

Evaluation of Content Management Systems

Bachelor thesis

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Abstract

The ever increasing number of content management systems (CMS) on the market easily leads to confusion, as determining a suitable CMS-solution for specific requirements is a very demanding task. In addition to a general introduction to CMS, this thesis focuses on defining the key criteria which support a proper evaluation. Theory is supplemented by the comparison of a significant number of concrete open source CMS. The mentioned CMS will be compared using well defined key criteria, such as: technical requirements, usability, web-friendliness, performance, security, built-in applications and support. The CMS have been selected primarily based on their popularity in different online forums and discussion boards. Furthermore, this paper may act as a guideline in determining the best solution to meet specific CMS requirements.

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1 Introduction

1.1 Overview

Content management can be described as resolving three general issues: content creation, content delivery for the consumer or user, and information retrieval, whether the information is in print or electronic form. [8]

There are many slightly different definitions of Content Management Systems (CMS), nevertheless a common understanding of this term is essential. In this paper, a CMS will be defined as follows:

A content management system supports the creation, management, distribution, publishing, and discovery of corporate information. [25]

While a CMS could even describe a manual process, in this paper it will be used to describe software-based tools that assist humans in the creation, management, delivery, and navigation of web content. In addition, a CMS ought to follow the complete lifecycle of the pages on a site, from providing simple tools for creation of content, publishing, and finally archiving.

1.2 A Short History

As computers have only recently become ubiquitous in the world of information management, it is worthwhile to have a look how information content was handled prior to the advent of computing. Of course, it all started with the invention of writing. The creation of portable document formats occurred first on papyrus, and then later pages were gathered to form scrolls and eventually books. The mass production of books was a result of the invention of movable type, and this innovation made it possible to make a clear distinction between the original work and a reproduction. The work itself can be seen as the words and ideas, as intellectual property, whereas the printed document is one instance of the work. Following the advent of mass production, it became necessary to catalogue the documents: first handwritten lists served well enough, then using separate index cards, which could be rearranged alphabetically by title or author. The classification of books into categories and their collocation on physical shelves to ease navigation of similar material was the next major step. The idea behind it is still significant in today's content management systems. In the early 1990s, as the importance of the internet grew, organizations which were doing a lot of content publishing started to develop their own CMS. In 1995, the US media company CNET Networks first offered their CMS solution to the public. CNET later spun off its internal development offerings

into a separate company called Vignette. Many of the largest content-rich sites on the World Wide Web run Vignette. (e.g. Time-Warner, Fox News Online, The Wall Street Journal) [15] In 1998, Pencom Web Works, a consulting company, introduced the Metaphoria Data Transformation Server, allowing Java developers to write applications that would be tied to content and to target the content output to different channels. The product failed commercially, but the concepts that were introduced by it made their way into many modern systems. [4] Today, Google and the DMOZ Directories [11] list hundreds of CMS options. Due to this vast variety of offerings, the CMS business is becoming more and more challenging: According to [1], most every CMS business in the last few years has either:

- been acquired by or merged with another company
- gone out of business
- hungrily acquired other companies or products to widen their product-base and to enhance integration.

Most of the CMS on the market have very similar features. Therefore, vendors are still looking for the new 'killer features' that will wipe out their competitors. In fact, this situation makes vendors diverge in their approach over time, rather than converge. This environment creates a tremendously complex and very inefficient marketplace: vendors have difficulties identifying potential customers; while organisations have no idea of where to start looking for possible solutions. The future CMS market is seen as being crystallised around specific problem areas. For example, some vendors may cluster around delivering solutions to health care organisations or universities. Others may primarily target e-commerce websites, or large intranets.

1.3 Basic functionality of a CMS

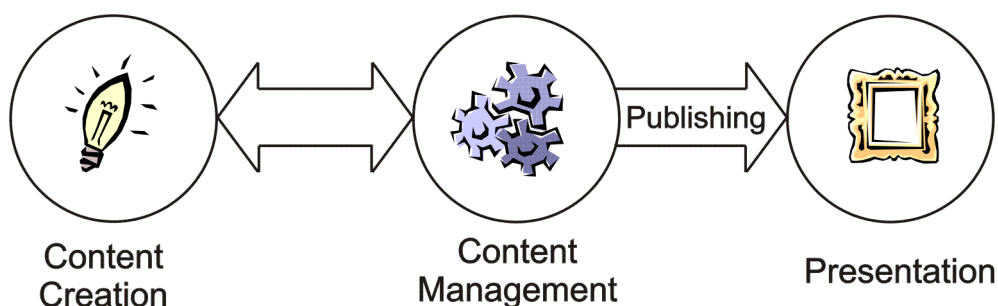


Figure 1: Basic functionality of a CMS

As described in the overview, the key functions for every CMS are content creation, management, publishing and presentation.

1.3.1 Content creation

Content creation includes *the authoring* of new content, *the acquisition* of content and *the aggregation* of syndicated content.

Authoring: At the front of most CMS is an easy to use, probably WYSIWYG featured, text editor, which acts as an interface for the authors of the page. In most cases, this editor is web-based, which allows content updating to be done remotely. Furthermore, CMS also allows the management of the structure of the site. The structure of the site can be pre-defined more or less, yet easily altered without breaking any links.

Acquisition: Besides the already mentioned web based editor, there are more possibilities for content acquisition: uploading files via FTP, native support for file types or even migration tools which get the data from other CMS. Another issue concerning acquisition is rights management, which defines different rights for the authors, or within bigger organisations, a whole work-flow management which forces the contributors to abide by specific rules. Mandatory metadata tagging also enforces structure and semantic constraints within the project.

Aggregation: Aggregation can be seen as the automated retrieval of content from other on-line sources: The managing of incoming syndication feeds and the metadata which accompanies them, as well as the integration of web services (e.g. currency conversion) are part of aggregation.

1.3.2 Content management

A central repository (e.g. XMLfiles or a database) is used to store the site and its associated metadata. The usage of a centralized information repository offers a wide range of advantages as mentioned above. For example Work-flow capabilities: a work-flow scenario is the creation of an article by a writer, which then goes automatically to the editor for approval before the content goes online. At each step, the CMS manages the status of the page and notifies the people involved. In this way, more authors can be involved in the management of the site. The strict rules defined by the work-flow significantly aids in ensuring high quality, accuracy and consistency of the information. So, work-flow rules bring order to the chaos of manual processes.

1.3.3 Content publishing

CMSs provide publishing engines which allow the appearance and page layout of the site to be applied automatically. These publishing engines further ensure the consistency of the appearance across the entire site. In this way, the publishing of the site is fully automated by the CMS. Some CMSs provide multi-channel publishing, where content published in several channels specific to different devices (print, PDF, PDAs, mobile phones, etc.) or to specific audiences (e.g. accessibility for the disabled, marketing to target groups, personalization of appearance). Content syndication through RDF and RSS feeds or web services is also a part of content publishing.

1.3.4 Content presentation

A CMS should also provide a number of features which enhance the quality and effectiveness of the site itself. (e.g. build site navigation, obtain the site structure directly out of the repository). The CMS can be used to make a site more dynamic and improve its accessibility and thereby enhances the site's overall impact.

1.4 User roles

One of the basic ideas behind CMS is to separate the management of content from the design process. This approach (separation of concerns) is being used in many fields in the IT sector, for example, the model-view-controller pattern concept used in software development. In the case of CMS, this separation leads to greater independence between the appearance of the web site and the information contained. Therefore, three different user roles can be specified.

User role	Responsibility	Skills
<i>Web designer</i>	graphical appearance of the site	skills for visual design (e.g. HTML, CSS, Photoshop, Dreamweaver, Flash etc.)
<i>Author</i>	concerned with the content itself	marketing and writing knowledge, has the 'message'
<i>Developer</i>	administers the CMS	knows how to use the CMS on a technical basis

Figure 2: Three basic roles within CMS

The content author does not need to know anything about how the content is presented nor the technical features of the CMS. He just delivers the content, is familiar with marketing and has a message to communicate. The web designer, the artist, on the other hand, knows about graphics and presentation. He defines and eventually realises the visual appearance of

the site, without being affected by the concrete information presented within. The third role involved would be that of the developer, who has the technical understanding of the system. He administers the CMS itself.

2 Evaluation of CMS

2.1 Overview

This chapter will clarify and explain some important criteria which affects every CMS. At first, criteria are listed according to their practical relevance: focusing on the concrete comparisons, the potential CMS user should have some reliable checkpoints which one can reference when (re-)implementing a CMS. These criteria will be the basis for the following concrete comparison.

2.2 Key criteria

2.2.1 Usability

Usability in this paper denotes the ease with which users can employ a particular function of the CMS in order to achieve a particular goal. A general principle of every CMS is the division of the system into two areas — the backend and the frontend. While the frontend is for everyone out there on the web — it is the website the system produces — only content contributors are allowed access to the backend — the administration of the website. In general, the backend is also web based. Proper authentication via username and password is always required. Usability in this section mainly focuses on the back-end. The criteria are:

- **WYSIWYG Editor:** A web-based rich text editor to allow publishers to create formatted content without knowing HTML, CSS, XML, or XSL.
- **Drag-N-Drop Content:** The system allows the user to position content in a drag and drop fashion.
- **Image Resizing:** The system is capable of allowing users to resize uploaded images.
- **Spell Checker:** The system has an integrated spell checker.
- **Versioning:** The system provides for some level of system-wide content versioning.

2.2.2 Technical requirements

The environment in which the system needs to run:

- **Server:** The application server/web server or application environment required to run this CMS.
- **Database:** The database engine the CMS uses to store content and settings.
- **License:** The type of license the CMS is distributed under.
- **Operating system:** The operating systems the CMS is compatible with.
- **Programming language:** The programming language that the CMS is written in.
- **Server root access:** Is root (or administrator) access required to install the application?
- **Shell access:** Do you need to be able to log in to the machine (other than through FTP) in order to install the application?

2.2.3 Web-friendliness

Web-friendliness measures how well the resulting website is organized from a client's point of view. It is important to understand here that the client does not necessarily need to be human. Clients in this context are seen as everyone and everything that might have access to the generated site. Besides regular web-browsers installed on workstations, this might also include mobile devices, specific devices which make the site readable for visually handicapped persons, as well as news aggregators, search robots and web crawlers. Web-friendliness in the context of this paper can be seen as follows:

Friendly URIs: Pretty URIs don't tell the user anything about the technology used by the site, e.g. instead of displaying `http://example.com/index/product.php?id=4711&lang=en` in the browser the user only sees what he is interested in: `http://example.com/product4711`. Furthermore, the user is not affected by some reorganisations of the site structure — links to pretty URI are valid any time, wherever the site is physically located (permanently linked). Clean URIs are also a crucial issue in search engine optimization (SEO). Google is said to be better at indexing pretty URIs than obviously dynamically created ones.

The possibility to set up content-negotiation: Content negotiation is a mechanism defined in the HTTP specification that makes it possible to serve different versions of a document (or more generally, a resource) at the same URL, so that user agents can choose which version best fits their capabilities. One of the most classic uses of this mechanism is to serve content in different languages. For that purpose, the client may include some `Accept-` messages in the header sent to the server:

```
Accept-Language: fr; q=1.0,  
                en; q=0.5  
Accept:         text/html; q=1.0,  
                text/*; q=0.8,  
                image/gif; q=0.6,  
                image/jpeg; q=0.6,  
                image/*; q=0.5,  
                */*; q=0.1
```

In this example, the client would be best served by content in French, but English would also be acceptable. The client accepts various media types, preferring HTML over plain text or other text types, and preferring GIF or JPEG over other image types, but also accepts any other media type as a last resort.

The possibility to set up a proper robots.txt control file: The robots exclusion standard or robots.txt protocol is a convention to prevent cooperating web robots from accessing all or part of a website. The information specifying the parts that should not be accessed is specified in a file called robots.txt in the top-level directory of the website. The protocol is purely advisory, but helps against e.g. search engines crawling transient or generated data.

Supply news feeds for syndication: Web syndication is a form of syndication in which a section of a website is made available for other sites to use. Content is extracted to a XML file whenever it changes. Popular syndication formats used are the XML languages RSS [13] and Atom [24]. Both are commonly supported.

2.2.4 Performance

This section explains how a CMS can affect the performanc of the generated sites. **Database Replication** [22] allows one to "scale out" the database server by distributing the processing load over multiple servers. Replication usually takes place with a master/slave relationship between the original and the copy. The master logs the updates, which then ripple through to the slave. For example, it is possible to move specific functions from the main (master server) to another server (slave server). This task is relatively easily accomplished by setting some parameter on the Database Management System (DBMS). To take advantage of database replication, the CMS would need to be able to perform reads from slaves and writes to the database master.

Load Balancing: Typically, load balancing distributes a common workload among multiple machines. There are a number of open source load balancing applications. Ideally a load balancer is installed on a dedicated machine that can handle all the incoming connec-

tions, with a separate network interface for internal and external connections. Sophisticated CMS should allow one to put a load balancer in front of it to split the load between multiple servers.

Static Content Export: Ideally CMS have the ability to export its content as static HTML. So it may be served up from regional cache servers, or from static HTML web servers.

Visitor tracking: The system keeps track of who browses, when and which pages of the site. Such systems also usually keep track of things like what browser the user was using and what IP address they came from. This information may be used for site optimization.

2.2.5 External security

In this section security is seen from the perspective of the end-user. **Captcha:** Captcha [2] is a challenge-response system designed to prevent spam robots from being able to access user-only features of a system. A common method of limiting access to services made available over the web is visual verification of a bit-mapped image. Although this presents a major problem to users who are visually impaired or have a learning disability such as dyslexia. There are also some alternative approaches.[21]



Figure 3: This CAPTCHA of 'smwm' obscures its message from computer interpretation by twisting the letters and adding a background color gradient [2].

Email Verification: To verify email addresses, the CMS needs to send an activation key to users to make sure they have entered a valid email address.

2.2.6 Internal security

In this section security is seen from the perspective of the administrator. **Audit Trail:** The system keeps track of additions, updates and deletions. **Granular Rights Management:** The system allows read and write privileges on a per page or per content item basis, as well as separate privileges for other system functions.

Session Management: The system provides some facility for an administrator to see who is logged in, what they are doing, and log them out if necessary. The system also logs unsuccessful login-attempts.

Means of Authentication: The system supports authentication via various means such as Kerberos, LDAP, NIS, NTLM or SMB. The system also allows an administrator to plug in additional 3rd-party authentication schemes which go beyond the default proprietary authentication scheme.

Secure Sockets Layer (SSL) Compatibility: The system can be used with an SSL certificate on the web server. It can be configured to switch to SSL mode (HTTPS) for logins, and then back to normal HTTP after the login. This kind of functionality protects user login information from being sniffed. The system should also be able to switch to SSL mode for certain pages, and then back to straight HTTP for other pages. This functionality might be useful if the system is used partially for regular site content and partially to distribute confidential data such as customer invoices or medical records.

Problem Notification: The system provides a mechanism for alerting administrators (by email, instant messenger, cell phone, etc) when it detects a problem.

Sandbox: The system allows for a private area for content managers to try new content ideas without the worry of affecting the rest of the site.

2.2.7 Built-in applications

Instead of forcing user to repeatedly reinvent the wheel, most CMS come with a wide variety of built-in applications. For example, an integrated search engine that can index the managed content and allow the user to search the indexed content; a guest book function; an application that will allow the user to generate graphs and charts based upon some data set (SQL, text file, xml file, etc); a HTTP Proxy mechanism to proxy or mirror HTML and other content and applications from other web servers; a photo gallery for displaying a thumbnail / image repository, an application for retrieving and displaying RDF/RSS/XML syndicated content or a system for allowing a user community to contribute stories and other content to the site.

2.2.8 Support

Support not only covers the availability and quality of documentation but also the existence of user groups, forums and mailing lists. Interesting mainly for CMS used within companies is the provision of commercial manuals, commercial support and training as well as professional hosting and further technical services. Some CMS communities offer a certification program or arrange user conferences.

3 Concrete comparison

3.1 Overview

Using the previously defined criteria, this chapter deals with the analysis and comparison of some open source CMS. The CMS projects are selected by their popularity and other specific attributes which may be interesting for the reader. Interesting attributes might be, for example, the usage of sophisticated technologies such as AJAX, extensive application of search engine optimization (SEO) or other particular innovative ideas which are worth mentioning.

3.2 Systems in detail

The subsections on the next pages show a detailed comparison of some popular open source CMS. The CMS are selected primarily by their popularity in different online forums and discussion boards. E.g.: [3].

3.2.1 Drupal

Web Site: <http://drupal.org/>

Version: 4.7

Description: Drupal is a modular content management framework, content management system and blogging engine which was originally written as a bulletin board system. Today, it is used by many high-traffic websites, including The Onion, Spread Firefox, CivicSpace and many more. [6] According to Drupal's website [17], Drupal is supposed to be more than a CMS: *The drupal.org community is comprised of a diverse group of people; from developers to neophytes, professionals to hobbyists, and contributors to non-contributors. Using Drupal as a foundation, you can build a powerful flexible website.*

Criteria	Comments
Usability	
WYSIWYG Editor	Free Add-on
Drag-N-Drop Content	No
Image Resizing	Free Add-on
Spell Checker	Free Add-on
Versioning	Yes
Technical requirements	
Server	Apache, IIS
Database	MySQL, PostgreSQL
Operating System	Any
Programming Language	PHP 4.3.3+
Server Root Access	No
Shell Access	No
License	GNU GPL
Web-friendliness	
Friendly URIs	Yes, needs manual activation
Content-negotiation	No
Web Robots Exclusion	No, robots.txt has to be done manually
Content Syndication	Yes
Performance	
Database Replication	No
Load Balancing	No
Static Content Export	No

Criteria	Comments
Visitor tracking	Yes
Security	
Audit Trail	Yes
Captcha	Free Add-on
Email Verification	Yes
Granular Rights Management	Yes
Session Management	Yes
Means of Authentication	LDAP as Free Add-on
SSL Compatible	No
Problem Notification	No
Sandbox	No
Built-in applications	
Search Engine	Yes
Guest Book	Free Add-on
Graphs and Charts	No
Photo Gallery	Free Add-on
User Contributions	Yes
Syndicated Content	Yes
Support	
Developer Community	Yes
Public Forum	Yes
Public Mailing List	Yes
Professional Hosting	Yes
Users Conference	Yes ¹
Certification Program	No
Commercial Manuals	Yes
Commercial Support	Yes
Commercial Training	Yes

¹<http://drupal.org/node/77404>

3.2.2 eZpublish

Web Site: <http://ez.no/>

Version: 3.8

Description: eZ publish is a content management system (CMS) and development framework (CMF). While the CMS is standardized out of the box functionality and solutions, the CMF consists of flexible engines for further customization and extensions. The CMS and CMF are seamlessly integrated and both are part of the eZ publish distributions you can download from ez.no. eZ publish is dual licensed, allowing you to choose between GPL (free open source) and the professional licence, which allows you to protect your work and relicense the software [7]

Criteria	Comments
Usability	
WYSIWYG Editor	Yes
Drag-N-Drop Content	No
Image Resizing	Yes
Spell Checker	No
Versioning	Yes
Technical requirements	
Server	Apache
Database	MySQL, PostGreSQL, Oracle, MSSQL
Operating System	Linux, Windows
Programming Language	PHP
Server Root Access	No
Shell Access	No
License	Dual licence: GNU GPL/commercial
Web-friendliness	
Friendly URIs	Predefined .htaccess file comes with installation.
Content-negotiation	No
Web Robots Exclusion	No, robots.txt has to be done manually
Content Syndication	Yes
Performance	
Database Replication	Yes
Load Balancing	Yes
Static Content Export	Yes

Criteria	Comments
Visitor tracking	No
Security	
Audit Trail	Yes
Captcha	Free Add-on
Email Verification	Yes
Granular Rights Management	Yes
Session Management	Yes
Means of Authentication	LDAP
SSL Compatible	Yes
Problem Notification	Yes
Sandbox	Yes
Built-in applications	
Search Engine	Yes
Guest Book	Free Add-on
Graphs and Charts	Free Add-on
Photo Gallery	Yes
User Contributions	Yes
Syndicated Content	Yes
Support	
Developer Community	Yes
Public Forum	Yes
Public Mailing List	Yes
Professional Hosting	Yes
Users Conference	Yes ²
Certification Program	Yes
Commercial Manuals	Yes
Commercial Support	Yes
Commercial Training	Yes

²http://ez.no/company/events/ez_publish_conference_2006

3.2.3 Mambo

Web Site: <http://www.mambo-foundation.org/>

Version: 4.5.4

Description: Mambo has attracted many users due to its ease of use. Mambo includes more advanced features such as page caching to improve performance on busy sites, advanced template creation techniques, and a fairly robust API. It can also automate many tasks such as web indexing for static pages. The rights to the Mambo CMS code-base, name and copyrights, are protected by the Mambo Foundation, a non-profit corporation formed to support and promote the Mambo Open Source project. [10] There are several branches of Mambo: Joomla!, VirtueMart and Limbo.

Criteria	Comments
Usability	
WYSIWYG Editor	Yes
Drag-N-Drop Content	No
Image Resizing	No
Spell Checker	No
Versioning	Yes
Technical requirements	
Server	Apache Recommended
Database	MySQL
Operating System	Any
Programming Language	PHP 4.1.2+
Server Root Access	No
Shell Access	No
License	GNU GPL
Web-friendliness	
Friendly URIs	Predefined .htaccess file comes with installation.
Content-negotiation	No
Web Robots Exclusion	No, robots.txt has to be done manually
Content Syndication	Yes
Performance	
Database Replication	No
Load Balancing	No
Static Content Export	No

Criteria	Comments
Visitor tracking	Free Add-on
Security	
Audit Trail	No
Captcha	No
Email Verification	Yes
Granular Rights Management	Yes
Session Management	Yes
Means of Authentication	LDAP
SSL Compatible	No
Problem Notification	No
Sandbox	No
Built-in applications	
Search Engine	Yes
Guest Book	Free Add-on
Graphs and Charts	Free Add-on
Photo Gallery	Free Add-on
User Contributions	Yes
Syndicated Content	Yes
Support	
Developer Community	Yes
Public Forum	Yes
Public Mailing List	Yes
Professional Hosting	Yes
Users Conference	No
Certification Program	No
Commercial Manuals	Yes
Commercial Support	Yes
Commercial Training	Yes

3.2.4 Joomla!

Web Site: <http://www.joomla.org/>

Version: 1.0.7

Description: Joomla! came into being as the result of the split up of Mambo by Miro Corporation of Australia, the trademark holder of the Mambo name, and the majority of the core developers. The first release of Joomla! (Joomla! 1.0.0) was announced on September 16, 2005. This was a re-branded release of Mambo 4.5.2.3 combined with other bug and moderate-level security fixes. In the project's roadmap, the core developers say Joomla! 2.0 will be a completely re-written code base built with PHP 5.[9]

Criteria	Comments
Usability	
WYSIWYG Editor	Yes
Drag-N-Drop Content	No
Image Resizing	Yes
Spell Checker	No
Versioning	Yes
Technical requirements	
Server	Apache Recommended
Database	MySQL
Operating System	Any
Programming Language	PHP 4.1.2+
Server Root Access	No
Shell Access	No
License	GNU GPL
Web-friendliness	
Friendly URIs	Predefined .htaccess file comes with installation.
Content-negotiation	Yes
Web Robots Exclusion	Yes
Content Syndication	Yes
Performance	
Database Replication	No
Load Balancing	No
Static Content Export	No
Visitor tracking	Yes

Criteria	Comments
Security	
Audit Trail	No
Captcha	Yes
Email Verification	Yes
Granular Rights Management	No
Session Management	Yes
Means of Authentication	Free Add on for LDAP
SSL Compatible	No
Problem Notification	No
Sandbox	No
Built-in applications	
Search Engine	Yes
Guest Book	Free Add-on
Graphs and Charts	Free Add-on
Photo Gallery	Free Add-on
User Contributions	Yes
Syndicated Content	Yes
Support	
Developer Community	Yes
Public Forum	Yes
Public Mailing List	No
Professional Hosting	Yes
Users Conference	Yes ³
Certification Program	No
Commercial Manuals	Yes
Commercial Support	Yes
Commercial Training	Yes

³<http://www.joomladay.de/>

3.2.5 MySourceMatrix

Web Site: <http://matrix.squiz.net/>

Version: 3.10.0

Description: MySource Matrix was originally developed by an Australian company called Squiz. The company's website says that their system is equally popular in the private and education sectors, with many major organisations using the product, such as News Limited, Austereo, Ray White, Melbourne University, and Cambridge University [19]. To run the System, a client-side installation of a recent version of Sun Microsystems' Java Runtime Environment (1.5) is required. The software isn't under GPL though, it's under the 'Squiz.Net Open Source License'. Roughly speaking the core is under a kind of open source, but Squiz charges a fee for most extensions needed to do proper work.

Criteria	Comments
Usability	
WYSIWYG Editor	Yes
Drag-N-Drop Content	Yes
Image Resizing	Yes
Spell Checker	Free Add on
Versioning	Yes
Technical requirements	
Server	Apache
Database	PostgreSQL, Oracle
Operating System	Any
Programming Language	PHP 4.3+, Java
Server Root Access	Yes
Shell Access	Yes
License	Squiz.Net Open Source Licence
Web-friendliness	
Friendly URIs	To be done manually via Apache's Mod Rewrite
Content-negotiation	No
Web Robots Exclusion	Yes
Content Syndication	Yes
Performance	
Database Replication	Yes
Load Balancing	Yes

Criteria	Comments
Static Content Export	Yes
Visitor tracking	Yes
Security	
Audit Trail	Yes
Captcha	Yes
Email Verification	Yes
Granular Rights Management	Yes
Session Management	Yes
Means of Authentication	LDAP as commercial Add on
SSL Compatible	Yes
Problem Notification	Yes
Sandbox	Yes
Built-in applications	
Search Engine	Commercial
Guest Book	Yes
Graphs and Charts	Commercial
Photo Gallery	Yes
User Contributions	Commercial
Syndicated Content	Commercial
Support	
Developer Community	Yes
Public Forum	Yes
Public Mailing List	Yes
Professional Hosting	Yes
Users Conference	No
Certification Program	Yes
Commercial Manuals	Yes
Commercial Support	Yes
Commercial Training	Yes

3.2.6 OpenCms

Web Site: <http://www.opencms.org/>

Version: 6.2.2

Description: OpenCms is an open source content management system based on Java and XML technology. It is distributed by Alkacon Software under LGPL license. The history of OpenCms starts around 1999 with its predecessor MhtCms, which was not Open Source. The first Open Source version was released at CeBIT expo 2000.[12]

Criteria	Comments
Usability	
WYSIWYG Editor	Yes
Drag-N-Drop Content	Yes
Image Resizing	Yes
Spell Checker	Free Add On
Versioning	Yes
Technical requirements	
Server	Tomcat, Apache, IIS, JBoss, BEA Weblogic
Database	MySQL, PostGreSQL, Oracle, MSSQL
Operating System	Any
Programming Language	Java 1.3+
Server Root Access	No
Shell Access	No
License	GNU LGPL
Web-friendliness	
Friendly URIs	Free Add On
Content-negotiation	No
Web Robots Exclusion	No, robots.txt has to be done manually
Content Syndication	Yes
Performance	
Database Replication	No
Load Balancing	No
Static Content Export	Yes
Visitor tracking	Yes
Security	
Audit Trail	No

Criteria	Comments
Captcha	No
Email Verification	Yes
Granular Rights Management	No
Session Management	No
Means of Authentication	LDAP (commercial Add On)
SSL Compatible	Yes
Problem Notification	Yes
Sandbox	Yes
Built-in applications	
Search Engine	Yes
Guest Book	No
Graphs and Charts	No
Photo Gallery	Yes
User Contributions	No
Syndicated Content	No
Support	
Developer Community	Yes
Public Forum	Yes
Public Mailing List	Yes
Professional Hosting	No
Users Conference	No
Certification Program	No
Commercial Manuals	Yes
Commercial Support	Yes
Commercial Training	Yes

3.2.7 Plone

Web Site: <http://plone.org/>

Version: 2.5

Description: Plone is a content management framework that works hand-in-hand and sits on top of Zope, a widely-used open source web application server and development system. To use Plone, no Zope specific knowledge is required, but helpful. Some Zope knowledge is covered in the documentation. Zope itself is written in Python, an easy to use open source programming language. Python can be used to add new features to Plone. By default, Plone stores its contents in Zope's built in transactional object database, the ZODB. There are products and techniques, however, for the sharing of information with other sources, such as relational databases, LDAP or even file-system files. [20]

Criteria	Comments
Usability	
WYSIWYG Editor	Yes
Drag-N-Drop Content	Free Add-on
Image Resizing	Free Add-on
Spell Checker	Free Add-on
Versioning	Yes
Technical requirements	
Server	Apache, IIS, Zope
Database	Zope (ZODB)
Operating System	Any
Programming Language	Python
Server Root Access	No
Shell Access	No
License	GNU GPL
Web-friendliness	
Friendly URIs	Configurable via admin interface
Content-negotiation	Yes
Web Robots Exclusion	Yes
Content Syndication	Yes
Performance	
Database Replication	No
Load Balancing	Yes

Criteria	Comments
Static Content Export	Yes
Visitor tracking	Free Add-on
Security	
Audit Trail	Yes
Captcha	No
Email Verification	Yes
Granular Rights Management	Yes
Session Management	Free Add-on
Means of Authentication	NTLM, as Free Add-on: Kerberos, LDAP, SMB
SSL Compatible	Yes
Problem Notification	No
Sandbox	Yes
Built-in applications	
Search Engine	Yes
Guest Book	Free Add-on
Graphs and Charts	No
Photo Gallery	Free Add-on
User Contributions	Yes
Syndicated Content	Free Add-on
Support	
Developer Community	Yes
Public Forum	Yes
Public Mailing List	Yes
Professional Hosting	Yes
Users Conference	Yes ⁴
Certification Program	No
Commercial Manuals	Yes
Commercial Support	Yes
Commercial Training	Yes

⁴http://plone.org/news/conference_01

3.2.8 Typo3

Web Site: <http://typo3.com/> (Official Site) <http://typo3.org/> (Developer Portal)

Version: 4.0

Description: Initially authored by Kasper Skårhøj, it is available under the GNU General Public License. Today, the core of TYPO3 is developed by two teams: one a maintenance branch and the other development. Independent authors have contributed hundreds of pluggable extensions. The Extension Coordination Team tries to bring best interoperability to extensions. Nearly 2000 extensions are available for download under the GNU General Public License from a central repository. The system is based on templates. To construct templates, a complex configuration language called TypoScript is used. Because of its flexibility and scalability Typo3 has grown and expanded rapidly over recent years. [14]

Criteria	Comments
Usability	
WYSIWYG Editor	Yes
Drag-N-Drop Content	Free Add On
Image Resizing	Yes
Spell Checker	Yes
Versioning	Yes
Technical requirements	
Server	Apache, IIS
Database	MySQL, PostgreSQL, Oracle, MSSQL
Operating System	Any
Programming Language	PHP 4.3.0+
Server Root Access	No
Shell Access	No
License	GNU GPL
Web-friendliness	
Friendly URIs	Free Add On
Content-negotiation	No
Web Robots Exclusion	Free Add On: sa_robotstxt
Content Syndication	Yes
Performance	
Database Replication	No
Load Balancing	No

Criteria	Comments
Static Content Export	Free Add On
Visitor tracking	Yes
Security	
Audit Trail	Yes
Captcha	Free Add On
Email Verification	Yes
Granular Rights Management	Yes
Session Management	Yes
Means of Authentication	Free Add-ons for: NIS, NTLM, SMB, LDAP
SSL Compatible	Yes
Problem Notification	Yes
Sandbox	Yes
Built-in applications	
Search Engine	Free Add On
Guest Book	Free Add On
Graphs and Charts	Free Add On
Photo Gallery	Free Add On
User Contributions	Yes
Syndicated Content	Yes
Support	
Developer Community	Yes
Public Forum	Yes
Public Mailing List	Yes
Professional Hosting	Yes
Users Conference	Yes ⁵
Certification Program	No
Commercial Manuals	Yes
Commercial Support	Yes
Commercial Training	Yes

⁵<http://t3con06.typo3.org/home.html>

3.2.9 WebGUI

Web Site: <http://www.plainblack.com/webgui>

Version: 7.0

Description: The system permits non-technically savvy users to arrange content into pages and layouts, containing "wobjects" (applets) which permit website visitors to view and interact with various types of data from basic articles to full-blown content submission systems and custom applications. The system was actually originally built as an application framework by creator Plain Black Software to support their customer development work, but it is likely that a majority of its current independent users utilize it as a CMS with the stock modules with which it ships. In late 2005 and early 2006, the system underwent a major metamorphosis, targeting a release of version 7.0 around July 2006 [16].

Criteria	Comments
Usability	
WYSIWYG Editor	Yes
Drag-N-Drop Content	Yes
Image Resizing	Yes
Spell Checker	Yes
Versioning	Yes
Technical requirements	
Server	Apache
Database	MySQL
Operating System	Any
Programming Language	Perl
Server Root Access	Yes
Shell Access	Yes
License	GNU GPL
Web-friendliness	
Friendly URIs	Configurable via admin interface
Content-negotiation	No
Web Robots Exclusion	No, robots.txt has to be done manually
Content Syndication	Yes
Performance	
Database Replication	Yes
Load Balancing	Yes

Criteria	Comments
Static Content Export	Yes
Visitor tracking	Yes
Security	
Audit Trail	Yes
Captcha	Yes
Email Verification	Yes
Granular Rights Management	Yes
Session Management	Yes
Means of Authentication	LDAP, as Add-on: NIS, NTLM, SMB
SSL Compatible	Yes
Problem Notification	Yes
Sandbox	Yes
Built-in applications	
Search Engine	Yes
Guest Book	Yes
Graphs and Charts	Yes
Photo Gallery	Yes
User Contributions	Yes
Syndicated Content	Yes
Support	
Developer Community	Yes
Public Forum	Yes
Public Mailing List	Yes
Professional Hosting	Yes
Users Conference	Yes ⁶
Certification Program	No
Commercial Manuals	Yes
Commercial Support	Yes
Commercial Training	Yes

⁶<http://www.plainblack.com/wuc>

3.2.10 WordPress

Web Site: <http://wordpress.org/>

Version: 2.0.4

Description: WordPress is a state-of-the-art semantic personal publishing platform with a focus on aesthetics, web standards, and usability.[18] The system is mainly designed to create personal web sites (web logs or 'blogs'). It extensively uses very hip techniques such as Ajax or Web 2.0 Mashup.

Criteria	Comments
Usability	
WYSIWYG Editor	Free Add-on
Drag-N-Drop Content	No
Image Resizing	No
Spell Checker	Free Add-on
Versioning	Yes
Technical requirements	
Server	Apache w. mod_rewrite
Database	MySQL 3.23.23+
Operating System	Any
Programming Language	PHP 4.3+
Server Root Access	No
Shell Access	No
License	GNU GPL
Web-friendliness	
Friendly URIs	Predefined .htaccess file comes with installation.
Content-negotiation	No
Web Robots Exclusion	No, robots.txt has to be done manually
Content Syndication	Yes
Performance	
Database Replication	No
Load Balancing	No
Static Content Export	No
Visitor tracking	Free Add-on
Security	
Audit Trail	No

Criteria	Comments
Captcha	No
Email Verification	No
Granular Rights Management	Yes
Session Management	No
Means of Authentication	proprietary
SSL Compatible	No
Problem Notification	Yes, but limited
Sandbox	Yes
Built-in applications	
Search Engine	Yes
Guest Book	No
Graphs and Charts	No
Photo Gallery	Free Add-on
User Contributions	Yes
Syndicated Content	Yes
Support	
Developer Community	Yes
Public Forum	Yes
Public Mailing List	Yes
Professional Hosting	Yes
Users Conference	No
Certification Program	No
Commercial Manuals	No
Commercial Support	No
Commercial Training	No

3.3 Comparison matrix

For a better overview, the subsections on the next pages summarize the criteria across all the evaluated systems.

3.3.1 Usability

	Drupal	eZpublish	Joomla!	Mambo	MySourceMatrix	openCMS	Plone	Typo3	WebGUI	WordPress
WYSIWYG Editor	Free Add On	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Free Add On
Drag-N-Drop Content	No	No	No	No	No	Yes	Free Add On	Free Add On	Yes	No
Image Resizing	Free Add On	Yes	Yes	Yes	No	Yes	Free Add On	Yes	Yes	No
Spell Checker	Free Add On	No	No	No	No	Free Add On	Free Add On	Yes	Yes	Free Add On
Versioning	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

3.3.2 Technical requirements

	Drupal	eZpublish	Joomla!	Mambo	MySourceMatrix	openCMS	Plone	Typo3	WebGUI	WordPress
Server	Apache, IIS	Apache	Apache Recommended	Apache Recommended	Apache	Tomcat, Apache, IIS, JBoss	Apache, IIS, Zope	Apache, IIS	Apache	Apache w. mod_rewrite
Database	MySQL, Post-GreSQL	MySQL, Post-GreSQL, Oracle, MSSQL	MySQL	MySQL	Postgres, Oracle	MySQL, Post-GreSQL, Oracle, MSSQL	Zope (ZODB)	MySQL, Post-GreSQL, Oracle, MSSQL	MySQL	MySQL 3.23.23+
Operating System	Any	Any	Any	Any	Any	Any	Any	Any	Any	Any
Programming Language	PHP 4.3.3+	PHP	PHP 4.1.2+	PHP 4.1.2+	PHP 4.3+, Java	Java 1.3+	Python	PHP 4.3.0+	Perl	PHP 4.3+
Server Root Access	No	No	No	No	Yes	No	No	No	Yes	No
Shell Access	No	No	No	No	Yes	No	No	No	Yes	No
License	GNU GPL	GNU GPL or commercial	GNU GPL	GNU GPL	Squiz.Net Source Licence	GNU LGPL	GNU GPL	GNU GPL	GNU GPL	GNU GPL

3.3.3 Web-friendliness

	Drupal	eZpublish	Joomla!	Mambo	MySourceMatrix	openCMS	Plone	Typo3	WebGUI	WordPress
Friendly URIs	Yes, needs manual activation	Predefined .htaccess file.	Predefined .htaccess file.	Predefined .htaccess file.	To be manually done via Apache's Mod Rewrite	Free On	Configurable via admin interface	Free On	Configurable via admin interface	Predefined .htaccess file.
Content-negotiation	No	No	Yes	No	No	No	Yes	No	No	No
Web Robots Exclusion	Manual	Manual	Yes	Manual	Yes	Manual	Yes	Free Add On: sa_robotstxt	Manual	Manual
Content Syndication	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

3.3.4 Performance

	Drupal	eZpublish	Joomla!	Mambo	MySourceMatrix	openCMS	Plone	Typo3	WebGUI	WordPress
Database Replication	No	Yes	No	No	Yes	No	No	No	Yes	No
Load Balancing	No	Yes	No	No	Yes	No	Yes	No	Yes	No
Static Content Export	No	Yes	No	No	Yes	Yes	Yes	Free Add On	Yes	No
Visitor tracking	Yes	Yes	Yes	Free Add On	Yes	Yes	Free Add On	Yes	Yes	Free Add On

3.3.5 Security

	Drupal	eZpublish	Joomla!	Mambo	MySourceMatrix	openCMS	Plone	Typo3	WebGUI	WordPress
Audit Trail	Yes	Yes	No	No	Yes	No	Yes	Yes	Yes	No
Captcha	Free Add-on	Free Add-on	Yes	No	Yes	No	No	Free Add-on	Yes	No
Email Verification	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Granular Rights Management	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes
Session Management	Yes	Yes	Yes	Yes	Yes	No	Free Add-on	Yes	Yes	No
Means of Authentication	LDAP as Free Add-on	LDAP	LDAP as Free Add-on	LDAP	LDAP as commercial Add on	LDAP as commercial Add on	NTLM, as Free Add-on: Kerberos, LDAP, SMB	Add-ons for: NIS, NTLM, SMB, LDAP	LDAP, as Add-on: NIS, NTLM, SMB	proprietary
SSL Compatible	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes	No
Problem Notification	No	Yes	No	No	Yes	Yes	No	Yes	Yes	limited
Sandbox	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes

3.3.6 Built-in applications

	Drupal	eZpublish	Joomla!	Mambo	MySourceMatrix	openCMS	Phone	Typo3	WebGUI	WordPress
Search Engine	Yes	Yes	Yes	Yes	Commercial Add on	Yes	Yes	Free Add On	Yes	Yes
Guest Book	Free Add-on	Free Add-on	Free Add-on	Free Add-on	Yes	No	Free Add-on	Free Add On	Yes	No
Graphs and Charts	No	Free Add-on	Free Add-on	Free Add-on	Commercial Add on	No	No	Free Add On	Yes	No
Photo Gallery	Free Add-on	Yes	Free Add-on	Free Add-on	Yes	Yes	Free Add-on	Free Add On	Yes	Free Add-on
User Contributions	Yes	Yes	Yes	Yes	Commercial Add on	No	Yes	Yes	Yes	Yes
Syndicated Content	Yes	Yes	Yes	Yes	Commercial Add on	No	Free Add-on	Yes	Yes	Yes

3.3.7 Support

	Drupal	eZpublish	Joomla!	Mambo	MySourceMatrix	openCMS	Plone	Typo3	WebGUI	WordPress
Developer Community	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Public Forum	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Public Mailing List	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Professional Hosting	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Users Conference	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	No
Certification Program	No	Yes	No	No	Yes	No	No	No	No	No
Commercial Manuals	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Commercial Support	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Commercial Training	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No

4 Conclusion

Choosing a CMS can be a long and difficult process, especially since there are a large number of content management systems available. Sourceforge.net alone lists around 600 active open source CMS projects one can choose from. The selection of a content management system depends on a variety of criteria, depending on the scope of the project.

Usability: All Systems evaluated are operated via a web client interface. That means that almost all customizing can be done via a JavaScript enabled web browser. At least Plone, Drupal and WordPress extensively use AJAX which leads to a desktop-like behaviour of the administration client.

Technical requirements: Combined usage of Apache as web server, PHP for the application and MySQL as database is very common in open source CMS. These systems are wide-spread and supported by strong open source communities. Therefore continuing development as well as support is more or less guaranteed. OpenCMS decided to use the Java based palette: Tomcat as application and web server, and Java1.3+ for the programming. Unusual but not uninteresting is Plone. It uses Zope for application and web server as well as for the database (ZODB).

Web friendliness: Content syndication, HTTP cookies and friendly URIs are de-facto standard. All evaluated systems support these features. Web robots exclusion has to be done manually in most cases, which is not difficult. However content negotiation [23], if even used in the evaluated systems, is mainly to figure out the language the client prefers. The full capabilities of content negotiation are used in none of the systems.

Security: In most cases authentication is done by LDAP. Systems are well equipped with audit trail, verification and rights management options.

Built-in applications: While some features of the CMS are build into the system core, many others can be added by installing third-party extensions. This principle is the same for every system evaluated. TYPO3 runs an extension repository where hundreds of extensions can be downloaded or even installed directly. If there is a feature not listed in the repository, one is invited to contribute and develop this feature for the community.

Support: All systems offer support in the form of mailing lists, forums or something similar. Except from WordPress, commercial support is available for all systems.

Highly scalable and flexible systems often require quite a lot of man-hours and effort to get the system running as desired. In the case of Typo3, for example, system administrators must learn a very specific scripting language called TypoScript [5] to do even very basic customizing. Although all tested systems are freely available, one should keep in mind that there might be significant costs for training and/or professional support. The more sophisticated

the system the higher the expected effort for implementation and maintenance. The usage of Systems like Typo3 or MySourceMatrix is recommended for sites which are expected to grow dramatically in complexity and functionality in the future. On the other hand, there are many good quality systems which consist more or less of PHP libraries with a database connection. Good documentation and strong community support is available in most cases. When using these systems in combination with ready made site templates, it is quite simple to create a respectable site in short amount of time.

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