

Developing, Managing and Maintaining Web Applications with Content Management Systems: Drupal and Joomla as case study.

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<p>Title of thesis Developing, Managing and Maintaining Web Applications with Content Management Systems: Drupal and Joomla as case study.</p>	<p>Number of pages and appendices 70 + 5</p>
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<p>The use of Content management systems by businesses, individuals, corporate and non-governmental organisations are recognized in the business and technology industries. Developers and companies are realising the advantages in the concept of free development environment for Web contents.</p> <p>Content Management systems have made content publishing on the internet fast and easy. Companies want to reach out to their customers, sell their products and expertise, maximize profits and increase efficiency. All these are great advantages provided by content management systems applications.</p> <p>Open source content management gives opportunities for developers to utilize and practise their knowledge. It also allow developers to contribute to the contribute to growing applications on the internet.</p> <p>This thesis focuses on researching and examining how to build different web applications with desired functionalities using both Drupal and Joomla. It contains Web applications introduction, interviews and questionnaires from Drupal and Joomla experts, Definitions and argument about content management systems and Open source content management systems, Drupal and Joomla analysis and guides, Sample applications to support the research, and application testing which confirm that content management applications provides functionalities that are seen in applications developed with HTML editors.</p> <p>In conclusion, it can be inferred from the research and analysis of the result that Drupal and Joomla Web applications which are content management systems are secure, reliable, flexible and cost effective.</p>	
<p>Keywords Content Management Systems, Drupal, Joomla, Open Source, Web applications, Ubercart, VirtueMart</p>	

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Acronyms and Meaning

API	Application Programming Interface
CMS	Content Management System
CSS	Cascading style sheets
CRM	Customer Relationship Management
GNU	“GNU,s Not Unix!”
GNU GPL	GNU General Public License
HTML	Hypertext Markup Language
IIS	Internet Information Services
JS	Javascript
OOD	Object Oriented Design
OS	Open Source
SQL	Structured Query Language
OSCMS	Open Source Content Management System
OSI	Open Source Initiative
OSS	Open Source Software
PHP	PHP:Hypertext Preprocessor
URL	Uniform Resource Locator
XML	Extensible Markup Language
XML-RPC	XML for Remote Procedure Call

1 Introduction

Since the emergent and widespread of web browsers, organisations and individuals have been using web applications to enhance their businesses and day to day activities. The cost, availability, centralisation, compatibility and up-to-date advantages of using web applications contributed to their usage and popularity.

In addition, the existence of internet has contributed to the increase in different applications on the web.

Web application refers to an application installed on a server accessed through the internet or intranet with the aid of a web browser (Wikipedia, January 2010).

The use of content management systems for web applications development such as portal, webshop, web bookings, weather report e.t.c. has been on the increase over the past five years because cost reduction, easy to update advantages that CMS website has over traditional HTML websites. Many web content management systems application are evolving every year such as phpNuke, wordPress, phpBB, mambo and so on.

This thesis focuses on how new person and experts in web application development could get started with Drupal and Joomla for building different web applications. A sample demonstration of webshop application for both Drupal and Joomla will be provided.

Furthermore, this thesis will also demonstrate and analyse how to add different functionalities and features to a Drupal and Joomla web applications by utilising the knowledge of PHP, MySQL, CSS, Javascript, JQuery, and possibly Ajax.

This thesis will last for about 4 months, which contains 400 working hours. This thesis has 4 main parts, which are; CMS, OS, Drupal and Joomla, and a Sample application part.

Chapter 2 of this thesis focuses on method through which sources and information are gathered. The utilisation of the datas are also discused in the second chapter.

Chapter 3 comprises content management systems, its meaning, types and the reasons why it's necessary to use a CMS for processing contents. It also talks about the emerging software technology in the computing world.

Chapter 4 and 5 discuss the main focus of this thesis, Drupal and Joomla. It contains everything that is needed to start developing web applications with Drupal and Joomla. Also, chapter 4 and 5 are useful for anyone who had developed web applications with Drupal and Joomla before and just need to modify it.

In chapter 6, there are explanations and screenshots of a sample webshop developed with Drupal and Joomla.

Chapter 7 contains testing procedures and results for the webshop sample application built using Drupal and Joomla.

The final chapter of this thesis is the conclusion, which contains summary of the findings about Drupal and Joomla, experences about CMS softwares and suggestions for further findings.

1.1 Research methodology

This basically describes the procedure used in this thesis. It explains the research method, method of collecting data, analysis and result of collected data, and the selected organisation used for this research. It also shed light on peoples' experience on this thesis topic.

Research methodology is a process used for making observation, gathering evidence and data, and obtaining information through a research work or study in ones area of practise (Kumar, 2011).

1.2 Research method used

This thesis will be base on qualitative research that involves using action method as the research method. This method involves interviews, observation, and documents and literature analysis (Fisher, 2007, p.166). This method also includes a case study work.

1.3 Organisations used

This thesis work was chosen due to the widespread usage of content management systems and open source softwares both in big and small organisation. Another reason for chosen this thesis topic was because application developers think CMS softwares wouldn't contribute to ones knowledge in the area of web application, rather it is a complete work of someone.

This research work was carried out in two different companies in different countries, Finland and Canada, though both companies are into ICT developments.

Activeark Oy and Braindigit IT solutions are the two companies used for carrying out the interviews.

1.4 Data collection

According to Verkevisser et al, data collection gives a research worker the system of collecting information on a subject under study such as people, objects and phenomena and the particular settings which the events occur (Verkevisser et al. 2003, p.380).

There are different methods of data collection, but interview and questionnaire are those used in this thesis.

1.5 Questionnaire

Questionnaire is a way of gathering data from people in a particular area with the aim of getting scholarly opinions and ideas. Questionnaire is a convenient and easy method of data collection. It reduces cost and energy, and it usually gives adequate information for analysing the goal of the research work (HH CnM, 2010.)

The questionnaire used in this thesis is a structured one which involves predefined questions. The questionnaires were distributed through the Drupal and Joomla community site. The Drupal and Joomla community sites have experts from different countries and they contribute and experiences about Drupal and Joomla developments and usage.

Response has been gotten from about 10-15 respondents. The result and questionnaire will be presented in the appendix.

1.5.1 Questionnaire result analysis

This analysis covers both Drupal and Joomla CMS questionnaire.

Background

Individual respondents have used one or two content management systems such as e107, Drupal, DotNetNuke (dnn), Joomla, and WordPress. Also, 99 percent of the respondents are web developers.

CMS used and why current one

The respondents have experience with the following CMS software: e107, Drupal, DotNetNuke (dnn), Joomla, and WordPress. According to the respondents, they choose their current CMS software because of its flexibility, extensibility and because it is open source.

How to add features and tools needed (languages)

You could add features and functionality to Drupal and Joomla via modules, themes, components, and blocks. You need knowledge of JavaScript and its derivatives to op-

timise pageload and speed, PHP for module customisation and block, MySQL for the improving data storage, XML etc.

Supports available

The average support availability given by the respondents for their chosen CMS software is 8 out of 10.

1.6 Interview

Interview is an exchange of questions and answers between persons with common goals or interest. The interview used in this thesis is called a structured interview, which involves pre-prepared questionnaires and verbal presentation of the questions (HH CnM, 2010.) The same questions were used for both the questionnaire and interview methods. Out of the two organisations interviewed, one deals with Drupal and the other with Joomla.

1.6.1 Interview result analysis

1.6.2 Activeark Oy

Respondent: Quang Pham

Company Background

Activeark is a full-service agency built for today's digital society. Activeark has 70 design-driven digital professionals located in three locations around the world; London, Mumbai and its Headquarters in Helsinki. It has developed different applications for Nokia Siemens, Marimekko, sipooranta, Koskinen, Finnmatkat, Hartwall, Jaffa e.t.c.

CMS used and why current one

We use CMS because CMS offers different functionalities to organize the whole of your site. It gives you options and easy ways to organize the content than making everything from the scratch. The main important thing is that CMS makes everything works in normal and correct flow in an organized manner. We make use of Drupal in our company and it has contributed to our efficiency with good results. Mr. Quang also said they choose Drupal because of its exten-

sibility, flexibility and supports for other technologies like; Google map API, Flash, and so on. (Quang, 2011)

How to add features and tools needed (languages)

You can add features to Drupal through its modules and themes, which also involves making “hooks” (Quang, 2011)

According to Mr. Quang, PHP, SQL, and JAVASCRIPT & its derivatives could be used for adding functionalities to Drupal.

Supports availability

There are many supports for Drupal in different sections and I can give Drupal support 80%.

1.6.3 Braindigit IT Solutions

Respondent: Narayan Koirala

Company Background

Brain digit has been established with a vision to provide affordable and unique ICT services to all business, government and social communities round the world.

Braindigit has its development center in Kathmandu, Nepal; head office is in Ontario, Canada and has equipped her offices with latest hardware and network facilities.

Braindigit uses latest software and tools to develop customized web application and software application for her clients.

“It helps business communities to digitalize their business process, that’s why we have named ourselves as “Brain digit”. By this we mean think digital and then go digital.”

(Narayan, 2011)

CMS used and why current one

“At Braindigit, we currently use Joomla because it is powerful and highly extensible. I have tested and used other CMS software like Drupal, dnn, and WordPress”. (Narayan, 2011)

How to add features and tools needed (languages)

If you have to add feature to core, build a plugins, if you are not satisfied with the design then customize the template you have, or for design you can make your own custom view, and for other make components or modules as per your need. PHP, JavaScript (Jquery, mootools etc), XML, CSS (not really a programming language). (Narayan, 2011)

Supports availability

“I will give Joomla 100% because it has an elaborate and organized wide range of supports through the Joomla community and other platforms”. (Narayan, 2011)

2 CMS

2.1 Introduction

Not everyone knows how to write HTML, PHP, JavaScript, Mysql codes, for putting up and updating information on the web. Industries today, want to advertise their businesses for improved communication, E-commerce and information without going through any hassle or difficulty.

Importantly, organisations want to publish and update contents to the web without the need to know about any software than the web browser. Also, individuals want to share ideas, store reference list of URLs, snippets of technology configuration details, web logs, list of upcoming events and appointments, and their thoughts without bordering with any technical details (Simpson, 2005.)

The best solution to these needs of organisations and individuals is content management systems. Delgado describes CMS as everything from portals, e-commerce to blogs and wikis (Delgado, 2007).

“A Content Management System (CMS) can be defined as a database of information and a way to change and display that information, without spending a lot of time dealing with the technical details of presentation” (Simpson, 2005.)

A content management system provides anyone without the knowledge of HTML, PHP, Javascript, and Mysql the ability to manage, update, upload and delete contents from a website without the proficiency or advice of a web developer (Robertson, 2003).

In addition, according to Altarawneh & El Sheikh (2008), “Web based projects are; 79 percent of information technology projects are delayed with respect to time, 84 percent fails to meet business requirement, and 63 percents exceeds budgets”.

With all these problems encountered in web based projects, the best solution to these problems could be a CMS. As CMS does not need writing HTML codes from scratch thereby reducing the time spend in web based project development. CMS also gives a

way of organizing web based development in a continuous flow manner; this will ensure web based projects development to meet its business purpose.

With a content management system, a web page developed by a web developer could be updated by any member of an organisation or any individuals. This without doubt ensure continuous flow of work and increase efficiency in a company. For instance, A company employs a web developer that develops the company's website, after some time the web developer was fired or got a new job and decided to join the new company. Then the former company wants to update or remove some information on their website, instead of hiring a new web developer, since the website was developed with a content management system any member of the company with permission could update the information on the website.

2.2 Definition

A content management system is software that enhances the initiation or foundation, formation, manipulation, and elimination of information in the form of images, documents, scripts, and plain text (Mercer, 2010).

“The CMS increases overall operational efficiency through the automation of customized content processing via rules management interface and extensible workflow” (Ericsson highlights watchpoint CMS, April 2010.)

“Content management system is a standardized and organized process of supply, creation, processing, management, presentation, processing, publication and reuse of content” (Rothfuss, 2001.)

Content management systems render organizations and individuals the skill to develop and organize enterprise information for all its web needs such as Internet portals, e-business applications, intranets and extranets (Durham, 2004. p 3).

Bradford Lee, 2006 describes CMS as a way of managing large numbers of web-based information that are more than coding all of the information into each page in HTML by hand (Bradford Lee, 2006. p 5).

A content management system (CMS) is a computer application used to create, edit, manage, and publish content in a consistently organized fashion. CMSs are frequently used for storing, controlling, versioning, and publishing industry-specific documentation such as news articles, operators' manuals, technical manuals, sales guides, and marketing brochures. The content managed may include computer files, image media, audio files, video files, electronic documents, and Web content (The Open Source Collective, Inc., 2002.)

CMSs have been defined by different authors, individuals, organisations and so on. These definitions represent the opinion of individuals or organisations, and have been based on their own experiences using CMS.

A general definition of content management system is that, a CMS is a facility that is used to handle the content of a website.

In conclusion, base on the preceding discussion it can be inferred that CMS provides multiple functionalities with capability to manage the contents of a site. With such functionalities, CMS provides avenue for easy and well organized contents arranged in a proper flow rather than developing the site contents from the scratch.

2.3 Classification of CMS

In an attempt to classify CMS, it could be classified based on two different criteria which are either Functionality or License. Classification based on functionality reveals what the CMS is used for and which sector or platform it is being used.

Enterprise CMS, Web CMS, and Component CMS are the 3 categories of CMS based on functionality. Classification of CMS based on functionality is not the main focus of this thesis but a brief description will be provided.

Enterprise CMS abbreviated as ECM, ECM is used by organisations for managing, organizing and sharing their large contents. These contents could be images, text, files etc. ECM system usually includes many template website in their package. E.g. IBM Lotus, Alfresco, SharePoint, RedDot e.t.c.

Component CMS abbreviated as CCM, could be taught of as a CMS used for contents constituent or part stored for later use.

Web CMS is a CMS that involves the use of Markup languages for publicising, creating, storing and sending contents onto the World Wide Web.

Web Content management systems could be categorise into 2 based on the license, which are proprietary CMS and open source CMS. This category also forms the license categorisation of CMS.

Proprietary CMS is a commercial CMS used by organisations and it usually comes with price value. E.g. Microsoft DotNetNuke- also available as open source CMS.

Open Source CMS should be explained in details because the focus of this thesis is base on OSCMS. Therefore, the next subtitle will be dedicated to OSCMS.

2.3.1 Open Source CMS

Open Source is not a new technology; it literarily means source code availability.

Though, the word open source encompasses many other rights. According to the Open Source Initiative (OSI. 2011), before software would be considered an OS, it must meet the following criteria:

- Free Redistribution

The license shall not restrict any party from selling or giving away the software as a component of an aggregate software distribution containing programs from several different sources. The license shall not require a royalty or other fee for such sale.

- Source Code

The program must include source code, and must allow distribution in source code as well as compiled form. Where some form of a product is not distributed with source code, there must be a well-publicized means of obtaining the source code for no more than a reasonable reproduction cost preferably, downloading via the Internet without charge. The source code must be the preferred form in which a programmer would modify the program. Deliberately obfuscated source code is not allowed. Intermediate forms such as the output of a preprocessor or translator are not allowed.

- Derived Works

The license must allow modifications and derived works, and must allow them to be distributed under the same terms as the license of the original software.

- Integrity of The Author's Source Code

The license may restrict source-code from being distributed in modified form *only* if the license allows the distribution of "patch files" with the source code for the purpose of modifying the program at build time. The license must explicitly permit distribution of software built from modified source code. The license may require derived works to carry a different name or version number from the original software.

- No Discrimination Against Persons or Groups

The license must not discriminate against any person or group of persons.

- No Discrimination Against Fields of Endeavor

The license must not restrict anyone from making use of the program in a specific field of endeavor. For example, it may not restrict the program from being used in a business, or from being used for genetic research.

- Distribution of License

The rights attached to the program must apply to all to whom the program is redistributed without the need for execution of an additional license by those parties.

- License Must Not Be Specific to a Product

The rights attached to the program must not depend on the program's being part of a particular software distribution. If the program is extracted from that distribution and used or distributed within the terms of the program's license, all parties to whom the program is redistributed should have the same rights as those that are granted in conjunction with the original software distribution.

- License Must Not Restrict Other Software

The license must not place restrictions on other software that is distributed along with the licensed software. For example, the license must not insist that all other programs distributed on the same medium must be open-source software.

- License Must Be Technology-Neutral

No provision of the license may be predicated on any individual technology or style of interface (OSI, 2011.)

Making source codes available means the public could contribute to a software completion thus making software open to community of developers who could share their knowledge and could also customize the software to suit their needs. OS softwares come with many different licenses, those that are used with Drupal and Joomla will be discussed in later chapters.

OSCMS means a CMS that has the criteria of an open source. That is, OSCMS is a CMS that has its source code available for use or alteration by users or other developer community, as they like.

In addition, it is possible to play around OSCMS software source code and develop any type of derived product that would suits your own purpose.

3 Drupal

3.1 Introduction

Drupal is one of the 10 most popular and highly rated OSCMS.(WebDevNews, 2008) It became open source software in 2001, when the source code was released to the public by Dries Buytaert, the original creator and project lead of Drupal. Drupal.org is the official web site for Drupal. It offers consistent and thorough support about Drupal, and it contains well structured, agile community of developers and users who contribute towards further Drupal development and security on a daily basis.

Drupal is used to build different web applications ranging from community portal sites, business community sites, news publishing, aficionado sites, corporate web sites, international sites to e-commerce web sites.(Drupal, 2002) It is easy to use, and has so many modules and libraries. Web applications developed with Drupal are reliable, robust, efficient, extensible and flexible.

Drupal being OS software, comes under the restrictive General Public Licence GPL. This license gives the freedom to share and modify any part of Drupal source code. It is not possible to make proprietary software from Drupal. That is, if you modify any part of a Drupal source code and build software from it in order to make money, then you must provide the source code of the software to anyone who requests for it and distribute the software under the GPL license. (Mercer, 2010.)

Drupal is written in at least six different programming languages: PHP, SQL, HTML, CSS, XML, and JAVASCRIPT. (Butcher, 2009) Drupal also uses the open source databases: MYSQL and PostgreSQL for storing contents and settings. It is multiplatform software that runs on different platforms such as Windows, Mac OS X and Linux.

Presently, current version of Drupal is Drupal 7.xx which is characterized with a better administrative interface over previous versions but lack some modules and supports. Due to the fact that some features are missing or not yet presented in Drupal 7.xx, a previous version Drupal 6.xx was selected for this thesis work.

3.2 Getting started with Drupal

It is important to know the technologies that are involved in a Drupal, this will let us know what are the things needed before developing a Drupal site.

Since Drupal is multiplatform software, operating system is not to be considered when starting to build a site with Drupal. The technologies that need to be considered when getting started with Drupal are: Web server, Database and Language interpreter.

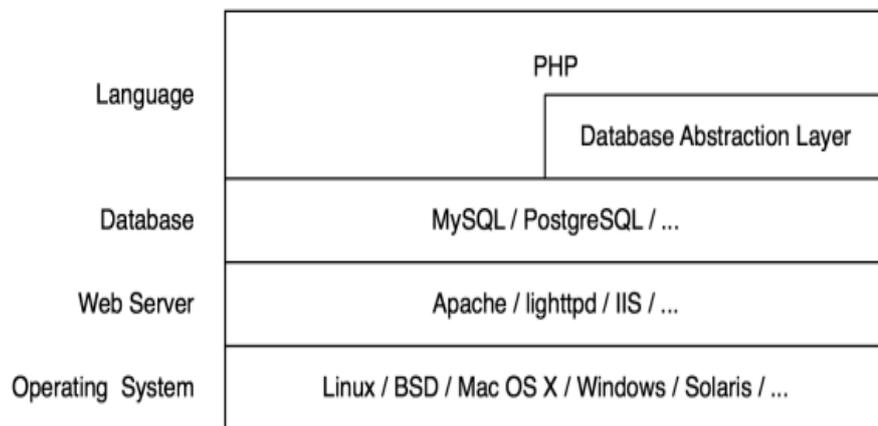


Figure 3.1: Drupal's Technology Requirements.

As it is shown in the figure above, Web server is what should be considered next after operating system, when developing with Drupal. Drupal works with different web servers that support PHP because the main Drupal part is built with PHP language. Drupal could be installed on Apache, Microsoft IIS, and Lighttpd web servers. The recommended and the official web server recommended for Drupal site is the Apache web server.

Apache is the most popular web server. Drupal works with Apache 1.3 or Apache 2.x hosted on any operating system. Many Drupal development and utilization has been done on Apache, so there are many supports from experienced Apache users than other web servers. (Mercer, 2010.)

The next technology that is needed for getting started with Drupal is the database. MySQL and PostgreSQL have been used with Drupal but MySQL is recommended due to the availability of support from other users.

MySQL is a popular open source database engine that works with all platforms, though each platform has its unique installation guide. Drupal 6 version works with MySQL 4.1 or higher. MySQL will be used to store all the site information.

The last technology is PHP interpreter. PHP is the language of Drupal; it has Object Oriented Design (OOD) framework. It is used with many open source softwares on the web. PHP 4.4.0 or higher is the version that can be used with Drupal 6.

3.3 Structure of Drupal

Drupal structure could be said to contain many different parts, the exact structure depends on the richness of the site. Although, all Drupal sites contain 2 basic structures: The Drupal core and The Theme engine.

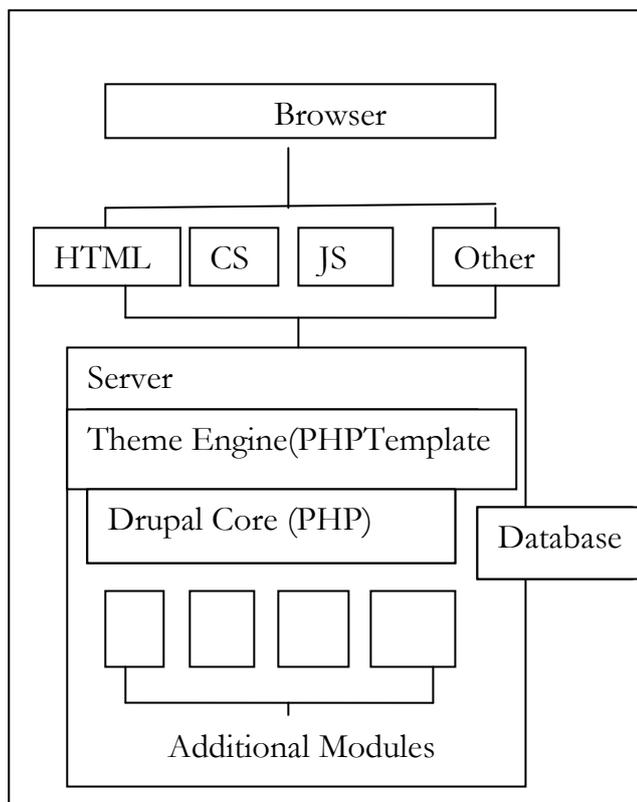


Figure 3.2: Drupal's Structure

The Drupal core is the drupal folder that is downloaded from the drupal.org, and it is the heart of Drupal. The Drupal core provides main functionality to be used by other parts of Drupal system. It contains: codes that assist the Drupal system to respond when it takes a request, libraries for running Drupal, and **Core modules**-modules that provides basic functionalities for Drupal system. Drupal core takes data from contributed modules, custom modules, core modules, and database and hand them over to the theme engine.

The Theme engine is responsible for receiving the data from the Drupal core and rendered them for display in the web browser. That is, Drupal uses PHPTemplate-a theme engine, for formatting and to layout HTML, CSS, and XML for display in the browser. There are many theme engines such as Smarty, XTemplate, PHPTemplate, and PHPTal. Drupal makes use of PHPTemplate as its theme engine (VanDyk, 2008.)

The Contributed modules and themes are the modules and themes developed or put up and maintained by the Drupal community. Any individuals with Drupal development interest can be part of the Drupal community.

The Custom modules and themes are implemented or developed, and customized by individual Drupal site developer. This is usually done when a drupal site developer couldn't find a suitable module or theme for his/her site need.

The Hook is an act or process through which the Drupal core interact with the contibuted modules, and custom modules. This is the most common way to enhance the Drupal core functionalities (VanDyk, 2008 p. 5).

3.4 Drupal installation

As it has been said earlier, web server (Apache), MySQL, and PHP are needed for building a Drupal site. Different operating systems have different local web servers that incorporate these 3 technologies. So, it is only required to download and install the web server as it already contains Apache, MySQL, and PHP. Otherwise, one needs to

download and install the three technologies one by one and then connect them together.

There are 2 different ways through which Drupal could be installed:

- 1- Web installation
- 2- Command line installation

Web installation is usually good for individuals who are not used to Drupal and don't know how to use the UNIX/Linux commands.

Command line installation is mostly used by drupal developers and individuals with UNIX/Linux commands knowledge. It is used on a UNIX computer.

3.4.1 Web Installation of Drupal

For installing Drupal through the web, I will be describing the process on both Windows and UNIX machine (Mac and Linux). Web installation can either takes place on a local host or on a production server. The processes of installing Drupal on local host and on production server are similar but some web hosting organizations provide "one-click" installations of Drupal via a third party application on their production server. E.g. The Fantastico application used by Green Geeks Web hosting (Drupal guide, 2011).

For installations on Windows, there are many web servers that have the 3 Drupal technologies (Server, MySQL, PHP) included in them; examples include XAMPP, and WAMP. In this thesis, WAMP server will be employed.

WAMP (Windows Apache MySQL and PHP) server is a free and open source web development environment that allows the creation of web application on Windows. WAMP server could be downloaded from <http://www.wampserver.com/en/download.php>, the server official web page. It contains a database engine for managing and storing data.

- 1- Click on the link above to download, then click "save file" on the pop-up box.

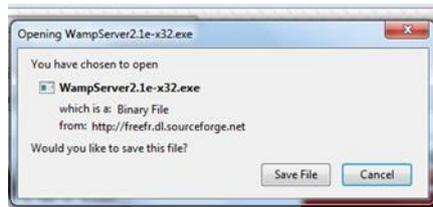


Figure 3.3: Wamp server download pop up.

- 2- After the file has finished downloading, right click on the WampServerxx.exe file and choose open.
- 3- Click “Run”



Figure 3.4: Wamp server Download security warning

- 4- Click “Next”
- 5- Agree and accept the WAMP license terms. Select I accept the agreement box then click on the “Next” button.
- 6- WAMP is installs in the C:\wamp folder by default. You can change this setting if you want to install WAMP in a different location. Click on the “Next” button.
- 7- A WAMP shortcut is in your start menu folder. Nothing to edit here. Just press “Next” button.
- 8- It is better to start Apache and MySQL manually through the WAMP icon because sometimes you might not need it. So, leave the box blank in this step.
- 9- This next step is asking about the location you wish to place the root folder. Just press “OK” and continue.

- 10- It is not advisable to configure SMTP and mail server on a localhost because it requires great technical knowledge, so skip the next 2 prompts.
- 11- This step is just asking if you want FireFox to be the default web browser to use with WAMP if you have it installed, instead of Internet Explorer. Click “Yes” to set FireFox as your default web browser for WAMP, otherwise press ‘no’ to leave Internet Explorer as your WAMP default web browser.
- 12- Click “Yes” in this step because you are installing WAMP for the first time.
- 13- Successfully, WAMP has now been installing on your computer. If you don’t want to start WAMP now, uncheck the box and press the finish ‘button’.

Double click the “Start WAMP” icon in the WAMP menu from the start menu on your computer to start WAMP. WAMP has a tray icon located in the bottom right corner of your screen. You can tell if there are any problems running any of the servers by the color of the icon.

After the WAMP server has finished installing and started, a cone-like shape will appear in the taskbar notification area of your computer, with white colour. If half of the cone shape is red, it means you’ve not started the WAMP server, if after you’ve started the server the cone shaped icon shows half yellow colour, it means there are some services conflicting with the WAMP server. Close any VoIP software on your computer like Skype.

There are two ways to access the applications you have created on WAMP. The first way is to use the WAMP tray icon menu and select “Localhost”. The default WAMP web browser will start and open the default WAMP home page. The second way to access your website is to start your web browser and type “Localhost” which will also open WAMP home page.

After installing the web server, it’s now time to install Drupal on the server. The following steps show how to install Drupal on both local host and production server:

Step by step installation of Drupal

Before starting the installation, it is necessary to create the installation database that will be used to store data for the web application.

- 1- First click on the WAMP cone icon and select phpmyadmin or through CPanel on a production server. Create a database for the Drupal installation; don’t

bother about user and password as the default one will be used. You can also type <http://localhost/phpmyadmin/> in the browser to access phpmyadmin.



Figure 3.5: Wampserver cone icon menu

- 2- Download and unzip the zip file that contains the Drupal directory from Drupal.org. As it has been said earlier, version 6 is being used in this thesis.
- 3- On the localhost server, upload the Drupal directory that was downloaded inside C:\wamp\www directory. For online server, upload it in public_html of the web hosting account.
- 4- Go to the browser, type “localhost” or click on the WAMP cone icon on task bar of your computer and choose localhost (see figure 3.5). For live server or online server, type <http://yourdomain.com/org/net/fi>.
- 5- Click on the Drupal directory that was uploaded. This opens up the Drupal web installation language page.
- 6- Choose the default language for the Drupal site.
- 7- Follow the instruction on the screen by going to “C:\Wamp\www\drupalinstallationfolder\sites\default” and copy the default.settings.php file to “C:\Wamp\www\drupalinstallationfolder\sites\default” then rename it to settings.php.
For online server, copy the /public_html/drupalinstallationfolder/sites/default/default.settings.php file to/public_html/drupalinstallationfolder/sites/default/settings.php.

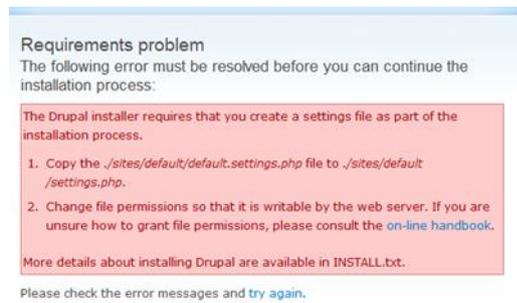


Figure 3.6: Drupal installation error page.

- 8- Fill in the database details created in step 1 and click “save configuration”. Remember in this thesis, the database username is “root” with no password.
- 9- Enter the site information and click “Save”.
- 10- Congratulation! The installation is complete, you can click the visit your site link to see the site. It shows a warning message because the mail client is not configured; don’t worry as this doesn’t affect the site.

3.4.2 Command Line Installation of Drupal

For installation on UNIX/Linux, LAMP server will be used.

LAMP (Linux Apache MySQL and PHP/Perl/Python) server is a free and open source development environment used on any UNIX or Linux computer. The installation of LAMP takes place via the command line or terminal. These installation steps assume UNIX/Linux operating system has been installed on your computer, so Apache, MySQL and PHP will be install.

- 1- To install Apache, open the terminal window and then issue the command:
`sudo apt-get install apache2`
- 2- Apache server should start after the installation. To check, open a web browser and type “localhost”, you should get “It works!” display on the page.
- 3- If Apache didn’t start after installation, type:
`sudo /etc/init.d/apache2 start`

command in the terminal to start Apache manually.

- 4- For PHP installation, type:

```
sudo apt-get install php5 libapache2-mod-php5
```

in the terminal. Then after installation,

- 5- Restart apache with the command:

```
sudo /etc/init.d/apache2 restart
```

- 6- For MySQL installation, only the server is needed, then configuration inside the server.

Type: `sudo apt-get install mysql-server`

Now, issue the command: `mysql -u root -p` to log into mysql server.

Click “enter”

Issue the command `“SET PASSWORD FOR ‘root’@‘localhost’ = PASSWORD (‘YOURPASSWORD’); “`.

NB: YOURPASSWORD is the password you want to choose for the MySQL administrative user.

Enter “quit” to exit the MySQL prompt. Then type: `“sudo /etc/init.d/mysql start”` to start MySQL.

Step by step installation of Drupal via command line

There are four main steps to do for installing Drupal through command line. They are: Downloading and extracting the Drupal file, creating the configuration file and granting permissions, creating the Drupal database, and running the installation scripts.

Breaking the steps down, consists;

- 1- Open the terminal and type

```
“wget http://drupal.org/files/projects/drupal-x.x.tar.gz
```

```
tar -zxvf Drupal-x.x.tar.gz” to download and extract the Drupal zip file.
```

- 2- Then move the file to the web server folder with the command

```
“mv Drupal-6.20 /var/www/”
```

- 3- Copy the default.settings.php file that is in the sites/default folder of the Drupal directory and rename the default.settings.php file to settings.php with the command “cp sites/default/default.settings.php sites/default/settings.php”
- 4- Grant write privilege to the web server for the configuration file and sites/default directory with the commands
“chmod a+w sites/default/settings.php” and “ chmod a+w sites/default”
- 5- Create the Drupal database and user with “mysqladmin -u root -p create drupal” command.
NB “root” is the username while “drupal” is the database name.
- 6- Log into the MySQL server to set the database rights.
Enter “mysql -u root -p”
Then enter “GRANT SELECT, UPDATE, DELETE, INSERT, ALTER, CREATE, DROP, INDEX, CREATE TEMPORARY TABLES, LOCK TABLES ON drupal.* TO ‘root’@’localhost’ IDENTIFIED BY ‘password’” to the prompt.
NB “localhost” is the server name for the mysql, you could replace it with your web hosting server name if you are using online server. “Password” is the password for the username “root”.
- 7- If this query is successful, mysql respond with “Query OK, 0 rows affected”.
- 8- Run the installation script by opening your browser and type: “localhost/drupal” for local server and “yourdomainname.com/drupal” for online server.
- 9- Follow the installation wizard on the screen to complete the Drupal installation via command line and start using the Drupal website.

3.5 Creating site contents in Drupal

There are different types of contents in Drupal called content types. Content types can be created or deleted. Each content type depends on the idea of the content or what the content really does. Content can be created and updated by anyone logged in as the administrator or any users with create content privilege/role.

Create content in Drupal by following the steps below:

- 1- Click on the “Create content” link on the navigation menu or from the administrator menu (If the administrator menu module is installed).
- 2- Select the type of content to be created (Content type)
- 3- Fill the content form and Save. By creating content, a menu link to the content could also be created. In the content display section of the form, select “publish”.

The screenshot shows the Drupal administration interface. On the left is a vertical navigation menu for user 'sharmel' with options: My account, Create content (highlighted), Page, Story, Administer, and Log out. The main content area is titled 'Create Page'. It includes a 'Title' field with a star icon containing 'Welcome'. Below it is a 'Menu settings' section with a plus icon. Inside 'Menu settings', there are fields for 'Menu link title' (containing 'HOME'), 'Parent item' (a dropdown menu showing '<Primary links>'), and 'Weight' (a dropdown menu showing '0'). Below these is a 'Body' field containing the text 'Welcome to my thesis project home page.'.

Figure 3.7: Create “Page” content type

- 4- “Page” content type usually appears in the site front page. Go to the front page to see the content.

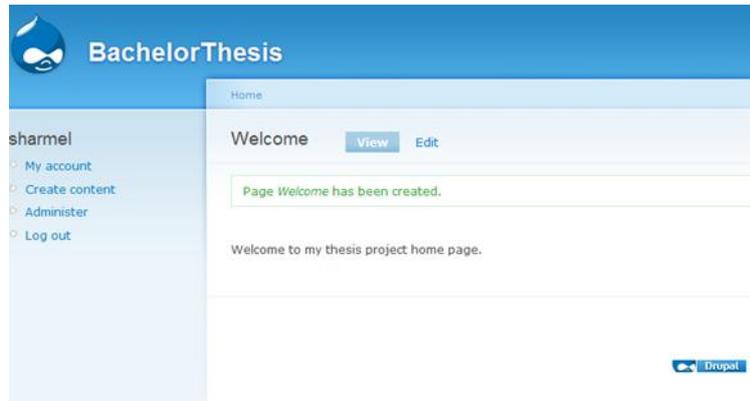


Figure 3.8: Front page of the application sample, showing the created content has been saved and published.

It is possible to edit the content after it has been saved and published. When logged in as the administrator, a link will appear at the top of the content which can be used to edit and change the content.

3.6 The site contents and configurations

There are different contents on a Drupal site depending on the site. The following are found on a typical Drupal site:

Note: A node is every part of information. That is, a node is information that is presented on a drupal powered web page. It may be any content types.

Content type: are types of information that are displayed on different parts of a Drupal site. It is basically a type of node. Content types may include: story, blog entry, page etc.

Block: This is a region on a Drupal powered site where nodes are displayed. There are different regions on a drupal page depending on the themes used. General blocks on a Drupal powered site includes: Header, Sidebar-Left, Sidebar-Right, Footer, Content etc.

Menu: are links used to explore different part of a Drupal powered site. They include: navigation menu, primary menu, secondary menu, JQuery dropdown menu etc.

Comment: is a piece of information that is attached to a node. It is not in many drupal powered sites because it involves security risks if it isn't configuring properly.

In addition, after installing drupal, it is necessary to configure the site. Changing the favicon, site name, configuring the search result, adding mission statement to the site are all that could be configure before starting to use the website. These could be done by navigating to Administer>site configuration>site information.

3.7 Improving site contents functionality

According to the Drupal structure (Figure 3.2), it shows that Drupal provides four different ways of improving the content of a site. These four ways are all based on the **Modules** and the **Themes**. Functionalities are included in modules and themes.

“Drupal itself doesn't try to provide every possible feature that a web site might need. Instead, it provides common and important features and then it provides a mechanism for plugging in additional functionalities” (Butcher, 2009.)

It is possible to add functionalities to Drupal web site by enabling existing modules and themes, installing modules developed by others, customising existing modules and themes, and by developing new modules and themes yourself (VanDyk, 2008).

3.7.1 Drupal Modules

Drupal being a modular system contains many categories of modules. The modules that are contained in the Drupal core are called **Core modules**. Core modules are further divided into **Core required** and **Core optional** modules. The core required modules cannot be disabled, they are require by the Drupal core for it functionality. These modules are: Filter, Node, User, System, and Block module.

The core optional modules can be enabled and disabled; they can also be customising to add more functionality to a Drupal site. Some of these modules include: Aggregator, Blog, Content translation, Open ID, Help, Locale, Menu e.t.c.

▼ Core - optional

Enabled	Name	Version	Description
<input type="checkbox"/>	Aggregator	6.0	Aggregates syndicated content (RSS, RDF, and Atom feeds).
<input type="checkbox"/>	Blog	6.0	Enables keeping easily and regularly updated user web pages or blogs.
<input type="checkbox"/>	Blog API	6.0	Allows users to post content using applications that support XML-RPC blog APIs.
<input type="checkbox"/>	Book	6.0	Allows users to structure site pages in a hierarchy or outline.
<input checked="" type="checkbox"/>	Color	6.0	Allows the user to change the color scheme of certain themes.
<input checked="" type="checkbox"/>	Comment	6.0	Allows users to comment on and discuss published content. Required by: Forum (disabled), Tracker (disabled)
<input type="checkbox"/>	Contact	6.0	Enables the use of both personal and site-wide contact forms.
<input type="checkbox"/>	Content translation	6.0	Allows content to be translated into different languages. Depends on: Locale (disabled)
<input checked="" type="checkbox"/>	Database logging	6.0	Logs and records system events to the database.
<input type="checkbox"/>	Forum	6.0	Enables threaded discussions about general topics. Depends on: Taxonomy (enabled), Comment (enabled)

Figure 3.9: Drupal 6 Core optional modules

Contributed modules are later added to Drupal sites, they are not part of the drupal core. Contributed modules allow the site developer to extend, create, and manage Drupal's core functionality. These types of modules are developed and managed by the Drupal community and are available for download from the Drupal module page: <http://drupal.org/project/modules>.

3.7.2 Module installation

Installing a module is the same as when installing a theme but enabling a module and theme are two different ways.

- 1- First, go to <http://drupal.org/project/modules> search and download the module. Be sure of the version of the module that is compatible with the drupal installation.

- 2- Extract the downloaded zip file to a location on your computer. The directory inside the zip file contains a folder with the module name and version.
- 3- Create a directory inside drupalinstallationfolder/sites/all/ and name it “modules”. So you have drupalinstallationfolder/sites/all/modules.
- 4- Copy the extracted module directory in step 2 to drupalinstallationfolder/sites/all/modules.

The module has been installed successfully. After installing the module, it is of no use until it is enable.

Go to Administer >site building >modules, and check the “Enabled” box that is beside the module just installed. Then scroll down and click “save configuration”

After enabling the module, some modules require setting access control or permission before they can be used. For setting who can access the module, go to Administer>user management>permission. Locate the module and enable the role that should access it.

3.7.3 Creating and customizing modules

Drupal being a modular CMS, has the advantage of creating new modules that suits ones purpose. It also gives the opportunity for individuals to customize already existing modules. Some popular Drupal module that suits many purposes includes:

Anyone with knowledge of PHP, MySQL, and JAVASCRIPT could develop and customize Drupal module. These programming languages are specific to Drupal; other CMS have their own programming languages.

Drupal has some specific development tools that would help a module developer to create and customize any kind of modules. These development tools are also modules themselves and could be downloaded from the Drupal modules site. These modules includes: **Developer and Coder modules.**

Developer module (Devel module) it provides cache management, SQL debugging tools, investigation tools, a module reinstaller, an API reference tool, and many more. It also provides tools for building themes, and tools to generate testing data. Coder module helps Drupal module developers to conform to the Drupal coding standard, and to locate and fix non standard codes.

Any integrated development environment (IDE) could be used for Drupal module development. Information on how to configure IDE for Drupal development could be found from <http://drupal.org/node/147789>.

3.7.4 Drupal Themes

Drupal provides a way to enhance the visual display of the site. Just like Drupal modules, there are different categories of themes in Drupal. The **Core themes** are themes that come with default Drupal installation. That is, the themes of the Drupal core. In Drupal, it is possible to enable more than one themes but only one theme can be the default. The core themes that accompanied the Drupal core file are: Minnelli, Push button, Garland, Marvin, and Chameleon. Garland is enabled and used as the default in Drupal installation. Besides the core themes, there are also contributed and custom themes. It is possible to customize an existing theme to suit your site needs and you could make a custom theme- create a new theme yourself. You can explore many Drupal themes in the themes official page, <http://drupal.org/project/Themes>.

Contributed themes are themes that are developed by the Drupal community and there are different types of contributed themes, which are:

- End User themes e.g. Tapestry, Artists C01 and Acquia Marina.
- Colourable themes e.g. Bartik and Garland in Drupal core, Pixture Reloaded and Twilight.
- Starter themes e.g. Zen, Fusion, Ninesixty, Genesis and Foundation.
- Admin themes e.g. Rubik, Root Candy, Activesite and Fruity.
- HTML5 themes e.g. HTML5 Base, Boron and Adaptive Theme.
- RTL Ready themes e.g. Colorfulness, Interactive Media and Garland. Tendu and Zen which are starter themes are also RTL themes.

3.7.5 Theme installation

A theme can be installed the same way a module is being installed. So, follow the module installation step above to install themes.

NB: Create themes directory instead of modules directory in sites/all/

As it is with modules, a theme is of no use when it is not enabling.

Themes can be enabled by going to Administer>Site buildings>Themes. After enabling the preferred theme, click on the “configure” link that is closed to the chosen theme used as default and adjust or change the theme settings.

3.7.6 Creating and customizing themes

Theme creation and customization is similar to module creation and customization.

Although, understanding of Theme system and PHPTemplate are needed in order to customize or create any theme. Basically anyone who could create a module will also be able to create themes.

4 Joomla

4.1 Introduction

Joomla is an award winning CMS used for developing different applications on the web (Rahmel, 2009). Joomla make way into the web development software in 2005 when the name Joomla was announced by Open Source Matters-a non-profit organisation. Joomla is an English spelling of a Swahili word *jumla* which means “As a whole” or “altogether”. Joomla is said to have evolved as branch of Mambo CMS in 2005 (Kennard, 2007). The official web page for Joomla is www.joomla.org. It is very well structured and provides adequate information and help about Joomla.

Joomla is used to build small and large web applications; it offers nice and extensible web site functionalities. Joomla has been adopted internationally by web developers for building corporate web sites, corporate intranets and extranets, news publishing, e-commerce, and NGO web sites. Joomla ease of use provides features such as: built-in user polling, automatic full text searching, and accessibility option for disabled, and plug-ins for e-commerce. (Rahmel, 2009.)

Joomla Content Management System is licensed under an Open Source Software license, the General Public License (GNU). It's free of charge. What this mean is that, you can build a CMS website for an organization with open source software to reduce cost on software license. Since Joomla is free, you get access to its source code and you can make any changes as you want. More so, you can make contribution to the Joomla community and you could also get some help when you need it.

PHP, SQL, MySQL, HTML, and CSS are the programming languages behind Joomla. It also includes JAVASCRIPT language for extension. It is cross- platform software that runs on different platforms such as Windows, Mac OS X and Linux.

As at the time of writing this thesis, Joomla 1.6.x is the current Joomla version. Because this version might not have all extensions yet, this thesis will be using the Joomla

1.5.x version which is a successor to the first version of Joomla that was released in 2005. Joomla 1.5.x offers many improved features compared to the first version.

4.2 Getting started with Joomla

It is known that Joomla doesn't make choice of operating systems, because it will run on all operating systems browsers that exist.

So just like Drupal, operating system is not a concern when starting up Joomla web site. Web server is what should be considered next after when developing with Joomla. Joomla also works with different web servers that support PHP because the main Drupal part is built with PHP language.

Joomla could be installed on Apache, and Microsoft IIS web servers. The recommended and the official web server recommended for Drupal site is the Apache web server. These technologies needed for getting started with Joomla has been explained in chapter 4.2 of this thesis.

4.3 Structure of Joomla

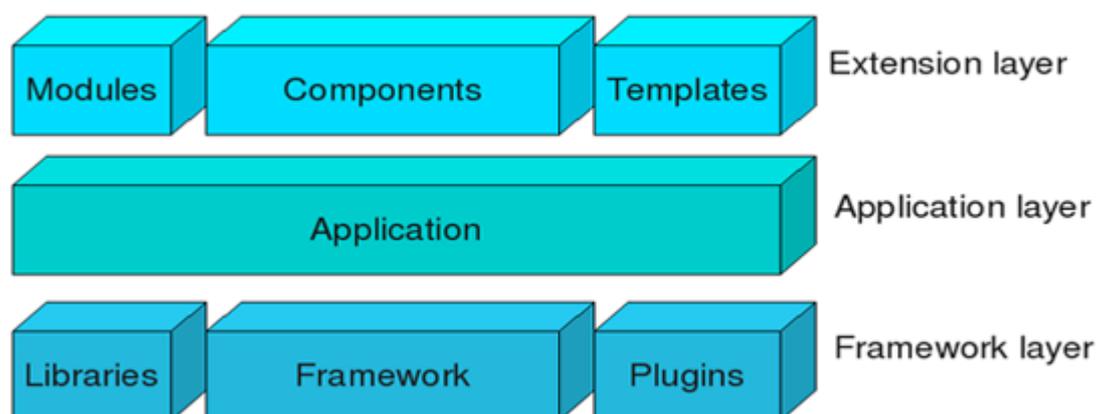


Figure 4.1: Joomla's structural architecture

Joomla is built on 3 structures:-

- 1- Extension Layer
- 2- Application Layer
- 3- Framework Layer

These three layers work together to give the flexible and extensible Joomla CMS software.

The Extension layer provides section through which Joomla could be improved beyond its core. It offers extensible ability to the application and framework layers. It consists of Modules, Components, and Templates.

Module is an extension that appears on different sections of a Joomla site. It shows what the contents of a site are or what could be done on a Joomla powered web site.

Examples of modules includes: Poll module, Menu module, Latest News module e.t.c.

Components are fundamental extension in Joomla; it provides major new functionalities that occur in Joomla. Examples of components are: forums, feeds e.t.c.

Template controls the general visibility or appearance of a Joomla web site. It is also used to modify the position of a module on a site.

The Application layer are applications that extends Joomla framework, this include: JInstallation, JAdministration, JSite, and XML-RPC.

JInstallation is in charge of Joomla installation on a web server. It is the folder that is deleted after finishing the Joomla installation.

JAdministration is responsible for administrative login into Joomla back-end.

JSite controls the front-end of a Joomla website.

XML-RPC is a protocol that aid remote access to a Joomla administrative section. it can be found in Joomla 1.5 and above.

Framework layer is made up of the Framework, Libraries, and Plugins.

“Framework is a major part in the Joomla structure. That’s based on modern object-oriented design models which make the Joomla core highly maintainable and easily extensible” (Wikipedia, 2011.)

Libraries are groups of codes that render common functionalities to Joomla Framework and Extensions.

“Plugins are Joomla extensions that modify: Joomla behavior, extend Joomla functionality beyond the core components, and also add completely new functionality to Joomla. It extends mainly the basic features of Joomla” (SLJ, 2011.)

4.4 Joomla Installation

It is now time to install Joomla, since the system and software requirements and some basic knowledge of Joomla have been discussed. All the technology discussed above must be available before starting the installation.

As it is with Drupal installation, also Joomla can be installing through 2 different ways: Web installation, and Command line installation.

4.4.1 Web Installation of Joomla

Joomla works with any web server that supports PHP, but Wamp Server will be used as the local web server in this thesis. I have gone through the installation of Wamp server in chapter 5, so only Joomla installation will be discuss here.

The process of installing on local and production servers is the same except that you need an FTP client for the transfer of file to the production server.

This installation procedure here is suitable for both local and hosted server.

- 1- First click on the WAMP cone icon and select phpmyadmin or through CPanel on a production server. Create a database for the Joomla installation.
- 2- Go to joomla.org to download version 1.5 of the Joomla package. Then unzip the package.
- 3- Move the folder content of the downloaded zip file to the www directory in the WAMP server. In a live server, copy the downloaded folder to the public_html of the web hosting account through an ftp client.
- 4- Open up the web browser, type “localhost”. For live server or online server, type <http://yourdomain.com/org/net/fi>. This displays the web root folders, click on the Joomla directory just uploaded.
- 5- This opens up Joomla web installation page. Choose the language for the installation.
- 6- The next step is the pre-installation check, Joomla check the system environment to see if the requirements has been met.

- 7- Once all the requirements are met, the page should look similar to that in the figure below. Click “Next” button.



Figure 4.2: Joomla Web Installation

- 8- Accept the Joomla license and click “Next” button to continue.
- 9- Fill in the database details created in step 1. See the figure below.

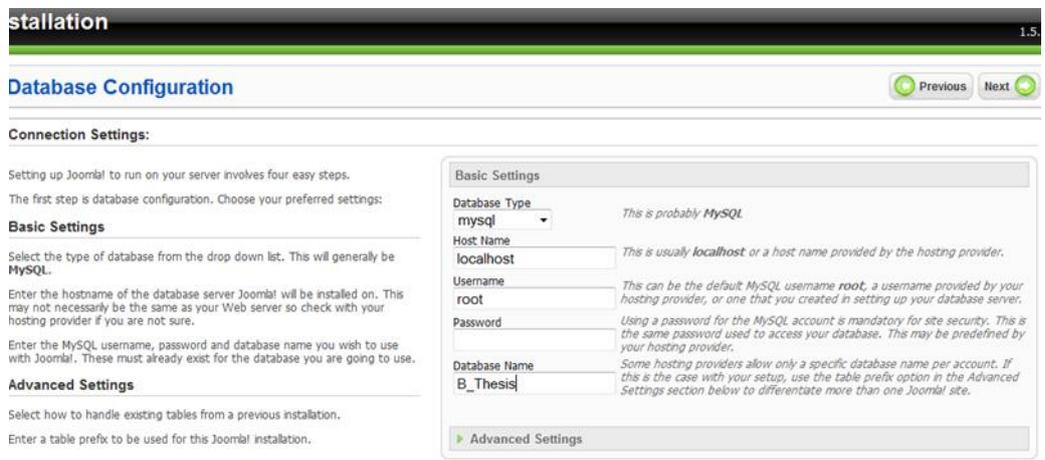


Figure 4.3: Joomla Installation Database Configuration

- 10- Don’t fill any ftp detail, just click “Next”.
- 11- Enter the site information details with email. Don’t click on the “Install sample data” button because a new site is being created from the scratch. Also, don’t select the “load migration data” button. Just click “Next” at the top of the page.
- 12- Click “OK” button on the pop up that appears.

- 13- The next page that appears is the installation success information page. Before continuing, the installation directory that is located in the Joomla folder must be deleted.
- 14- After deleting the folder, go back to the web and click “site” at the top right corner of the installation page to access the blank site.
- 15- For accessing the administrative page or backend of the site, type “localhost/joomla/administrator” in the browser URL.

NB: The username for the backend page is “admin” and password is the password that was chosen in step 11 installation steps.

4.4.2 Command Line Installation of Joomla

LAMP server will be used for installing Joomla via the command line. The LAMP server installation steps had been explained above in chapter 4.

- 1- Open the terminal to download, create a joomla folder and extract the Joomla zip file into the folder. Type
“wget
http://joomlancode.org/gf/download/frsrelease/8232/30034/Joomla_1.5.6-Stable-Full_Package.zip”
Then change current directory to the web root with
“cd /var/www” Make a directory in the current location by typing “mkdir -m 0755 joomla” command.
- 2- Move into the newly created directory in the web server folder with the command
“cd joomla”
Then type “tar -xvzf /home/user/Joomla_1.5.11-Stable-Full_Package.tar.bz” to extract the joomla zip file.
- 3- Set ownership and grant file and directory permission for the joomla directory with the commands below:
“chown -R www-data:www-data var/www/joomla” ,
“find var/www/joomla -type f exec- chmod 0644 {} \;” and
“find var/www/joomla -type d exec- chmod 0755 {} \;”

NB: take care of the space between the command.

- 4- Create database and user for the Joomla installation with “mysqladmin -u root -p create joomla” command.

NB “root” is the username while “joomla” is the database name.

- 5- Log into the MySQL server to set the database rights.

Enter “mysql -u root -p”

Then enter “GRANT SELECT, UPDATE, DELETE, INSERT, ALTER, CREATE, DROP, INDEX, CREATE TEMPORARY TABLES, LOCK TABLES ON joomla.* TO ‘root’@‘localhost’ IDENTIFIED BY ‘password’” to the prompt.

NB “localhost” is the server name for the mysql, it could be replaced with the web hosting server name if there is one. “Password” is the password for the username “root”.

- 6- Run Joomla’s installation script by opening your browser and type: “localhost/joomla” for local server and “yourdomainname.com/drupal” for online server.

- 7- Follow the installation wizard on the screen to complete the Joomla installation via command line and start building the Joomla website.

4.5 Creating contents for Joomla powered site

Text, images, videos, and audios are called article in Joomla and it is the main content managed by Joomla. Content can be created and updated through the administrative interface in Joomla. The following procedure is how you can create contents in Joomla.

- 1- Login to the administrative backend
- 2- Click the “Add New Article “ link on the control panel

- 3- A form that allows you to add content is pop out. Add a title to identify the article. It is what the user sees in the front page.
- 4- Choose the “yes” for publishing; else it will save it in the database without publishing to the front page.
- 5- Leave the alias field empty, and choose “yes” for the front page field.
- 6- Select “uncategorized” in the section and category fields.
- 7- Put the text you want inside the text editor body. You could also format the text through the editor as you want.
- 8- Then click “save “.

The content has now been saved in the database. Go to the front page of the site by typing “localhost/thesis2011” or “domainname/drupalfoldername” and refresh. The content is now shown on the front page of the site.

Joomla has a function called “Read more” that appears at the bottom of an article, it is used to break long article or content on a page. It is added the same way used in adding content to the site.

Use the following steps to add “Read more” functionality to the site content;

- 1- Click the “Add New Article “ link on the control panel
- 2- A form that allows you to add content is pop out. Add a title to identify the article. It is what the user sees in the front page.
- 3- Choose the “yes” for publishing; else it will save it in the database without publishing to the front page.
- 4- Leave the alias field empty, and choose “yes” for the front page field.
- 5- Select “uncategorized” in the section and category fields.
- 6- Put the text you want inside the text editor body. You should put text of like 3 paragraphs.
- 7- place the cursor after the first paragraph to separate the texts,
- 8- At the bottom of the text editor, click “Read more”.
- 9- Then click “save “.

Go to the front page and refresh, the read more functionality has been added to the content.

To edit or update already created articles, follow the steps below:

- 1- Login to the backend

- 2- Click “Article Manager” from the control panel menu. This will show a list of articles on the site.
- 3- Click the title of the article to be changed or updated.
- 4- Then update the article and click save at the right corner of the page. The article has now been updated.

4.6 Improving site functionality

Extensions are the main media through which features and functionalities could be added to a Joomla site. They provide a way of improving Joomla powered web applications beyond the core.

Extensions in Joomla include: Templates, Components, Modules, and Plugins. Through these 4 extensions, the functionalities and features of a Joomla powered site may be improved. They allow for example, adding slideshow, image gallery, blog comment, online shopping and so on to a Joomla application. (Kramer, J 2010 p 231.)

There are 2 types of extensions in Joomla, which are; **Core** extensions and **Third party developer** extensions (3PD).

Core extensions are Joomla extensions that are contained in the downloaded zip file from joomla.org. These extensions are maintained, developed, and updated by the Joomla project team or community. These types of extensions come with Joomla by default. They include extensions like: user component, content component, web links component, and contacts component.

3PD extensions are those extensions developed, maintained and updated by people that do not belong to the Joomla community. These types of extensions usually add completely new functionalities to Joomla applications. Extensions like social network, galleries, slideshow are 3PD extensions. Some of these extensions are free and some are proprietary.

It is a best practise to use Core extensions before searching for 3PD extensions.

Furthermore, a whole lot of Joomla's extensions are available for download in the Joomla extension directory (JED) located in extension.joomla.org web page (Chapman, D 2009 p 55.)

1. Joomla Templates

In the administrative backend, go to Extensions-> Template Manager. There are three templates that come with Joomla site by default. Template function like theme in Drupal, it is responsible for the visual look of a Joomla powered applications.

It is possible to have different design for the administrative back end and another design for the site. This could be done through the two tabs in the Template Manager page. Click the Edit button in the template manager screen and configure the template parameters for the default template.

Templates, Components, Modules, and Plugins could be downloaded from the Joomla Extension directory (JED) or other sites by searching through Google or other search engines. For installing templates, components, modules and plugins, refer to the VirtueMart installation steps in chapter 5.

NB: Templates usually comes in a zip file.

2. Joomla Components

Contacts, polls, banners and web links are components that come with Joomla powered site. These could be configured by logging into the back end, and go to Components on the top menu.

3. Joomla Modules

Breadcrumbs, Latest News, Newsflash, Random Image, and Search are some of the popular modules that exist in Joomla powered sites. They are text functionality that is on a particular page. Modules could be embedded inside articles.

To configure modules, logging into the back end, and go to Extensions on the top menu then click Module Manager from the dropdown list.

4. Joomla Plugins

Plugins work behind the scenes, providing indirect functionality. Login form features, email address, editors and many more could be improved through plugins. It is better not to edit plugins because it might affect the main functions in the site if not properly done.

To configure plugins, logging into the back end, and go to Extensions on the top menu then click Plugin Manager from the dropdown list.

5 Application Sample

5.1 Drupal Web shop

Ubercart is an online web shop component for selling products on a Drupal CMS website. Like Drupal, Ubercart is OS and has a lot of modules that enhance its features. It is completely compatible with the Drupal core system. Ubercart offers users great features such as search engine friendly, powerful online shop features, security, growing number of community members.

5.1.1 Ubercart installation

Installing Ubercart is similar to module installation. Just by downloading Ubercart from this link <http://www.ubercart.org/downloads>, and enable it like any other modules. Check the version that is compatible with the Drupal version you have for your site. Ubercart component contains many other modules like:

- Attribute (uc_attribute)
- Cart (uc_cart)
- Cart Links (uc_cart_links)
- Catalog (uc_catalog)
- Conditional Actions (ca)
- Credit Card (uc_credit)
- Order (uc_order)

Payment (uc_payment)
Payment Method Pack (uc_payment_pack)
Product (uc_product)
Product Kit (uc_product_kit)
Reports (uc_reports)
Roles (uc_roles)
Store (uc_store)
Test Gateway (test_gateway)

These modules are already installed but they need to be enabled separately. See module installation section for how to enable other Ubercart modules.

5.1.2 Application Scenario

With Ubercart, any online shop features are integrated through its Drupal administrative panel. After enabling the downloaded Ubercart file, there are still some more modules that are needed for complete Ubercart web shop features. Modules like Fivestar, Google Analytics, uc_bank_transfer, uc_upsell, uc_checkout_review, uc_coupon, uc_gift_certificate etc.

Adding Product

After downloading the Ubercart file, the file contains many other modules which are considered as the Ubercart core modules. This product module has been enabled by default. It allows adding and display of products in an Ubercart powered shop.

Adding product to a Drupal Ubercart shop is just like adding contents. In fact after enabling Ubercart, Drupal automatically create a content type called “Product” which makes it possible for adding a product content type.

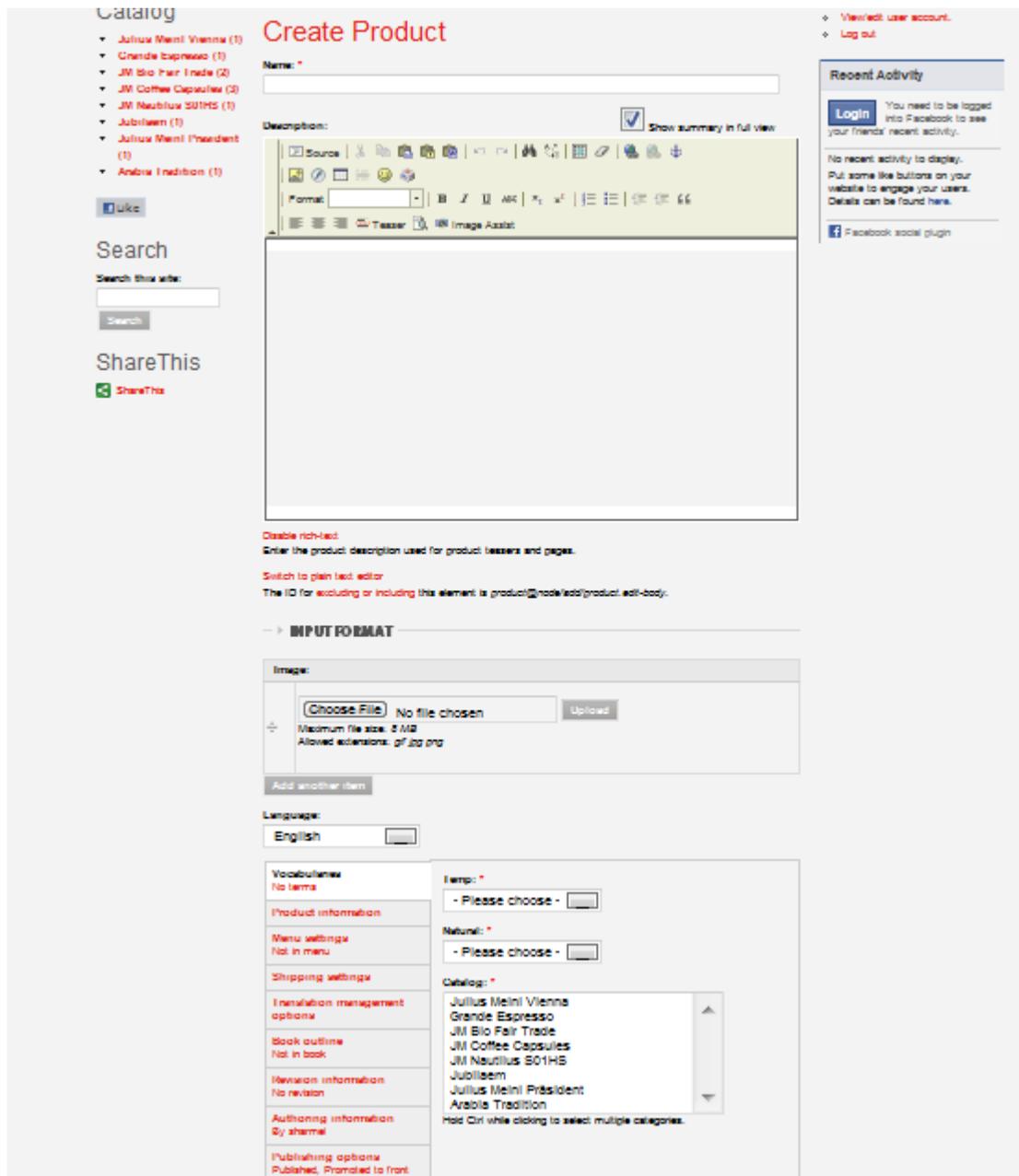


Figure 5.1: Create Product Page

Catalogues

Ubercart like other online stores allow the possibility of putting similar products into groups. Products with same or similar feature could be display together in a category called catalogue. The catalogue module is an optional Ubercart core module, i.e. it can be enabling and disable anytime. Creating a catalogue in Drupal Ubercart starts by creating “Taxonomy”, then adds “Vocabulary” to the taxonomy, and lastly adds “Terms” to the vocabulary. “Taxonomy” simply means classification, the “Terms” is

for the content description and it is what the users will see after adding products to the terms.

In Drupal, it is possible to display the catalogues either in grid or table form.



Image	Name	Price	Add to cart
	Meinl Capsule Melange	€6.49	Add to cart
	Capsule Kleiner brauner	€6.49	Add to cart
	JM Capsule Mokka	€6.49	Add to cart

Figure 5.2: JM Coffee Capsules Catalogue showing table display of products, price of each products and ability to add each product to cart.

Payment methods

Ubercart has wide varieties of online and contact method of payment. After enabling the payment module which is an optional Drupal Ubercart module, different payment could be used depending on the shop. The following are the payment methods that could be used in Ubercart store: 2checkout, Authorize.net, Bank transfer, Credit card, Cybersource, Gift certificate, Test gateway, PayPal, Google checkout, and Discount Coupon.

Shopping Cart

Cart display module is part of Ubercart core modules. Ubercart displays the product cart just like many other online stores with the ability to see products viewed/buy by other customers.

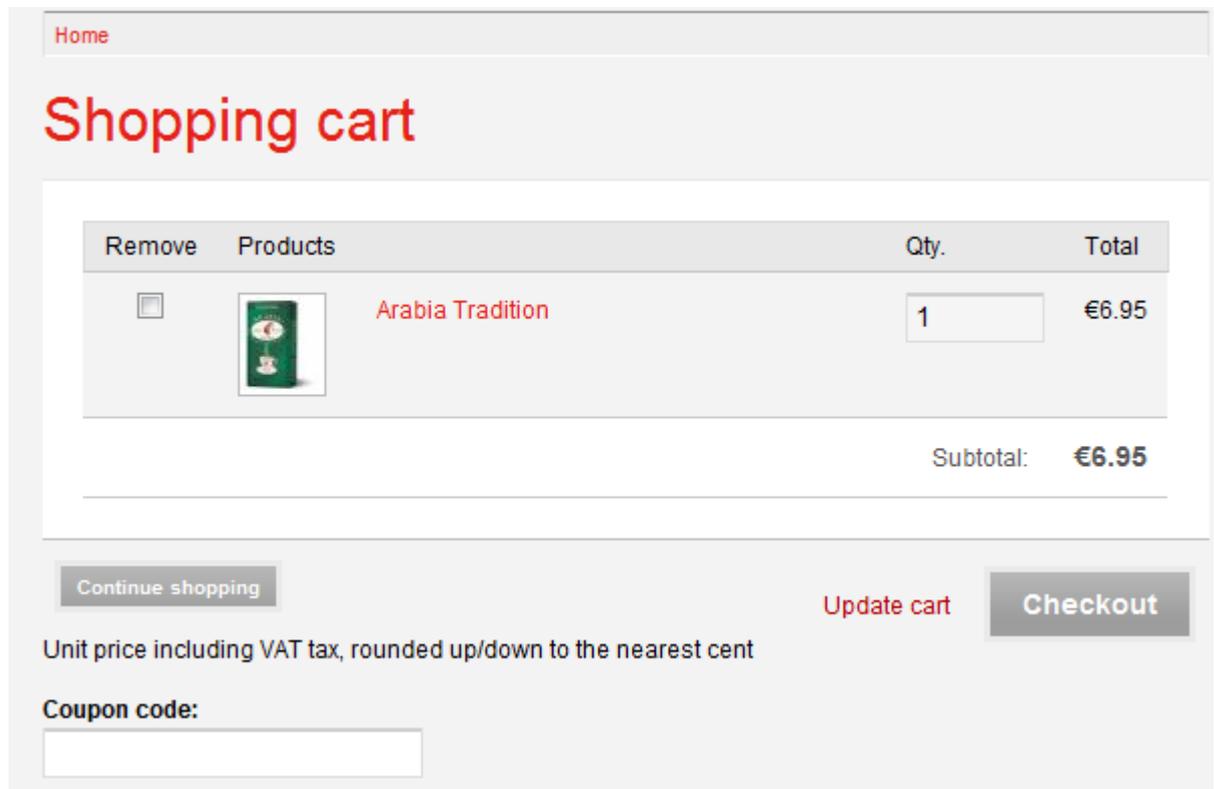


Figure 5.3: Ubercart Cart Display

5.2 Joomla Web shop

Joomla has an e-commerce component called VirtueMart. VirtueMart is a web shop application for selling products on the internet. It can only be used through Joomla and or Mambo. It has all the great features and functionalities seen in today's online stores, like eBay, Amazon, Google shop e.t.c. VirtueMart offers flexible payment methods, product image display, store maintenance features, customer help, and so on.

5.2.1 VirtueMart installation

Before installing VirtueMart, Joomla must have been installed. Because the system is already running, there is no need to worry about the system requirements. The following guide will be used to install VirtueMart.

- 1- Download the VirtueMart file from <http://virtuemart.net/downloads>

VirtueMart installation script contains many packages that enhance its functionalities.

The content of a VirtueMart installation file are:

1. 1 VirtueMart Component (com_virtuemart_x.x.tar.gz): VirtueMart component file.
2. 1 Main VirtueMart module (mod_virtuemart_x.x.tar.gz)
3. 10 More Modules

- 2- Unzip the 'VirtueMart_x.x_COMPLETE_PACKAGE.zip' file.

- 3- Log in into Joomla's Backend (using the URL

'http://joomla_url/administrator') to access the administrative interface.



Joomla! Administration Login

Use a valid username and password to gain access to the Administrator Back-end.

[Return to site Home Page](#)

Username

Password

Language

Login

Joomla! is Free Software released under the GNU/GPL License.

Figure 5.4: Joomla Administrative Logon Page

- 4- Click 'Extensions' => 'Install/Uninstall' in the Top Menu.



Figure 5.5: Joomla Control Panel, click on Install/Uninstall to install extension

5- It shows this screen below



Figure 5.6: Extension Installation Page

In the 'Package File' part, click 'Choose File' select the file 'com_virtuemart_x.x.tar.gz'. This package file contains all files for the VirtueMart component, which was downloaded in Step 1.

Then click on 'Upload File & Install'.

- 6- VirtueMart Component has now been installed. It should display the Welcome Message Screen with two options:

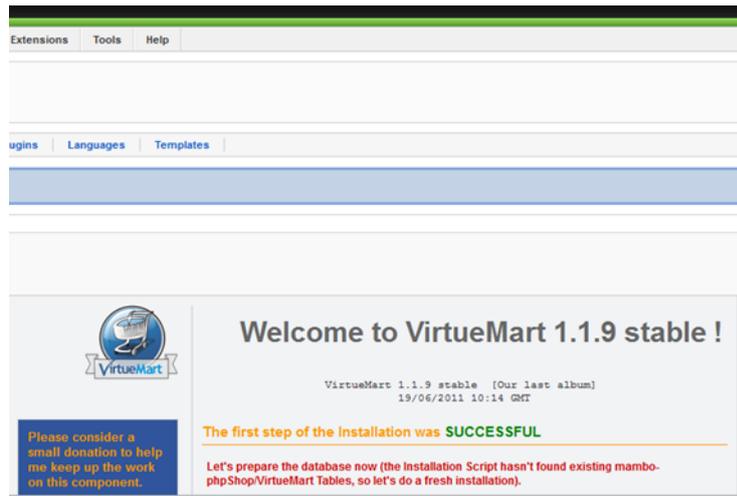


Figure 5.7: Joomla VirtueMart Welcome Page

You can choose either to install sample data Or 'go directly to the Shop >>' without installing any sample data.

- 7- Follow step 4 &5 to install VirtueMart Main module.

Choose the file 'mod_virtuemart_x.x.tar.gz' from the zip file downloaded in step 1 and click 'Upload File & Install'.

After finishing the installation, it is necessary to enable or publish some important modules.

This can be done by clicking 'Components' -> 'Module Manager' in the Top Menu. Then browse t the list of already installed modules and look for those with 'VirtueMart Module'. You can select it and modify it settings and where you want it to be display on your site.

5.2.2 Application Scenario

The VirtueMart control panel after installation offers the possibility of adding products to the shop. Without downloading and installing the required modules, it is not possible to add online shop features like product display, catalogue, payment and shipping methods etc to your VirtueMart web shop.

Adding Product

It is a common functionality in all online stores to be able to add product to their shop. VirtueMart have this feature integrated to the main file which can be accessed through the VirtueMart control panel after installing VirtueMart.

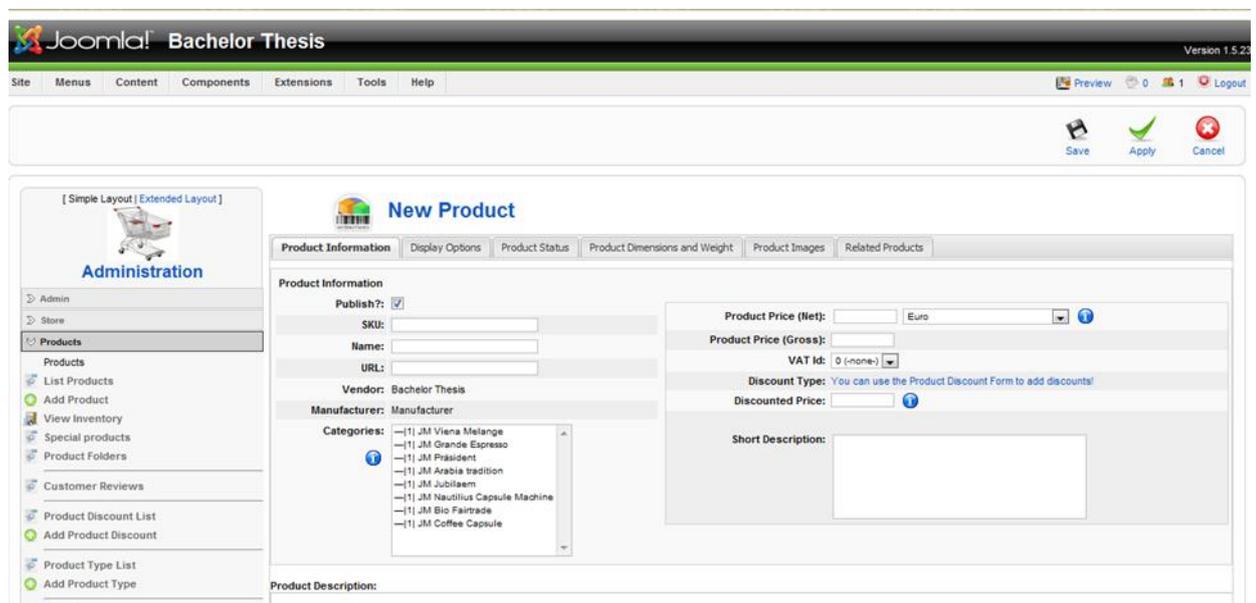


Figure 5.8: Add Product wizard screenshot

Product category and Product catalogue

VirtueMart allows the shop owner to group their products. This feature can be added to Drupal by downloading and installing the mod_product_categories module.

Product Catalogue

JM Viena Melange
JM Grande Espresso
JM Präsident
JM Arabia tradition
JM Jubilaem
JM Nautilus Capsule Machine
JM Bio Fairtrade
JM Coffee Capsule

Categories



[JM Viena Melange](#)



[JM Grande Espresso](#)



[JM Präsident](#)



[JM Arabia tradition](#)



[JM Jubilaem](#)



[JM Nautilus Capsule Machine](#)



[JM Bio Fairtrade](#)



[JM Coffee Capsule](#)

Figure 5.9: Product Catalogue Display

Payment Methods

VirtueMart offers different kind of payment methods ranging from cash on delivery, PayPal etc.



[Shipping Address](#) [Ship Methods](#) **[Payment Method](#)** [Complete Order](#)

Name	SKU	Price	Quantity / Update	Subtotal
Julius Meinl Bio Fair-Trade- beans	12344	E7.59	1  	E7.59
				Subtotal: E7.59
				Shipping and Handling Fee: E13.17
				Total: E20.76
				Tax Total: E1.17

If you have a coupon code, please enter it below:

Please select a Payment Method!
PayPal



Credit Card Payment
 Credit Card
 Credit Card
 Verisign PayFlow Pro
 MerchantWarrior

Other Payment Methods
 Cash On Delivery (+ E2.00)
 Dankort/PBS via ePay
 PayPal (Legacy)

Credit Card Type:
 Name On Card:
 Credit Card Number:
 Credit Card Security Code:
 Expiration Date: /

Powered by [DrSharmel](#)

Figure 5.10: Joomla's Payment Method

Cart Display

VirtueMart have a module called mod_virtuemart_cart. By downloading and installing this module, it offers cart display with a link to the items currently in your shopping cart.



Education: Think Less, Stupid More

[Home](#) [About Us](#) [Coffee Equipm](#)

Product Catalogue

JM Viena Melange
JM Grande Espresso
JM Präsident
JM Arabia tradition
JM Jubilaem
JM Nautilus Capsule Machine
JM Bio Fairtrade
JM Coffee Capsule

Cart

Name	SKU	Price	Quantity / Update	Subtotal
<u>Julius Meinl Bio Fair-Trade- beans</u>	12344	E7.59	<input type="text" value="1"/>	E7.59
Subtotal:				E7.59
Total:				E7.59
Tax Total:				E0.00



If you have a coupon code, please enter it below:

[»» Checkout](#)

Figure 5.11: Joomla's VirtueMart Cart Display

VirtueMart also have the following modules that add to its functionalities after downloading and installing them. They are:

mod_virtuemart_manufacturers: This displays product manufacturers and a link to all the products offered by that manufacturer.

mod_virtuemart_latestprod: Shows the newly added products in the store

mod_virtuemart_search: Allows site wide product search

mod_virtuemart_topTen: Displays top best selling product in the store and provide a link to the products.

6 Testing the Applications

6.1 System and Usability Testing

The purpose of this testing is to verify that the whole system exhibit the functionalities and features found in all other web shop applications built with HTML editors. Such as Amazon, EBay, Google web store etc.

1. Who is testing?

This testing will be conducted by the end users of the systems or independent test group. These end users are usually not involved in the development and design process of the system. The end users or individual test group could be anyone that is familiar with web shop functionalities.

2. What is tested?

The functionalities of the system as a whole are tested. The following functionalities and usability will be tested: View products, adding products to cart, checking out, view products in the cart, view the catalogue, and ordering a product.

3. How the testing is performed?

Thinking aloud Method-

This method will be used to collect information on users' own reason for their behavior i.e. the users will be able to verbalize their thoughts about the system.

4. What test type is used (white-box or black box)?

The black box approach (Equivalent partitioning) will be employed for the System Testing.

Black-box testing will test the functionality of the web shop application, as opposed to its internal structures or workings.

5. When does the testing take place?

The system and usability testing will take place on the 13th of September, 2011. Two people will test the applications and it will be done on WAMP server (localhost).

6. How is the test result handled?

All the test results will be well documented and reported.

6.2 The Test form

The test form could be found in appendix C.

7 Conclusion

The goal of this thesis work is to research and analyse how to develop different web applications with desired functionalities using content management systems (Drupal and Joomla).

After about 4 months of thorough research, thinking and analysis, I have been able to achieve the goal. This has been demonstrated with a web shop sample application for both Drupal and Joomla. From this research, I have been able to learn how and where to add functionality in a Drupal and Joomla powered web application.

There are many CMS software, the open source collective incorporated contains list of the CMS software currently available. They include Moodle, DotNetNuke, WordPress, Drupal, BitWeaver, CitusCMS, and Joomla etc. Drupal and Joomla has been chosen for this thesis work. However, this thesis is not about comparing Drupal and Joomla but to analyse the potentials in both of them separately. I have researched and analyse both CMS software from the fundamentals to advance thereby, making this research work suitable for novice and professional CMS learners.

In This thesis, I have been able to demonstrate that without much technical knowledge, it is possible to insert and update contents of a site developed with CMS software which would therefore increase organisations efficiency and information outreach. In addition, I have been able to show that there are lots of ways one could utilize ones knowledge of programming languages in CMS web applications. PHP, JAVASCRIPT, MySQL and CSS are those discussed in this research because they are ones used with Drupal and Joomla.

The advent of open source software has given drastic improvement and widespread adoption of CMS to small and medium sized companies. Although many enterprise content management systems are being used by large companies but the use of its open source software is still minimal. However, with more community involvement in the improvement and development of the OSCMS software, ECMS benefits would be achieved by OSCMS. Therefore, there will be widespread usage of CMS by corporate organisations.

CMS convey considerable number of contents together in a location for easy retrieval and convenient improvement from other locations. Although, CMS are essentially for business purposes, yet, can be used for individual purposes. CMS can be used with CRM to automate all paper works in an organisation. That is, it can be used to manage all administrative work online, e.g. event registration, and membership renewal etc.

There are many web applications that can be developed with CMS. Web shop has been used in this thesis and system and usability testing was carried out with the web shop application. The testing ascertained that CMS applications exhibits the same functionalities with web applications developed with HTML editors.

Nowadays, many web applications exist on the web. A great number of these web applications are made with CMS. This means that these applications are open to wide range of developers that are willing to contribute to the usability, security and stability of the CMS web applications.

Finally, Drupal and Joomla are reliable, flexible, stable, secure, modular, supportive, extensible and less expensive. They can be used for all types of web sites and web applications by individual or organisation. They provide the ability of learning from the basis and develop on it in later time. With ease of use functionality and growing community support for Drupal and Joomla, CMS have the ability to replace HTML editor for web application development.

7.1 Recommendation

As this thesis work analyse Drupal and Joomla in detail, time could not permit in dept explanation of how to develop modules, themes and extensions. Though, the basics such as tools and examples needed for developing modules, themes and extensions had been discussed explicitly in this thesis. Further research work could be done in the area of modules and extensions development.

Also, I would like to recommend this thesis work for used by Haaga-Helia University of Applied sciences (HHUAS) Information technology department. CMS could be included in the Business Information Technology (BIT) course curriculum as many companies will be adopting this software for their businesses in future because of its advantages. Therefore, students of BIT program in HHUAS will not be lacking in this area.

Although, PHP is not being taught in HHUAS BIT program but CMS software like DotNetNuke and Umbraco that involves Microsoft ASP.Net knowledge could be taught and student can utilize their ASP.Net knowledge. This will prevent students dropping from BIT to other programs. Because I can remember many of my colleagues that we started the BIT together in 2009, many have dropped to other programs and some withdrew from HHUAS with the claim that the starting courses like introduction to website design and introduction to programming are advance. Therefore, with CMS students could learn the basis of web applications and improve on it with other courses.

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Appendices

Appendix A: Drupal Questionnaires

- 1- Name of individual or organisation
- 2- How many employees in your organisation
- 3- What is your organisation's business type?
- 4- In your opinion, what is the advantage of using content management systems?
- 5- What content management system do you currently use?
- 6- What other content management systems have you used or evaluated before choosing the current system?
- 7- Why do you choose the current content management system?
- 8- Why do you use Drupal as your content management system?
- 9- Is it possible to improve Drupal web applications features?
- 10- How can one add own features or functionalities (with programming knowledge) to a Drupal web applications.
- 11- What is the best and common way to add own features/functionality to a Drupal web application?
- 12- What programming language can I use to improve or change the features of Drupal web applications?
- 13- How can I use JQuery, JavaScript, PHP, MySQL, and AJAX to improve or change the features of my Drupal web applications?

14- How can you rate the support or resources available for Drupal?

Appendix B: Joomla Questionnaires

1- Name of individual or organisation

2- How many employees in your organisation

3- What is your organisation's business type?

4- In your opinion, what is the advantage of using content management systems?

5- What content management system do you currently use?

6- What other content management systems have you used or evaluated before choosing the current system?

7- Why do you choose the current content management system?

8- Why do you use Joomla as your content management system?

9- Is it possible to improve Joomla web applications features?

10- How can one add own features or functionalities (with programming knowledge) to a Joomla web applications.

11- What is the best and common way to add own features/functionalities to a Joomla web application?

12- What programming language can I use to improve or change the features of Joomla web applications?

13- How can I use JQuery, JavaScript, PHP, MySQL, and AJAX to improve or change the features of my Joomla web applications?

14- How can you rate the support or resources available for Joomla?

Appendix C: System and Usability Test Form and Results

Test cases	Detailed Instructions for the Tester	Expected result	Errors/Exceptions	Has to be fixed? Yes/No
View Products	Click or select “product” from top menu.	Displays list of all products as drop down		No
Add products to cart	Click on a product, then click “Add to cart” button on the right. Scroll down and click “Add to cart” button that is under “Quantity”	The selected product has been added to your shopping cart		No

Checking out	<p>Click the shopping cart icon at the top right corner of the page. Then click “Checkout” link.</p> <p>NB: you must first add products to the cart</p>	Display the checkout page where users can fill in their details		No
View products in cart	Click the shopping cart icon at the top right corner of the page.	Displays list of products in the cart	It shows a message that “there are no products in your shopping cart”. If no product has been added to the cart	No
View product catalog	Click the “JM coffee capsules” catalog on the left side of the page	Displays all the products in the “JM coffee capsules” catalog.		No

Ordering a product	Do add product to cart and checking out steps above, then fill in the details in the check out page and click “Submit order”	It displays order completion page with Payment information and my order number. Also, it sends order successful message to my email.	Message was not send because email client has not been configured on a localhost server.	No
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1- Question: Are the items on the screen consistently aligned? E.g. Menus, text-boxes, site name etc.

Answers: Yes/ No

Comment:

2- Question: Do you feel the screen is clutter with unnecessary information?

Answer: Yes/ No

Comment:

3- Question: Is the screen well organized?

Answer: Yes/ No

Comment:

4- Question: Is it easy to find available action buttons on the screen?

Answer: Yes/ No

Comment: but not all

5- Question: Is the navigation menus easy to use.

Answers: Yes/ No

Comment: but could be improved more