

# Content Management Systems – Unleashed Possibilities

Jove Jankulovski<sup>1</sup>, Mimoza Anastoska-Jankulovska<sup>2</sup> and Pece Mitrevski<sup>3</sup>

**Abstract** – Digital products and services providers need to maintain their attractiveness among Internet users and online clients, end-users of web sites. Content management systems (CMSs) are one of the tools that can respond to these challenges. This paper introduces a new taxonomy of CMSs, based on their security, community platform, support, and feature sets, to assist organizations to identify CMS that will match the expectations and demand from clients and end-users of the organization products and services offered via the CMS.

**Keywords** – Content Management Systems, digital assets, taxonomy.

## I. INTRODUCTION

Rapid development of Internet technologies is providing users with infinite access to information, as well as, vast communication and networking opportunities. Currently, the amount of information that exists, and is increasingly created, is overwhelming. As a consequence, digital products and services providers need to maintain their attractiveness among Internet users and online clients, end-users of web sites. Content management systems (CMSs) are one of the tools that can respond to these challenges. Such a system organizes and provides access to all types of digital content (digital assets) – files containing images, graphics, animation, sound, video or text. It contains information about these files, and may also contain links to the files in order to allow them to be located or accessed individually. CMS can encompass an organization's entire content creation and organization system. At the same time it is a depot where information can be edited and uploaded, independently from the web design or web context.

There are no standards or features that are minimum or a must for CMSs to contain or functions to perform. The most common use of a CMS is to manage web content, starting from content creation / editing and content management, through publishing and concluding with presentation. Still, many of the CMSs have possibilities to provide document management, records management, and digital asset management in an integrated system. Furthermore, CMSs have the potential to dramatically simplify the maintenance of both websites and intranets.

An organization that intends to be present and appealing on Internet, with freshly updated content, close to its community

of users / clients, and administer internally most probably will look for a CMS that is able to meet all of the above for a concrete constituents. In order to be able to identify the most suitable CMS for organization purposes, features of the CMS need to be examined, to be compared with the short and long term intentions of the organizations and adequate CMS identified. The paper intends to help organizations make the right decision when identifying CMS they will use. It elaborates some of the most relevant features of the CMSs and reasons why some of the CMSs are more suitable for a specific purpose.

## II. WHAT IS A CONTENT MANAGEMENT SYSTEM?

Developments that occurred in recent decades dramatically changed the approach in the information provision. In the period through 1990 a book-centric publishing approach was used. Ever since Internet got operational, Standard Generalized Markup Language, SGML/HTML and XML publishing [3] was applied. Web 2.0 and social Web marked the beginning of the new century (2003+); were followed by XML multi publish format (2004+); from 2006 and on, information provision is specialized and content distribution is on-demand – by adapting publishing solutions for specific areas. For everybody present on-the-net, it was clear that responsiveness to users' demand for current information, technology and design is a must. The Web, that used to be characterized by a highly manual approach to maintenance, had to respond to new expectations / requirements: having regularly added fresh content and up-to-date information.

Therefore, the content management approach was developed as a mechanism to address the need of companies and organizations to maintain and update websites internally, rather than relying on the availability of specialized developers and programmers for routine or regular tasks. It is the strategy and technology of storing and indexing information from and about analogue or digital media. CMSs range from very basic databases, to sophisticated tailor-made applications that enable access to digital assets and to allow regular updating. In all cases, content is either created or acquired by users. It is then automatically converted into a master format (such as XML) and segmented into discrete chunks (content components). Components can be thought of as “containers” that make it easier to organize, store and retrieve content [1]. CMS contributes to the effective management of various kinds of content by combining rules, process and workflows. This way, centralized webmasters and decentralized web authors/editors can create, edit, manage and publish the content of a web page in accordance with a given framework or requirements (i.e. design, branding, media type, etc.) [1]. This allows users to take control of the specific content and contribute to development of a content management product offering target information to specific audiences.

<sup>1</sup>Jove Jankulovski is with the Faculty of Technical Sciences, St. Kliment Ohridski University, Ivo Lola Ribar bb, 7000 Bitola, Republic of Macedonia, e-mail: jove.jankulovski@yahoo.com.

<sup>2</sup>Mimoza Anastoska-Jankulovska is with the Faculty of Technical Sciences, St. Kliment Ohridski University, Ivo Lola Ribar bb, 7000 Bitola, Republic of Macedonia, e-mail: jankmj2@yahoo.com.

<sup>3</sup>Pece Mitrevski is with the Faculty of Technical Sciences, St. Kliment Ohridski University, Ivo Lola Ribar bb, 7000 Bitola, Republic of Macedonia, e-mail: pece.mitrevski@uklo.edu.mk.

### III. FUNCTIONS OF CONTENT MANAGEMENT SYSTEMS

#### *A. Content Creation / Collection (Authoring)*

Content can include any type or unit of digital information that is used to populate a web page or updating content. It can be text, images, graphics, video, sound, etc. – anything that could be published via the Internet [2]. On the user side, a CMS is an easy-to-use authoring environment, designed to provide a non-technical way of creating new pages or updating content, without having to know any HTML [2]. CMS provides efficiency and autonomy to website owners, who may want to make changes, add content and maintain websites from within an organization that may lack designers, programmers or technically trained staff. It might be used by staff digitizing images, authors and editors, or those responsible for the management of the content development process. Almost all CMSs now provide a web-based authoring environment, which further simplifies implementation, and allows content updating to be done remotely. The CMS also allows managing the structure of the site.

#### *B. Content Management (Storage)*

All the content of a CMS product, along with other supporting details is saved into a central repository in the CMS. It provides a range of useful features: keeping track of all the versions of a page, and who changed what and when; ensuring that each user can only change the section of the site they are responsible for; integration with existing information sources and IT systems [2]. The CMS provides a range of workflow capabilities, or categorized content to be handled by multiple people, while CMS is maintaining control over the quality, accuracy and consistency of the information. CMS can assign users permission to add, edit or publish content by site-specific criteria. For instance, after a page is created by an author, it can be sent to content manager for approval. A person dealing with legal issues in giving the final approval before a page is published to the site. At all of the stages of the workflow, CMS handles the status of the page, notifies the people involved, and where required, prompts jobs.

#### *C. Publishing*

After final version of the content is stored in the repository, it is published to either the website or intranet. CMSs automatically apply the appearance and page layout to a web site, or prompt the same content to be published to multiple sites. This CMS function allows the authors to concentrate on writing the content, and the appearance of the site entirely to the CMS, or designers and web developers.

#### *D. Presentation*

One of the strengths of the CMS is that it can offer features to enhance the quality and effectiveness of the site itself. For instance, building the site navigation; support multiple

browsers; or users with accessibility issues. The CMS can be used to make a site dynamic and interactive, thereby enhancing the site's impact [2].

### IV. SOME IMPORTANT FEATURES OF CONTENT MANAGEMENT SYSTEMS

#### *A. Easy to Understand and Use*

A CMS has to be easy on the eyes, meaning that it should have a user friendly GUI (Graphical User Interface); with not very complicated options, and to offer simplicity in its administration interface. Creating and managing content should be quicker, saving time, or increasing productivity. In principle, CMS is intended for end users who are not "technology-savvy". If CMS solution requires highly skillful IT user, than end users will unlikely be using such a CMS, which is diminishing the primary purpose of CMS – to empower users to do content authoring in the frame of CMS [6].

#### *B. Content Administration*

In principle, Web sites are developed after substantial planning, development, testing, and publishing. Yet, sometimes, there is a need for updating web site structure, text and images. If CMS was used for web site development it should offer simple figures like: adding a new page, or section; add an image or a link to a document; quickly find and quickly edit pages; paste text from Microsoft Word.

#### *C. Site development*

For building a relatively not so complicated site, without a lot of extra features, it is important to use a system that makes it easy to set up pages, and provides everything needed to allow non-technical staff members to do authoring. If the intention is to develop more complex web site, than time should be allocated to: understand the administration tools, develop custom graphic themes, master more advanced features and understand the tools available to build a navigation structure. Also, it is important to learn how easy it is to find out what is available: resources for help/assistance, add-on modules, support on the CMS web site.

#### *D. Customization / Flexibility and Navigation*

If CMS is having only fixed and not changeable design themes (templates), than there is a probability that web site will look like other web sites which might not be appealing to the users / clients. Therefore, it is better to look for CMS that allows customization of own design without major restrictions. A theme is a graphic design layer that controls graphic elements, font styles, navigation styles, and page layouts. "Themes" that can be easily installed can help in building a Web site quickly. Along with solid themes, systems that easily set up pages and a simple navigation scheme are important too. If there is a need site to include an events

calendar or list of news stories, it would be good such features to be included with the basic CMS. Otherwise, they will need to be installed separately which sometimes might not be easy. If navigation and theme setup in a particular CMS is complicated, or requires knowledge of HTML programming, it might be wise to install WYSIWYG (What-You-See-Is-What-You-Get) editor as an add-on module for personnel to edit text or images on the site.

#### *E. Structural Flexibility*

Systems that offer the ability to display some information, like news of some kind, or a description of an upcoming event, in different ways in various lists on the site are considered to have structural flexibility. For instance, the titles of next two upcoming events are shown on the homepage, and a full list with descriptions for the next two months is shown on the events page.

#### *F. Extending Default CMS Configuration*

If an organization wants to enhance its site's ability to provide site users with useful options for interfacing with the site, than extensibility of the default configuration with plugins/extensions/modules should be possible. In fact, the more plugins there are in the CMS, out-of-the-box, the better it is [4]. It might be that not all of them will be promptly needed, but most probably some of them will be needed on a later stage. Numerous organizations might want to integrate their CMS with other organizational systems, i.e. user databases, accounting systems, or broadcast email packages.

#### *G. Interaction with constituents*

Interaction with constituents is of paramount importance to organizations. CMS product that allows visitors to comment on site content; publish blogs; can subscribe to site content through RSS feeds; create their own profiles and link it to other people or groups; accept and post content, are very much welcome. Also, a good Spam filter is important too. So, such a CMS product takes users 'on-board' the system – active users and proud community members, and is assuring own further development and sustainability.

#### *H. Roles and workflow*

If a web site should have categorized content that is handled by multiple people, than adequate to use is a CMS that can assign users permission to add, edit or publish content by site-specific criteria. For example, a number of people can edit the pages in their own sections, but a central person must approve everything before it can be published. It also helpful to be able to: easily see what needs to be done by whom and when (get notifications from the system when something needs to be checked / reviewed); control who can view what on the site; go back to a previous version of a page; or create a to-do list.

#### *I. Security*

Security of the CMS content is another very important feature. CMS that has fewest identified and fastest resolved vulnerabilities would be the most adequate choice. Fixing vulnerabilities immediately is a must for a CMS that tends to offer reasonable security. Therefore, CMS that allows installation of specific plugins to protect the integrity of the content and editing of files/permissions to increase security levels should be an option.

#### *J. Backup and Update*

As all digital products / systems, CMS must be backed up regularly, just in case there is a need to go back to an older version. Another aspect is to look for CMS with an easy system update (address security issues and fix bugs). Systems that continue to support old versions of the system with security updates are welcome.

#### *K. Speed*

The faster pages load on the browser, and the faster site is connecting to a server, the better web site is. Simply, visitors do not want to spend their time on sites that are not alive and up-to-date. Therefore, CMSs that offer adding plugins and caching of objects is important for making good choice. Also, by choosing a good host the load time of the site will be decreased.

### **V. A NEW TAXONOMY OF CONTENT MANAGEMENT SYSTEMS**

Identifying CMS is not an easy thing to do since there are many CMS functionality aspects that need to be identified and determined well before actually purchasing proprietary CMS, or hosting / installing open source CMS.

In cases where investment of large amount on Web site design and implementation is possible, or substantial customization is anticipated, CMSs that provide compelling and useful feature sets can be the right choice [5]. Investing in CMS that could work well for some sophisticated needs only, unfortunately, can lead to a situation where, after a period of time, demand towards the CMS is exceeding the feature sets that the CMS can offer. If complex workflows are needed, or integration into standard business systems, systems that can provide complete solution to the specific and complex need are necessary. Sometime this can be too demanding towards some of the open source CMSs.

Some organizations prefer their Web sites to have tools to handle constituent and donor tracking, emailing and online payments. While many of the open source CMSs (e.g. WordPress, Joomla, Drupal, Plone) can provide options for these features, there are a number of other integrated platforms that might be compelling for such needs. CMS community and its strength is one of the important factors for choosing a particular CMS. WordPress has many blogging and comment features, but not robust support for more

advanced functionality in this area. Drupal was designed to be a community platform and offers profiles, blogs and comments out of the box, with enhancements available through add-on modules. Therefore, is one of the most preferred and logical solutions for such a target.

Security was, is and will be one of the most important categories according which any software, including CMSs is judged. Concretely speaking, some of the most common types of attacks on CMS products are: capturing sensitive data (usernames and password); inserting links (usually invisible) to Spam and/or pornographic sites; preventing visitors from viewing digital content; defacing of site content through various means by hackers. Plone is among the most secure CMS since it has very few reported security vulnerabilities, and is immune to capturing sensitive data attacks. WordPress is among the most used and the most wide-spread CMSs, so most likely it will be targeted. Hence, it is critical to keep up

with its security updates. WordPress and Drupal issue bug fixes and security releases relatively frequently.

Possibility for updating / upgrading of the CMS product is assumed, yet sometimes it can be painful process, because major updates can break existing themes and add-ons. Therefore, organization should look for systems with only few changes to their common overarching features. Needless to say, yet, systems that continue to support features of the old major versions are welcome too. WordPress recently introduced easy automatic upgrades, while DotNetNuke, WordPress and Drupal provide support to old versions and issue feature upgrades relatively frequently. On contrary, Joomla had only one more significant upgrade in the recent period.

Having in mind all of the above, we are proposing the below taxonomy for CMSs (Fig. 1) in order to help future users identify suitable CMS for their short-term and long-term purposes.

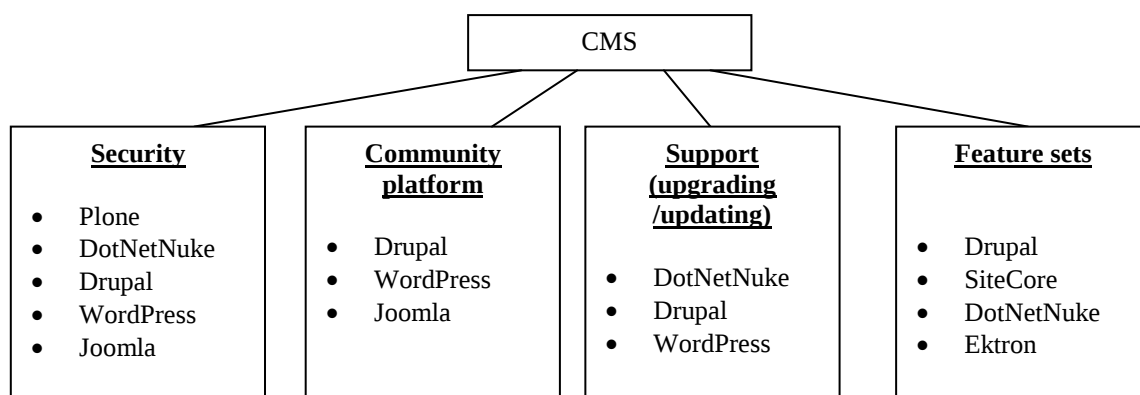


Fig. 1. Taxonomy of content management systems

## VI. CONCLUSION

A CMS allows and helps to easily conceive, organize and automate the collection, management, publishing, and presentation of content. Identification of CMS suitable for the organization purposes is of paramount importance to organizations. It is complicated task because there is a great variety of proprietary and open source CMS that have their own weaknesses and strengths. Hence, solid analysis needs to be completed in order to identify CMS that is fit-for-purpose in order to appropriately meet organization and user expectations from its products at the same time. There are no universally accepted standards or features for what CMSs should contain or how should function. Logically, unleashed possibilities of CMSs on the market offer diverse features, variety of purposes, a range of plugins/modules from-the-box, and are specific in many ways.

Therefore, in this paper we introduced a new taxonomy of CMSs, based on their security, community platform, support, and feature sets, to assist organizations to identify CMS that will match the expectations and demand from

clients and end-users of the organization products and services offered via the CMS. We clustered selected CMSs according to important aspect of their functionality that should be considered in making optimal decision when selecting CMS adequate for organization, its clients and end-users.

## REFERENCES

- [1] Halperin Creative Content Management System, White Paper, Halperin Creative, USA, 2012.
- [2] Step Two Designs: So, what is a content management system?, Step Two Designs, Australia, 2003.
- [3] Tran T. et al.: Document Builder, San Jose State University, USA, 2010.
- [4] Comentum, Drupal vs Joomla vs WordPress, Open Source CMS Comparison; April 2013; <http://www.comentum.com/drupal-vs-joomla-cms-comparison.html>
- [5] CMS comparison; April 2013; <http://www.r2integrated.com/dnn/services/cms-comparison.aspx>
- [6] Reyes J.: How to Evaluate What CMS to Use; April 2013; <http://sixrevisions.com/web-development/how-to-evaluate-what-cms-to-use/>