the desired components of the content from the management system, and converts them into publications, either online or offline.

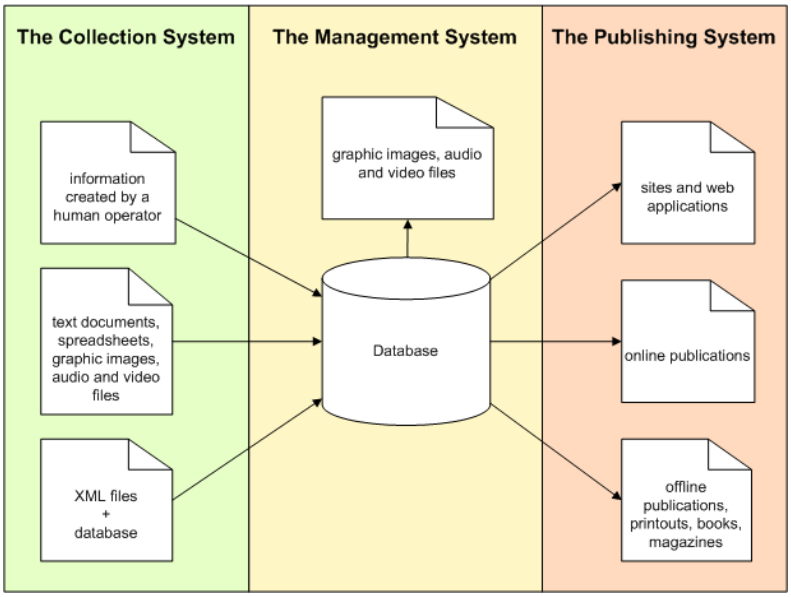

Fig. 2. The structure of a Web CMS. Schematic representation adapted from [2]

The collection system comprises that part of a Web CMS that is responsible for collecting the information from different sources in order to be stored in the system. The collection system must be expanded, in order to be able to receive data in various different formats, covering a large range of needs. In general, the collection system facilitates the importing of data in different formats and sources, such as XML files, external databases and Excel or text files. In the internal database of the system, only a reference to these files will be stocked, via which they can be accessed.
To gain entry to the system, the content must pass through the collection system. The literature [2] divides the collection system into many processes, as follows: the process of authoring, acquisition, conversion and aggregation.
The process of authoring or the creation of the content by human operators. This kind of content is usually created by special operators with the task of creating content, according to a well-defined objective. The collection system provides these operators with a series of tools and interfaces, both to support their creation process and to introduce the content into the system in the simplest way possible, in accordance with the general standards accepted by Web CMS. This process usually consists of several steps and contains a number of content versions, as well as several drafts until the final version is reached.

Very often, by developing a Web CMS, a lot of information, processed and imported from different sources, is required. This information can appear either in a format that is accepted by the system or in a format which has to be processed, so that the information can be stored. One of the most important formats that lies at the base of the information transfers between different applications is the XML. The most important advantage of this format is that the information is structured and has metadata associated with it, in order to facilitate its integration into the system.

The process of conversion constitutes the conversion of the content into a predefined format, in order to eliminate those information and elements that are not really necessary. Frequently, the content is entwined with a series of information and issues that have to be eliminated for the resulting data to be in accordance with the defined standards of the Web CMS, and to match the specified data structure.

The process of aggregation is the process through which the information from various dispersed sources are put together in order to form an integer. The information must be edited, structured and labeled with adequate metadata, for the computer to stock and manage it.

The core aim of the collection system is to create, import, convert and aggregate the content, so that the resulting data are in accordance with the data formatting and structuring standards, which in turn are defined and imposed by the Web CMS. The collection system prepares the data for processing by the management system.

The management system is responsible for storing and managing the data and the components of the content on a long-term basis and consists of the repository, the workflow and various administration tools. [2]

The repository is used to store and preserve the content and consists of various databases and types of files. [12]

The repository contains two big categories of files. The first category comprises the source files as well as the Web CMS configuration files. It also contains files that carry information about the type of content that can be processed, metadata, users and groups of users, as well as their access data, preferences and profiles. Furthermore, this category covers scripts, tools used in processing the content templates used for collecting and publish content and also the log files that contain information about the activities that take place in the system.

The second category plays an important role because it contains the databases in which the content and files that will be processed through the management system are stocked. This part of the repository entails databases and tables that are constructed for the recall and processing of the content. Likewise, the media files, the images and the audio and video files that are linked to the table of contents are also to be found here.

The workflow embodies the integral or partial automation of a business process, during which documents, information or tasks are passed from one actor to another for it to act in accordance with a set of procedural rules that are established in advance [10].

As stated by [12], the workflow comprises a series of tasks that develop inside an organization in order to obtain a result well established and defined. A well developed informational system may allow the definition of different workflows for different activities. Thereby, within the framework of a Web CMS a set of tasks can be defined under the form of a scenario that a document has to cover since it was created until the moment it is published. The document can be automatically sent to the author by a publisher for correction and after the publisher carries out its tasks, the document can get to a person who has the right to publish it. At each stage in the workflow, a person or a group of persons is responsible for a specific task. Once the task is completed, the system ensures the fact that those responsible for the next stage are announced and dispose of all necessary data in order to perform the task for which they are responsible in the process.

The publishing system is responsible for extracting data and various components of the content contained in the repository and their publishing. A publishing system usually contains different tools and templates for the automated publishing of content online or offline. In case that the publishing system is accessible online, for instance by a website, this can result in a dynamic web page generated by the publishing system. If the system is used to publish the content offline, it can generate the whole publication, either in digital or printed format.

The publishing templates are used to build publications from the components of the content that are to be found in the repository. A template is formed from both sides of the statistic and dynamic parts. The static parts of a template consist of html files, scripts that runs-on the client and server-side, texts and various media files that constitute the publishing pattern. The static part

of a template also contains a series of formatting and customization of models for the data and the content components extracted from the repository. The dynamic parts in a framework of a template may be specific objects that connect to the repository that extract and process certain components of the content in order to publish them. In the dynamic part of a template one can also encounter different procedures to various services on the Internet, in order to extract certain information and functionalities or to communicate with different web services.

5 Essential elements of a Web CMS

The fundamental capabilities of a Web CMS comprise content aggregation, integration of different modules and applications, user authentication, personalization, search, collaboration, web content management, workflow, analysis and the reporting [6]. Likewise, when a solution of content management is chosen, one has to take into account the needs of the business and of the web developments, of those who develop and create the content and content managers. The main goal of a Web CMS is to arrange the people and processes, in order to enable their efficient and quick organization to their creation, editing, correcting and testing successive changes of a web component. In other words, a Web CMS helps to combine items charged editorial and creative, as well as the programming in order to produce the desired output [11].

Another aspect that has to be taken into consideration is the existence in a Web CMS of an important control system that allows saving several versions one could refer and come back to, if necessary. According to [11], a version of a site is the complete set of properties corresponding to an web asset, taking into account its evolution and dynamic in time. An web asset can be used as a general term denoting a simple file, folder or record in the database as well as a complex web document. The existence of a version control system is very important because it helps increase the productivity of developers. Therefore, changes can be made due to the existence of several security copies that are saved, in case you go on a wrong track and need to return to a previous version.

Hackos [7] offers a description of a Web CMS conceptual model. This is based on a community of users, organized by an informational model that is able to satisfy completely the needs and objectives of multiple communities of users, in order to provide them with an efficient and collaborative work environment. It is also necessary for a Web CMS to have a deposit of well-structured data that allows the creation, classification and delivery of content, in different formats using personalization techniques.

In Figure 3 is showed the content management diagram in which, at the bottom of it, is the user community, organized on the basis of an informational model. This, in turn, provides support for the development of certain processes and forms of technologies for authoring, organization, storage and content delivery.

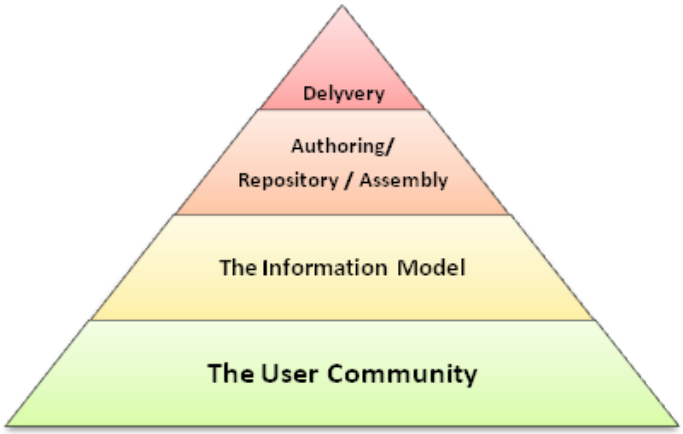

Fig. 3. The conceptual model of a Web CMS - Schematic representation adapted from [7]

Developing an online community is often a daunting task, due to the fact that there are many applications on the market that can be used for this purpose. The most popular applications used for building an online community are Web CMS's, forums and blogs. A Web CMS is an application that can be personalized by adding modules and functionalities specific to building a community online. They occupy a conspicuous place in the user preferences regarding the development of online communities, and generally contain a system of files management, photo gal-

leries, discussion forums, messaging systems, internal workflow for publishing articles and documents, systems review and comments, as well as many other functionalities [5].

6 Case study

Given the multitude of Web CMSs on the market and the diverse functionalities they have, we have done a research using structured interview. The tool we used was the questionnaire. Generally, the interview method is used in many areas of social life and requires a high level of training and experience in the field of the participants that take part in the interview, for which it applies to a more limited range of people [9]. The aim of this study was to determine which the most popular Web CMS in practice are and what are the relevant features they contain. This case study was not based on testing certain relationships between variables or quantifying behaviors and attitudes.

Rather, the purpose was to learn and extract knowledge from the respondents and take into account their opinion on the subject studied. Moreover, we wanted to study to what extend certain features influence on IT specialists, who develop web applications, aiming to grant credit to a particular Web CMS in order to develop a web application. Due to the fact that Web CMS represent a niche field and specialists who develop web applications based on them are hard to find, we chose a fairly small sample, consisting of 50 persons. In this case we did a prospective study that only tested the tendencies in the field. In order to demonstrate the functional relation between the exposed elements, a greater sample volume that would allow the use of econometric models would be needed.

After centralizing and processing the data, a series of results were obtained. Analyzing the answers to the first questions, resulted that most of the respondents have knowledge in IT. Thereby, the following results were obtained: 70.59% of the respondents have advanced knowledge in IT, and 11.76% are experts in this field. Only a percentage of 17.65% of the studied population have intermediate knowledge, and none of them are beginners. These results are illustrated graphically in Figure 4.

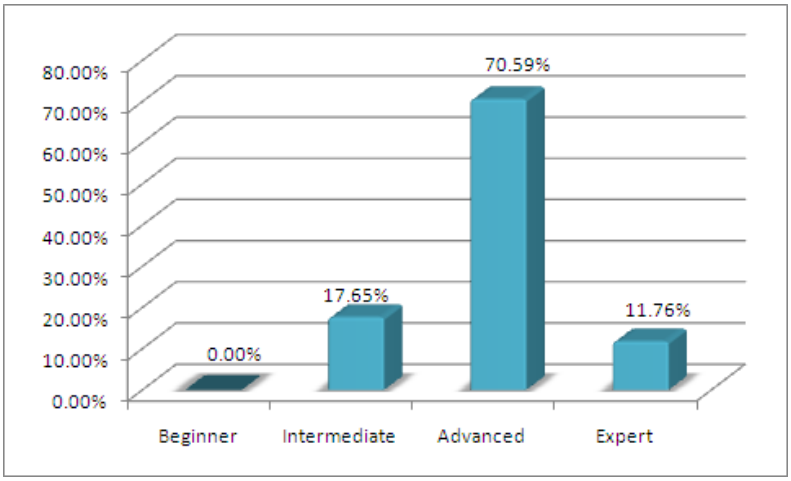

Fig. 4. The knowledge level in the field of IT

Analyzing the results of the answers to the second question, regarding the frequency of a Web CMS use, we can observe that 35% of the respondents have used fairly often a Web CMS, 18% very often and 32% very rarely. Cumulating the percentage of those who have used and continue to use a Web CMS, we obtain a result of 85%, the rest of the users developing web applications and using classical methods of programming. The distribution of respondents, depending on the frequency of using a Web CMS, can be seen in Figure 5.

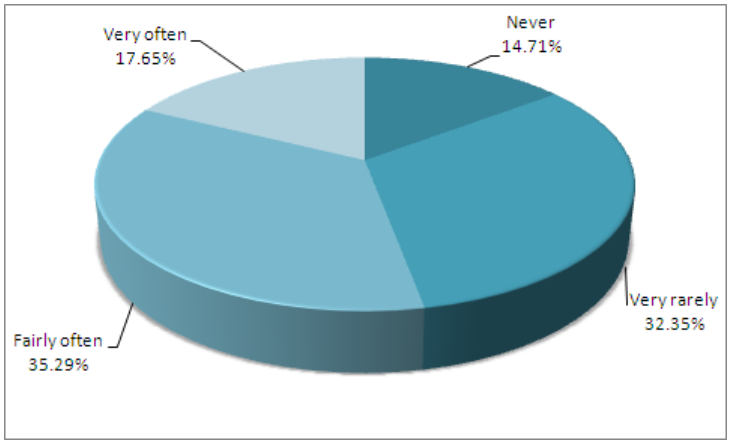

Fig. 5. The frequency of using a Web CMS

The analysis of the answers to question 3, show that most of the respondents, 37.66%, are using the PHP programming language. The ASP programming language occupies the second place in the preferences of the respondents that is 23.38 percent, followed by Java, with 22.08%. Other programming languages are used in a proportion of about 5%. These results are shown in Figure 6. It can be noted that the decision of choosing a Web CMS programming language is a decisive factor for 85.29% of the respondents. Therefore, most of the interviewed subjects would choose a Web CMS built on the basis of a programming language they usually use.

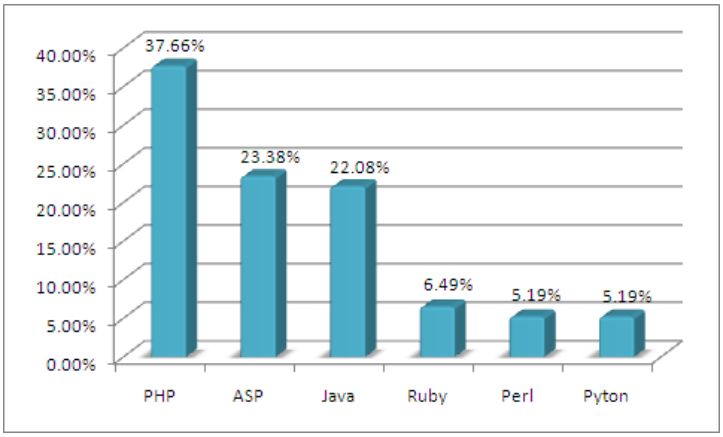

Fig. 6. The programming language most often used

Regarding the question about the functionality and the importance of the creation of content module, results that the functionality which most influences in choosing a Web CMS, is the existence of an editor that allows the editing of the source code. Thus, 47% of respondents believe that this functionality is very important, whereas 26% consider it as important.

The existence of an organization facility for content with the help of tags or labels is also an important aspect, followed by the existence of means of importing information that could help with uploading data from different sources such as: Word, Excel, XML, etc. Likewise, the existence of an editor WYSIWYG that can be easily used with many functionalities, for instance: easy formatting, spellchecker, are also of great importance for the users.

We draw attention to the fact that we realized the comparison between the influencing factor, ranking the answers 1, 2, 3, 4, 5. The same calculation methodology will be applied to questions 6, 7 and 8.

Taking a closer look at question 6, which refers to the existence in the management module of the content of certain functionalities, results that the most important influencing factor is the restricted access to the system on the basis of encrypted sessions. Thus, 68% of the respondents consider this factor as very important, whereas 23% of them consider it quite important.

The existence of an advanced back-up system that offers the possibility of saving not only the files but also the database and the complete re-

construction of the site, based on them, are also relevant to the study. Therefore, 65% of the participants consider this factor as very important, whereas 26% consider it important. Moreover, the possibility of offering restricted access to the user to specific content elements only, as well as the existence of a saving facility encompassing all versions of a document, their archive and the possibility of recalling each of the previous versions is important aspects that influence the choice of Web CMS.

Analyzing the answers to question 7, one can observe that in the publishing module of contact, the most important aspect is related to the existence of a functionality that permits the delivery of feedback and web services, as well as the possibility of publishing content that can be accessed from PDAs and mobile phones. This is regarded as a very important factor for 59% of the respondents, whereas 26% of them consider it quite important.

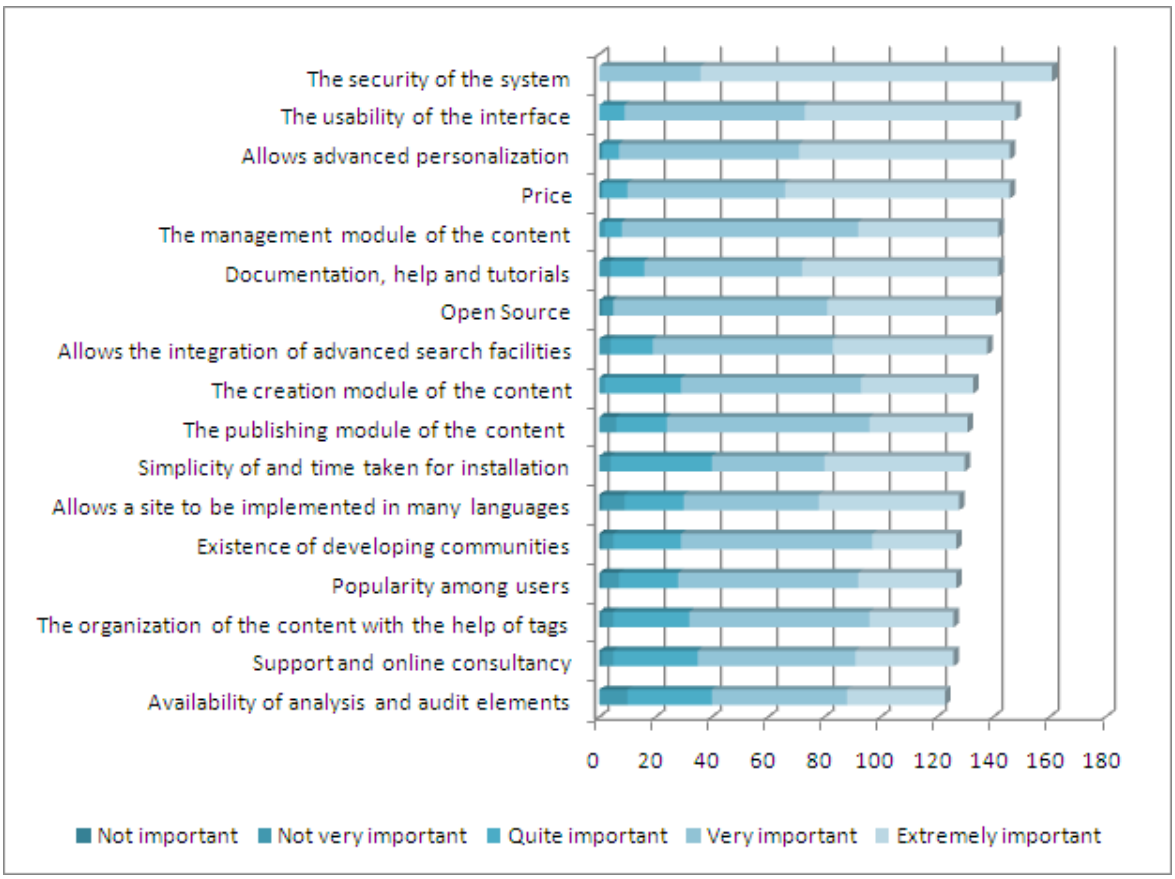

Fig. 7. Factors that influence your choice of Web CMS

Regarding other factors that influence the choosing of a Web CMS, the security of the system seems to be the most important one. The usability of the interface, the price of the Web CMS but also the allowance of an advanced personalization are very important factors for the users. The documentation, help, tutorials as well as the existence of a management module of content are important criteria in choosing a Web CMS. These results are illustrated in Figure 7.

After processing the results of the preferences for the most popular Web CMS we draw the graphical representation, illustrated in Figure 8. It is obvious that the most popular Web CMS is Joomla, preferred by 17.95% of the respondents, followed by Drupal with a percentage of 14.37%. Further, follows Share Point and Wordpress with a percentage of 12,90% and 12.35%. Mambo, Typo3 and Open CMS are on the same level in the users' preferences.

A very important aspect can be seen in Figure 8, namely the fact that just 2.80% of the respondents use other Web CMSs outside the list shown in figure. Even if there are thousands of Web CMSs on the market, it seems that only a relatively small number have managed to become popular and are frequently used by programmers and developers of web applications.

Examining question nr. 10 one can observe that the opinions regarding the creation of a Web CMS that would correspond to the own personal needs are almost equal to those regarding the

usage of an existing Web CMS.
On the other functionalities a Web CMS should contain, we include: adding of an extension that would allow the supplement of new parameters to the published articles, XML editor, import an compression of multimedia content, live cam, a system of access that allows the addition of groups, access to group of users and granting access rights to only certain modules and documents from Web CMS, the automatic translation of the fundamental content based on a translation tool, like Google, PDF exporter, personalization of the content based on user's accessibility on mobile devices, implementing a system of comments and ratings, adding the option to ping and track-backs and automatically optimizing pages for search engines.

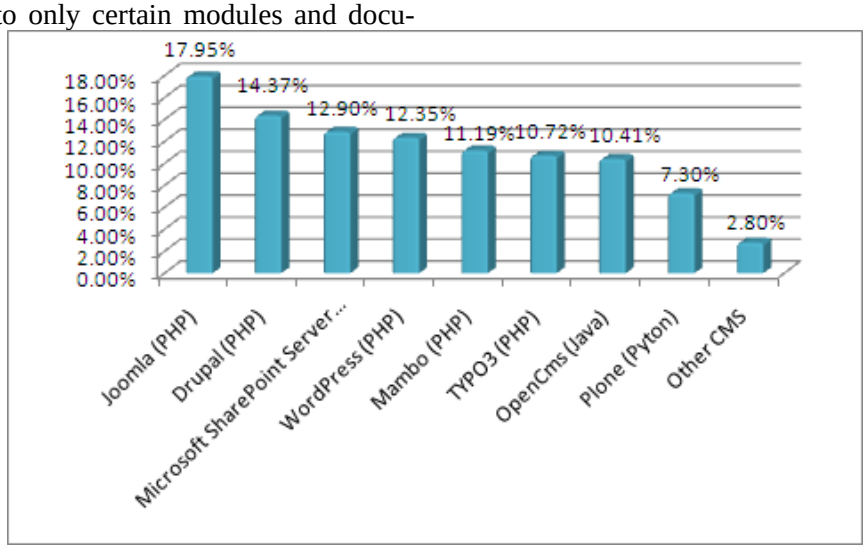

Fig. 8. Web CMS Preferences

Most respondents, with a percentage of 91% consider useful the usage of a Web CMS regarding the creation of online collaborative communities.

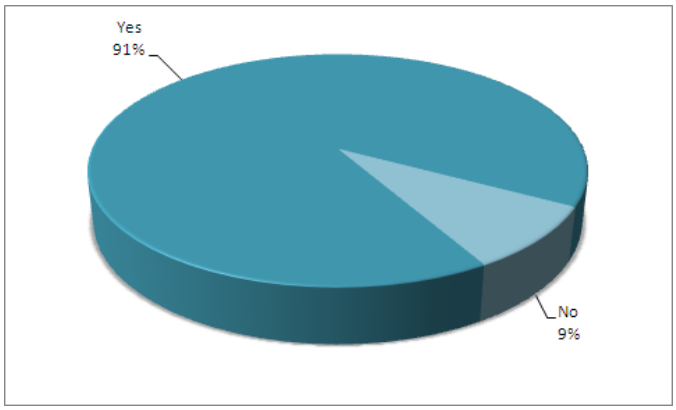

Fig. 9. The use of a Web CMS in the realization of an online collaborative community

The table 1 shows a comparison of the main features of the analyzed Web CMSs. To extract the data we used cmsmatrix.org, a tool that compares the various systems available on the market,. The features are grouped into: system requirements, security, support, ease-of-use, management, flexibility and built-in applications, and each category are divided in subcategories.

Table 1. Comparison of most important features of the analyzed Web CMSs

	Feature \ Web CMS	Joomla	Drupal	Share Point Server	Word Press	Mambo	TYPO3	OpenCms	Plone
System Requirements	Application Server	Any that supports PHP	PHP 4.3.5+	.NET	Server that supports PHP and MySQL	PHP 4.1.2+	PHP 5.2+	Tomcat, JBoss, Resin 3, Websphere 6	Zope
	Approximate Cost	Free	Free	4500 (USD)	Free	Free	Free	Free	Free
	Database	MySQL	MySQL, Postgres	Microsoft SQL Server 2000	MySQL version 4.0 or greater	MySQL	MySQL, PostGreSQL, Oracle, MSSQL	Oracle, MySQL, PostgreSQL, MS SQL Server	Zope
	Operating System	Any	Any	Windows Server 2003	OS Independent	Any	Any	Any	Any
	Programming Language	PHP	PHP	C#, ASP.NET, ASP	PHP version 4.2 or greater	PHP	PHP	Java 1.4.	Python
Security	Content Approval	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Email Verification	Yes	Yes	No	Free Add On	Yes	Yes	No	Yes
	Login History	Yes	Yes	Yes	Free Add On	Free Add On	Yes	Yes	Free Add On
	Session Management	Yes	Yes	No	Free Add On	Limited	Yes	No	Free Add On
	SSL Compatible	Yes	Yes	Yes	Yes	Free Add On	Yes	Yes	Yes
	SSL Logins	Yes	No	Yes	Free Add On	Yes	Yes	Yes	Free Add On
	SSL Pages	Yes	No	Yes	Limited	Free Add On	Free Add On	Yes	No
	Versioning	Free Add On	Yes	Limited	Free Add On	Limited	Yes	Yes	Yes
Support	Developer Community	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Online Help	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Public Forum	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Test Framework	Yes	Free Add On	No	Yes	No	Free Add On	Yes	Yes
	Third-Party Developers	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Users Conference	Yes	Yes	Limited	Yes	Yes	Yes	Yes	Yes
Ease of Use	Drag-N-Drop Content	No	Free Add On	Yes	Yes	No	Free Add On	Limited	Yes
	Mass Upload	Yes	Free Add On	Yes	Free Add On	No	Free Add On	Yes	Yes
	Spell Checker	No	Free Add On	No	Free Add On	Yes	Yes	Free Add On	Free Add On
	Style Wizard	No	Limited	Limited	No	No	Yes	No	Free Add On
	Undo	No	Limited	No	Free Add On	Yes	Yes	Yes	Yes
	WYSIWYG Editor	Yes	Free Add On	Yes	Yes	Yes	Yes	Yes	Yes
	Zip Archives	No	No	Yes	Free Add On	No	Free Add On	Limited	Free Add On

Management	Asset Management	Yes	Yes	Limited	Limited	Yes	Yes	Yes	Yes
	Online Administration	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Themes / Skins	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
	Trash	Yes	No	No	No	Yes	Free Add On	Yes	Free Add On
	Web Statistics	Yes	Yes	Yes	Free Add On	Yes	Free Add On	No	Free Add On
	Web-based Style/Template Management	Yes	Yes	Yes	Yes	Yes	Yes	Limited	Yes
	Workflow Engine	No	Limited	Limited	No	No	Limited	Free Add On	Yes
Flexibility	Content Reuse	Yes	Limited	Yes	No	Limited	Yes	Yes	Yes
	Metadata	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Multi-lingual Content	Free Add On	Free Add On	Yes	Free Add On	Free Add On	Yes	Yes	Yes
Built-in Applications	Discussion / Forum	Free Add On	Yes	Yes	Free Add On	Free Add On	Free Add On	Free Add On	Free Add On
	Document Management	Free Add On	Limited	Yes	No	Free Add On	Free Add On	No	Yes
	Groupware	Free Add On	Free Add On	Yes	No	Free Add On	Free Add On	No	Free Add On
	Photo Gallery	Free Add On	Free Add On	Yes	Free Add On	Free Add On	Free Add On	Yes	Yes
	Polls	Yes	Yes	Yes	Free Add On	Yes	Free Add On	Free Add On	Free Add On
	Search Engine	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Site Map	Free Add On	Free Add On	Yes	Free Add On	Free Add On	Yes	Yes	Yes
	Surveys	Free Add On	Free Add On	Yes	Free Add On	Free Add On	Free Add On	Free Add On	Free Add On
	Syndicated Content (RSS)	Yes	Yes	Yes	Yes	Yes	Free Add On	Free Add On	Yes
	Web Services Front End	Yes	Limited	Yes	Free Add On	No	Free Add On	No	No
	Wiki	Free Add On	Free Add On	No	Free Add On	Limited	Free Add On	No	Free Add On

7 Conclusion

Open Source CMS are an alternative that facilitate the development of online collaborative communities. After studying the theoretical part regarding the application of Web CMS's, we managed to create a questionnaire on their use. Moreover, we reviewed the main types of Web CMS, programming languages and facilities provided by them. The results have shown that the frequency of use is very high. We also noticed that the programming languages used by most of the users are: PHP, ASP and Java. Consequently, the most important functionalities are: the existence of an editor that allows the editing of the source code, organization facility for content with the help of tags, import functionalities from different formats as well as the WYSIWYG editor, restricted access and the existence of a back-up system. Similarly, we should consider other functionalities such as: the personalization of user interfaces and content, accessibility from mobile phones, addition of the ping and track-back option, automatic optimization, as well as dynamic pages for search engines. Hence, we intend to increase the work sample that would allow the use of econometrics models and the establishment of relations and dependencies.

Acknowledgement: This work is supported by the Romanian Authority for Scientific Research under project IDEI_573.

References

[1] T. Berners-Lee, *Weaving the Web: The Original Design and Ultimate Destiny of the World Wide Web by its Inventor*, 1st edition, HarperOne, 1999.
[2] B. Boiko, *Content Management Bible*, 2 edition, Wiley, 2004.
[3] P. Brna, "Models of collaboration," in *Proceedings of the Workshop on Informatics in Education, XVIII Congresso Nacional da Sociedade Brasileira de Computação*, Belo Horizonte, Brazil, 1998.
[4] T. Butler and D. Coleman. (2003, September). Guest editorial: Models of collaboration. Collaborative Strategies. Retrieved January 15, 2008, from http://www.collaborate.com/publication/newsletter/publications_newsletter_september03.html
[5] R. T. Douglass, M. Little and J. W. Smith, *Building Online Communities With Drupal, phpBB, and WordPress*, Apress, 2005.
[6] M. Eboueya and L. Uden, "Benefits and Limitations of Portals," *Encyclopedia of Portal Technologies and Applications*, IGI Global, April 2007.
[7] J. T. Hackos, *Content Management for Dynamic Web Delivery (Paperback)*, 1st edition, Wiley, 2002.
[8] I. Ivan and C. Ciurea. (2009, January). Using Very Large Volume Data Sets for Collaborative Systems Study. *Informatica Economică Journal*, [Online]. Vol. 13, Issue 1. Available: http://www.revistaie.ase.ro/content/49/003%20-%20Ivan,%20Ciurea.pdf
[9] L. Kalof and A. Dan, *Essentials of Social Research (Paperback)*, 1 edition, Open University Press, 2008.
[10] M. Khosrow-Pour, *Encyclopedia of E-commerce, E-government and Mobile Commerce*, Idea Group Publishing, Hardcover, 2006.
[11] R. Nakano, *Web Content Management: A Collaborative Approach (Paperback)*, Addison-Wesley Professional, 2001.
[12] Webopedia. Online Computer Dictionary for Computer and Internet Terms and Definitions. Available: http://www.webopedia.com

Daniel MICAN is a PhD student in Business Information Systems at Babeş-Bolyai University of Cluj-Napoca. His main research areas are: Web Applications and Search Engine Optimization. He is Teaching Assistant at Faculty of Economics and Business Administration, Babeş-Bolyai University of Cluj-Napoca.

Nicolae TOMAI is full Professor at Faculty of Economics and Business Administration, Babeş-Bolyai University of Cluj-Napoca. His main research areas are: Fundamentals of Computer Science, Operating Systems, Algorithms and Data Structures, C ++, C#, Computer Networks and Distributed Systems, E-business. His work includes 19 books, 59 scientific papers published, 1 patent, innovation patent 5, active member in 18 research contracts.

Robert Ioan COROŞ is a PhD student in Cybernetics and Statistics for Economics at Babeş-Bolyai University, Faculty of Economics and Business Administration. His fields of interest include Collaborative Systems, Databases, E-Business, and Web Analytics related issues.