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**WEB CONTENT MANAGEMENT SYSTEM: COMPONENTS AND SECURITY**

**OMOSEBI, PAUL ADEOYE**  
**RESEARCH SCHOLAR**  
**CENTRE FOR ECONOMETRIC & ALLIED RESEARCH**  
**UNIVERSITY OF IBADAN**  
**IBADAN**

**OLORUNLEKE, FEHINTOLUWA E.**  
**STUDENT**  
**LIBRARY & INFORMATION STUDIES DEPARTMENT**  
**UNIVERSITY OF IBADAN**  
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**ABSTRACT**

*Web Content Management Systems (WCMS) have grown in importance as more and more organizations communicate and publish their information via the web. A WCMS typically has automated templates, scalable expansion, easily editable content, workflow management, authoring, storage and publishing features. In the same vein, many are now experiencing problems because WCMS vulnerabilities are attractive targets for potential attackers. In this paper, we explore the common components of WCMS, security concerns and suggested precautionary measures.*

**KEYWORDS**

web content management, security, components, document management.

**INTRODUCTION**

With the explosive growth of the Internet, fundamental content management needs have also grown. No longer can information be published online in a manual process and be left unattended.

Almost every enterprise these days needs a website to communicate with customers, partners, shareholders, and so on, providing up-to-date information on the enterprise, its products and services. Online information must be continually reviewed and updated by content editors so that other content consumers, including customers and search engines, have access to the most up-to-date version.

Content management refers to the system and processes whereby information is created, managed, published, and archived. Information typically passes through this lifecycle for a finite period of time. A content management system (CMS) provides the necessary infrastructure for multiple persons to effectively contribute content and collaborate throughout these lifecycles.

Some of the Web Content Management (WCM) products are rooted in document management, while others have developed from customer relationship management, e-commerce, and software configuration management. In the crowded Web Content Management (WCM) marketplace, there are basic components of web content management system. As the volumes of information provided by organisations on the Web increase, so do the problems of managing that information. The aim of this paper is to explore the common components of WCMS, security concerns and to develop precautionary measures.

**WEB CONTENT UPDATING – THE CURRENT SCENARIO**

There has been an explosion of content on Web sites as the potential of the web for internal and external communication is recognized. For a web site to “live and breathe” it must be fed with new content and out of date content must be removed due to the dynamic nature of modern business. Therefore, building and setting up a website is not a one-time project. Different departments in the enterprise will have areas of content they need to add to and update.

There are several ways of uploading web content to the web server. One of the methods includes the use file transfer programs such as FTP (file transfer protocol). Another common approach is to create an upload function within a Web interface allowing different content owners to select appropriate files and upload them via the client/server protocol that defines how messages are formatted and transmitted on the World Wide Web (WWW), HyperText Transfer Protocol (HTTP). Both methods are common, and still used by web hosting companies and small & medium enterprises (SMEs).

Traditionally, technical staff would have to assist a content editor who needs to update a site by translating the content into a suitable web page format (i.e. HTML) and uploading it to the web server on their behalf. This iterative process often led to delays in publishing, and is obviously not an efficient process given the high mutual dependence required between the content provider and the technician. Managing the website updating process is another problem with older approach. Sometimes a web page may consist of several content areas that require input and material from several different enterprise departments. When more than one person is able to update web pages simultaneously, the problem of logging and tracing “who has amended what” and “what the latest version of a page is” becomes serious.

**ESSENTIAL FUNCTIONALITIES AND ORIGIN OF WEB CONTENT MANAGEMENT**

A web CMS simplifies the process by which content contributors create, publish, and update website content. Merker, L. (2013). The Web Content Management Systems (WCMS) that have appeared more recently are designed to tackle the problems with conservative perspective of content uploading, and make it easier to collaboratively update a website. Simply put, a web CMS:

1. Enables authors and editors outside the web team to contribute
2. Puts the responsibility for content accuracy in the hands of those responsible for that content
3. Decreases the time and costs associated with web content maintenance

Moving from conservative to collaborative approach is what brings about a WCMS. It facilitates a group of collaborative users, usually from different departments across an enterprise, to maintain and organise web content in an effective and manageable way. Web content can include text, images, audio and video. A modern WCMS can also include workflow features so that the authoring, storing, and updating of web pages, along with approval sub-procedures, can be streamlined.

**Authoring:** The authoring environment is the most important aspect of a content management system (CMS), for without content authors, there would be nothing to manage or publish. There are a wide range of possible authoring environments that can be used with a content management system, including:

- WYSIWYG authoring
- Markup-based authoring
- Template-based authoring
- Authoring using a desktop application

- XML-based authoring
- Importing from data sources

**Workflow** is the process of creating cycles of sequential and parallel tasks that must be accomplished in the CMS. The CMS workflow engine records an audit with comments on each step. Upon final approval, content is automatically published online.

**Storage** is placing of authored content into a repository. beyond this, it is also the versioning of the content, so that access conflicts between multiple authors cannot arise and so that previous versions can be found and restored if required. These can be stored as records in a database or as Extensible Markup Language (XML) files.

**Publishing:** As with many new IT trends, Web content management (WCM) is in part a practical response to a pressing business problem – how to organize and manage large-scale Web sites – and in part a technology push on the part of software suppliers.

## COMPONENTS OF WCMS IN BRIEF

Many WCMS are programmed in languages such as Java and PHP, and run on a web server. In addition to the web server, WCMS may also contain additional components such as workflow engines, search engines, and email integration modules. Web content and data is normally stored in data repositories or databases such as MySQL (open source) or Oracle (commercial). This could include text and graphic material to be published. Older versions of web pages from a particular site under management may also be stored in the database. Generally, draft web pages are not uploaded directly to the production web server. Instead, users keep copies of draft pages offline until they are approved for publication. Then, once approved and signed-off, a file transfer program runs automatically, uploading and linking in the final pages on the production web server. Compass Design (2014). A WCMS is essentially a web application supported by a backend database, with other features such as search engine, and perhaps integration with a translation engine. The general security threats applicable to web applications, such as cross-site scripting, injection flaws and/or malicious file execution, can all be applied to a WCMS.

In a broad term, data and content sent to a web server is considered public information. If it is necessary to store sensitive information on WCMS servers, appropriate data encryption and authentication measures should be put in place. Content duties are segregated by dividing users into two groups—content editors and content administrators—where only content administrators have final publishing authority. The role of technical personnel would be in building web page templates and maintaining the consistency of web page layouts and a common look-and-feel. Government of the Hong Kong Special Administrative Region (2008).

## BENEFITS OF WEB CONTENT MANAGEMENT SYSTEM

The key goal of a WCMS is the increased integration and automation of the processes that support efficient and effective internet delivery.

A Web Content Management System is not just another software system. It is the communication vehicle that connects your company's stakeholders, executives, marketers, and developers, with your customers. The CMS you choose must be able to engage customers at many levels and through many marketing channels. You must have a CMS that has the power, flexibility, and expansion to meet your current and future needs. Emery (2001), Omosebi (2012).

There are a wide range of business benefits that can be obtained by implementing a CMS, these include:

1. More efficient workflows: faster turnaround time for new pages and changes. Requests for changes and updates to a site are simplified under a WCMS framework. Users across different departments can add and apply changes to web content with a pre-defined and agreed-upon workflow process. Should an element need to be changed, you only need to edit one file. Change a product price in the right place and, once saved and published, the entire site reflects the change instantaneously.
2. Quicker response times: Your website takes up less space and requires less data by reducing repetition. Making new web content such as marketing materials available on the web is much quicker because content owners can update materials to a website directly, without the need to assign such tasks to technical personnel
3. Increased security: under a WCMS framework, content is only published after approval by designated supervisors or managers. This reduces the chance of publishing material by mistake, which is usually due to human error. In addition, most WCMS systems provide audit trails of publishing activities all of which help maintain accountability;
4. Other benefits include greater capacity for growth, improved version tracking, integration with translation servers, and consistency of page presentation through the use of common page layouts and controlled templates. Also, New pages can be created very quickly as many of the elements already exist. Only the fresh elements, such as specific content or images, need to be created.

Web content management has grown in importance over the past few years, and commercial as well as open source WCMS products are now available in the market.

## SECURITY CONCERNS AND PRECAUTIONARY MEASURES

Security continues to be a growing concern for everyone, as it is in the secular world so it is in the IT world. As identity theft proliferates, it's important for websites to employ the safest security measures when storing and processing data. WCMS is an application built on top of existing web technology. Like other web applications, a WCMS is subject to the same security threats and operation process vulnerabilities as other web applications. Hallikainen *et al* (2002).

### SECURITY CONCERNS

Given that a WCMS is a software application, it is prone to bugs just like any other program. Vulnerabilities have been found in WCMS. As one example, a vulnerability called "absolute path traversal vulnerability" was found in the open source product OpenCMS in 2006. Drupal Association (2006). Another security concern lies with protection of authentication credentials when accessing a WCMS. Many WCMS products are designed primarily to solve the content management problem of websites rather than building a secure product. Some WCMS products do not provide adequate protection for logins and passwords for example, and these passwords— including the administrator password—are sent as plain text over the network. Hackos (2002), Boiko (2001), Robertson (2003). Similarly, as part of the publishing/uploading process, a WCMS might use file transfer protocols such as FTP to transfer files from the WCMS data storage server to the web server. FTP is not a secure protocol in the sense that authentication credentials and passwords are sent as plain text over the network. In addition, because publishing is an automatic process from the WCMS to the production web server, FTP credentials might be hard-coded in certain configuration files. Usually a hard-coded login password like this will not be changed regularly. As a result, any leakage of this password could allow someone illegally access to web content on the production web server. If the WCMS includes other modules, individual subsystems may have their own bugs and introduce their own vulnerabilities to the WCMS. For example, if the WCMS has an email module, it might be prone to the same common threats faced by email server such as email spoofing. Government of the Hong Kong Special Administrative Region (2008). On top of this, the backend database server of the WCMS may have its own vulnerabilities as well.

### PRECAUTIONARY MEASURES

There are a number of precautionary measures that should be done proactively to mitigate the security threats.

1. Follow best practices by applying the latest security patches to all web server software. Any alerts or warnings about vulnerabilities on the WCMS product being used should be addressed immediately, especially if the WCMS can be accessed directly from the Internet. Any patch management process should also address additional WCMS modules, including email subsystems, backend database servers, JAVA runtime environments, and so on.
2. A strict password policy should be defined. This should include a minimum password length, initial assignments to personnel, restricted words and formats, and a limited password life cycle.



3. Logins and passwords sent over the Internet should be protected by Secure Socket Layer (SSL)/Transport Layer Security (TLS), so that attackers can't sniff them over the network. In general, access to administration pages should be further controlled and these should not be open to Internet access.
4. When publishing any web content from the WCMS to the production web server, file transfer programs such as FTP should be replaced by a Secure Shell (or SSH) that protects transmission channels by encrypting data. Some SSH implementations also support a feature that controls which IP addresses are allowed to connect to the destination server.
5. To enforce data security, many WCMS implementations have built-in access control whereby groups of users are segregated into editor and administrator (approver) roles. These roles and their corresponding access rights should be clearly defined and reviewed periodically.
6. A good WCMS should keep an audit trail, logging all editing and approval activities. These audit trails should be retained for a period commensurate with their usefulness, and should be secured so they cannot be modified and can only be read by authorised persons.

The issue of security in Web Content Management System also ties back to hosting provider, too. Vulnerabilities can arise if web server is not secure or encrypted properly. Shared servers pose an additional risk if someone else on your server is compromised. Just as important as WCMS is, a proactive hosting provider is equally critical. Meike *et al.* (2009), Omosebi (2012). Additionally, if payment processing is incorporated into a WCMS and is outsourced, third party vendor needs to also maintain a high level of due diligence with regard to security.

Other precautionary measures that can go a long way towards securing a Web site include regular backups, prompt updates to the release and a good web host. The hosting service should have a very reliable and up to date backup of data in their database to prevent unforeseen loss of data. Omosebi (2012).

## CONCLUSION

Overall, CMS platforms offer a great framework in which to build websites that are relatively easy to update and maintain. Just like any other website, though, security is an issue that must not be overlooked. It's advisable to assign a web programmer to maintain the system's security, or to budget for the assistance of a contractor or service on an ongoing basis.

While a good WCMS can facilitate businesses to better control their web content, making it more responsive in today's dynamic business environment, end-users should also be aware of the possible security impact on the enterprise if inappropriate material was published on the site.

Users should be aware of what is being published. Only approved content should be involved in the publishing process and passwords should be promptly changed if they are suspected of being, or have been, compromised or if they have been given to vendors for maintenance and support. Likewise, automatic protection features, such as a password protected screen saver, should be activated if there has been no activity for a predefined period to prevent any attempt at illegal system access. Also, when a member of a content editing and updating group ceases to provide services in that group or organisation, his or her WCMS user-IDs and access privileges should be terminated as soon as possible. Software patches and updates should be applied to user machines regularly, including web browsers, Java runtime environments and so on, on a regular basis.

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