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Customized website creation for University of Hargeisa IPCS

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<p>This thesis is an introduction of a project on which a customized website was built for University of Hargeisa- IPCS(Institute of Peace and Conflict Studies). The University of Hargeisa is located in Hargeisa, the capital of Somaliland. The main website of UOH was made by Joomla. The website outlook and content structure was redesigned but also the consistency with the main website of UOH was maintained.</p> <p>The project consisted of two parts: Drupal development for the website and portal education system made by PHP, MySQL, HTML, CSS and JavaScript. The website design covered user experiences, website designing, content structure designing, and database designing. The portal technology consisted of client-side programming, and server-side programming. Additional features of the Drupal content management system include Drupal administration, theme, node, block, module and taxonomy. Furthermore, project management, team coordination, and introduction and instruction of the tools and software were used in the project.</p> <p>The goal of this report is to provide a overlook of what we did in this project, the technology we used, and what we can improve in the future. The result of this project was satisfactory based on the response of the University of Hargeisa administrator. We built a professional and reliable website for the Institute of Peace and Conflict Studies and a perfect functional portal education system.</p>	
Keywords	Drupal, CMS, university website, web developing

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1 Introduction

1.1 Project introduction and background

In this age of information, more and more people rely on computers and the Internet. Websites have become the most common media for spreading information and advertising. The reasonable price and convenience have established long-lasting and stable popularity for the web media technology. Anyway, a website is just one of the communication tools, just like a bulletin board. People are able to publish and share information through Internet, or using websites to provide network services. Users are able to visit the website through a web browser to get the information or services they need.

Along with the popularity of the website production technology, more and more people start to create their own websites for personal use, such as blogs and portfolios to introduce their work and personal lives. Many companies and organizations have their own websites for publicity, release of product information, recruitment and etc. Universities are no exceptions to the common market demands. Due to the fact that I am really interested in continuing to develop on my web development skills, I was delighted to participate into this project of website creation for the Institute of Peace and Conflict Studies - University of Hargeisa. The team gathered seven team members from various countries: Finland, China, Vietnam, Nepal and Ethiopia.

The University of Hargeisa is the Republic of Somaliland's leading higher education institution and committed to provide a wide range of undergraduate degree courses. Peace and Conflict Studies is one of the postgraduate academic programs. The goal of this project is to create a website to disseminate information to attract new students and potential partners for collaboration. This main website can be accessed by anybody who visits it. Additionally, we aimed to create a portal online system for internal use, which can only be accessed by students and teachers. We would use the content management system - Drupal as our development method to create the main website and use PHP, MySQL, HTML, CSS, and JavaScript to create the portal education system. The functionality of the main website includes news, social media connection, course list, and other information about the university. Also the portal includes an email connection, network drives, schedules, course announcements, news and an announcement push, to submit and view answers and other important features.

1.2 Development background

1.2.1 Internet

Internet is an international network of computer networks consisting of WANs (Wide Area Network), accessed through LANs (Local Area Network) and single computers according to certain communication protocols. It is the result of the interconnection between client-side and server-side through the computer information technology method. People are able to send emails to their friends who live thousands of miles away, or complete the same task together, or play games together. The Internet (or International network) can be the collection of any separate entity networks. These networks connect by a set of general protocols, thereby logically developing a unified network. This interconnection of computer networks method is called "Network Interconnection". [1, 1]

1.2.2 Website

The Internet is derived from Arpanet which was developed by scientists in the US Defense Department. The World Wide Web was started in CERN, the European Laboratory for Particle Physics in Geneva, Switzerland. Tim Berners-Lee was the inventor of the Web. He invented the Web with HTML as its publishing language in 1989. In the beginning, a website according to certain rules on the Internet, using HTML (hypertext mark-up languages), links files to each other to show specific content on the correct pages. At that time, websites were simple text files uploaded into folders on a server. The files are like index.html, contact.html, etc. The website was referred to as a collection of the files. Every page had its own URL which should correspond to an HTML file. For example, the research.html should be corresponding with the URL address - <http://www.trial.com/research> which belongs to the research folder section.[2,5]

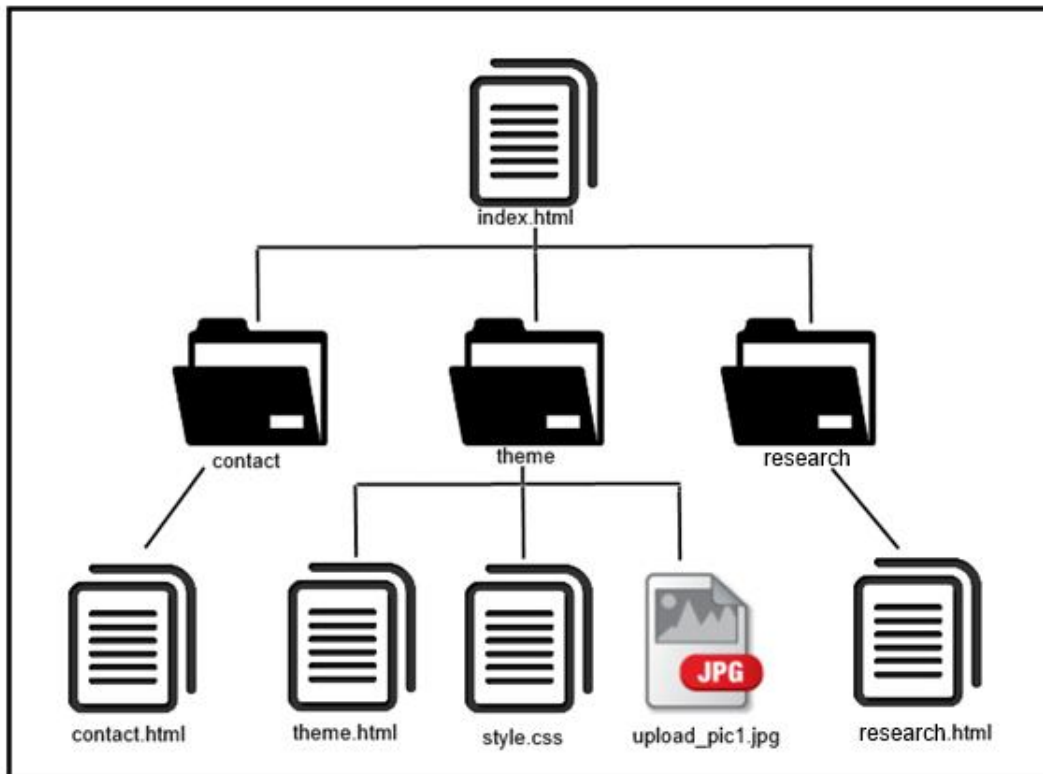


Figure 1. Website structure mapping

However nowadays, the technology has improved so that there are much more pages than before. For example, to simplify documents and avoid rewriting the same code for the design all over again, we may use CSS (cascading style sheets) to define the font, colour, positions and refer the CSS file in the main index file with the right directory path.

A website is constructed by the domain name, website source program and web space. The URL forms example of the domain names are : www.uoh-ipcs.com(top level domain), dev.uoh-ipcs.com(second level domain). A web space is located on an independent server or leased virtual server.

Measuring the performance of a website usually can consist of the web space size, the site location, the speed of connection, web software configuration and what services the website offers and other related aspects. The most direct measurement standard is the real traffic of the website.

Site construction include the following factors:

1. Client service group
2. The direction and property of the content
3. Website feature description and structure analyzation.
4. User experience
5. Profit gaining
6. The future development direction of the website [1,2]

Those are the six basic factors that have to be considered when creating website content and design. Depending on different requirements for different aims of the projects, there are more customized factors which cannot be overlooked.

1.2.3 Africa network connections

The International Telecommunication Union published the statics on 17th of March, 2013, and about 4.5 billion people do not use Internet connections to access the Internet. In the fixed broadband connection field, there is still a huge gap between developing countries and industrially developed countries. The percentage of the population that is able to get a fixed broadband connection is 77% in developed counties, and only 31% people have an Internet connection in developing countries. The average in Asian countries is 32% and only 17% in Africa.[3]

Although the Internet popularity in Africa is not so impressive compared with other continents, the Internet acceptability is still growing quite fast compared to what it used to be previously. Most of the Internet users are young people, such of students, business people and researchers. Figure 2 shows the Internet usage in various countries in Africa.

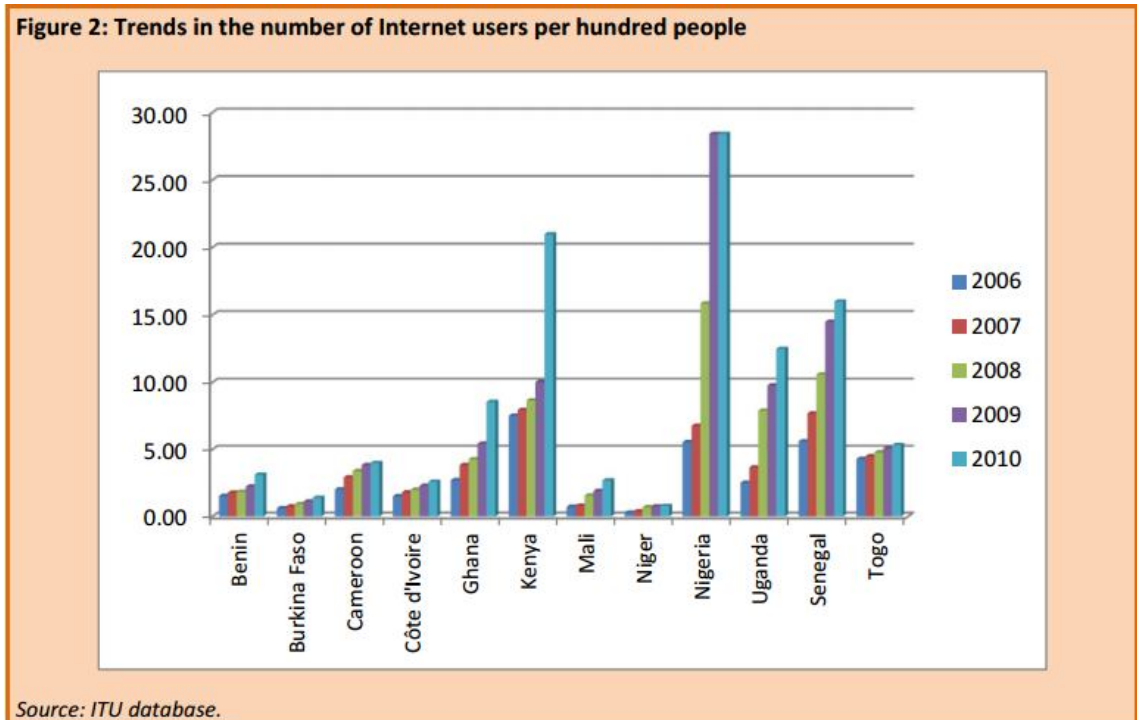


Figure 2. Trends in the number of Internet users per hundred people [4,7]

However the fact is most of the Internet users are not satisfied with the Internet speed which they are getting from Internet providers. Most African Internet users are getting an Internet speed with the measurement of only in megabytes (MB), whereas Europe and the US are having an Internet speed in gigabytes measurements. We can see the example figures in the table 1 below.

No.	Country	Global Rank	Internet Speed
1	Ghana	77 th	4.78 Mbps
2	Zimbabwe	80 th	4.65 Mbps
3	Kenya	84 th	4.46 Mbps
4	Libya	86 th	4.27 Mbps
5	Madagascar	87 th	4.25 Mbps
6	South Africa	114 th	2.85Mbps
7	Morocco	115 th	2.84 Mbps
8	Nigeria	130 th	2.41 Mbps
9	Rwanda	132 th	2.15 Mbps
10	Mozambique	140 th	2.13 Mbps

Table 1: Top 10 African countries with the fast Internet speed

The international submarine cables of Internet connection are more widely spread in west Africa like figure 3 shows. The west African coast is served mainly by five submarine cables: SAT, Main One, Glo One, WACS, ACE and the east African coast is served by three submarine cables: SEACOM, EASSy, LION 2. The number of subma-

rine cables are increasing, except in Bissau. There is a competition of submarine cable operators going on coastal and landlocked countries. Some cities even have more than one submarine cable, which stimulates competition and reduces the price of an international Internet connection via a submarine cable.

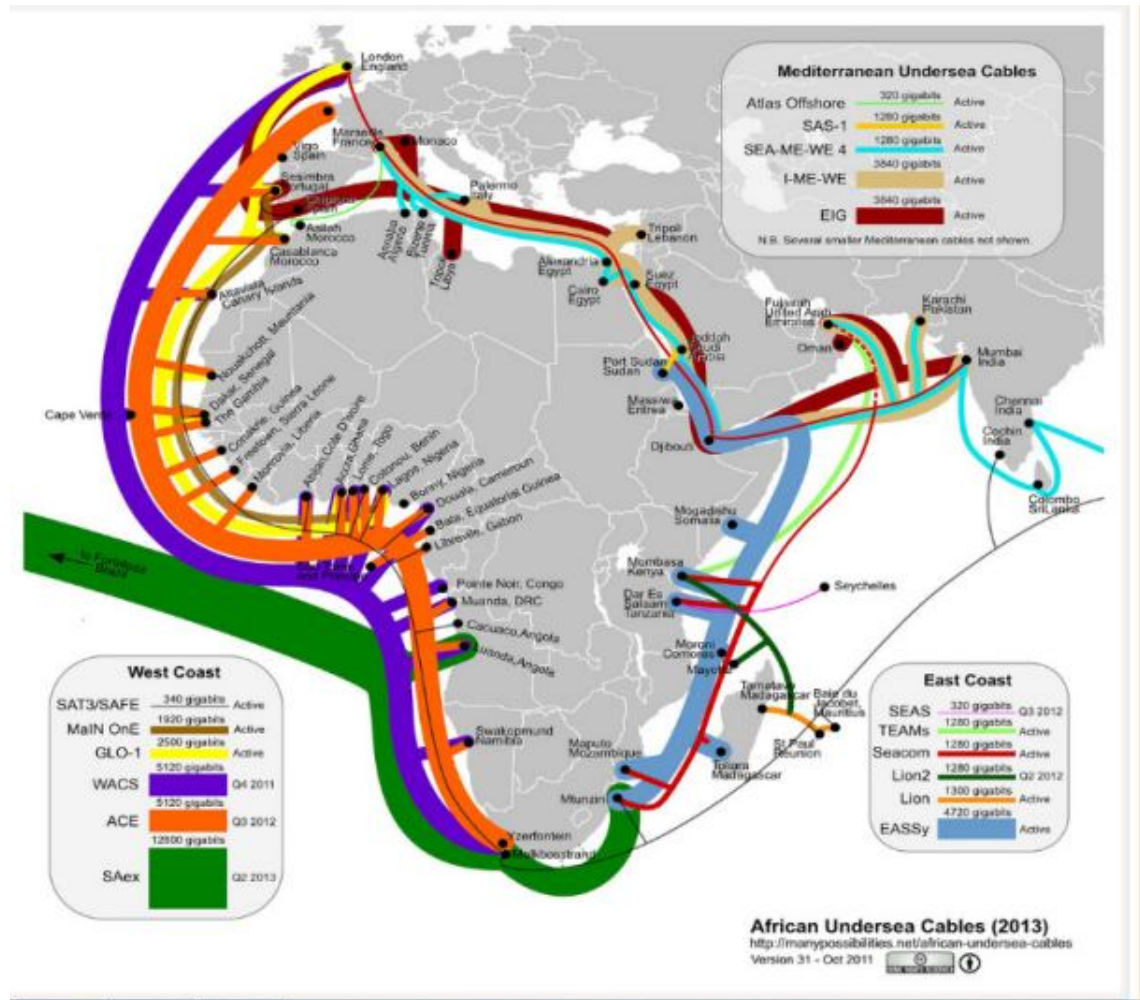


Figure 3. Submarine cables serving in 2012 [4,15]

In most African countries Internet is owned and regulated by the government due to several reasons, such as, security, and economic reasons. Thus, this has retarded the growth of the service. Besides this, there have been some other improvements done to increase the service. I believe there is a brighter future for an Internet connection and its popularity in Africa.

2 Project management and design

2.1 Project plan and preparation

2.1.1 Case study

Website

Before the beginning of the project, we compared different websites with the similar topic which already exist to get some inspiration.



Figure 4. Conflict resolution program of Portland State University screen shot [5]

The screen shot above is one of my favourites. First the colour combination is good and the green background on the top banner fits the program content, because I think "peace" is usually represented as green. A clear structure and clean user interface gives it a professional impression.

Took a look at the current main website of the University of Hargeisa. We aimed to do something different but it was really important to keep some content and design consistency with the main website which already existed.



Figure 5. University of Hargeisa main site screen shot [6]

Based on figure 5 above, we analyzed the advantages and disadvantages of the main website. One of the most important advantages in the official website is the good structure and it has the important features that most other websites have, like news, event and social media links. The disadvantages are that the font size on the top banner is too small, and the design structure and style are outdated. So we planned to improve the visual effect based on the design view and add some functionalities. This simple initial analysis and case study helped us establish a good foundation on our structure and interface design.

Portal-education system

The educational system we are using day to day in Metropolia is Tuubi, which is a good sample of where we got inspiration from. The Tuubi service is oriented for teachers and students for internal use. Tuubi provides services such of course administration, internal announcements, shared workspaces, information for students and staff, links to

Winha, email, etc, which correspond to the services provided by Metropolia data administration list below:

1. User ID / e-mail address
2. Home directory / home pages
3. Remote connections (ssh)
4. File transfer (ftp)
5. Webmail
6. Pop and imap -services

Although the user interface is old-fashioned and some functionality is not well performed, the whole structure of the Tuubi system is worth learning.

2.1.2 Project management

There were seven persons who participated in this project. We carried out this project from November 2013 to April 2014. Because the amount of work and number of the team members, it was necessary to use management tools for communication and team coordination. The most popular management tools we chose were Google Drive for sharing documents and Trello for sharing the process of our work.

Trello

Trello was released in 2011. It is a small coordination application supported for both web and mobile, made by Fog Creek Software.[7,2014] It is easy and simple to use, and is also designed for a team of our size. It can also be used as a notepad for personal use.

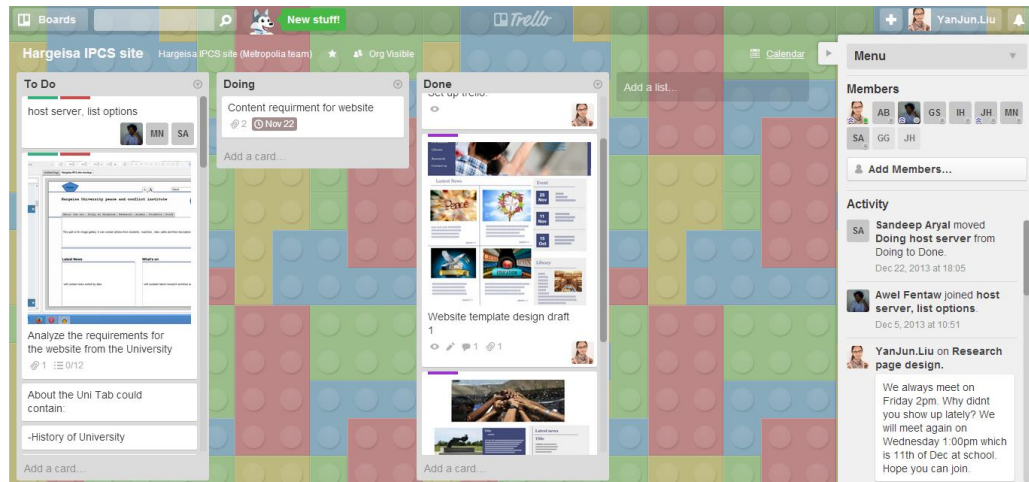


Figure 6. Trello User Interface screen shot

Trello organizes the projects and ideas into boards. At one glance, Trello tells one what is being worked on, who is working on what, and where something is in process. A Trello project is composed of multiple lists. Each list can have any number of cards. A card represents a software bug, a new feature in the application -- or, in our case, a task to be executed. Cards can have a number of useful widgets attached to them -- due dates, check lists and text notes. They can also be archived (by doing that one removes the widgets from the list the cards originally belonged to). In figure 6 the interface of our project is shown. In this case I created three lists including: to do list, doing list and done list. Priorities can be assigned for the tasks also. The tasks with a red label are emergency tasks. The tasks can be assigned to anybody, and the other way around people are free to take the tasks as well. One great feature about Trello is that if one uses the Trello mobile application, the notification would be received by users if there are new tasks been created. Also it has email notifications if one only uses a web platform to access Trello.

Google Drive

Google Drive is a cloud drive where one can create a folder to share with the person one invited by email. Not only is it a file storage but also provides a synchronization service, which allows multiple persons to access the same file and edit it at the same time.

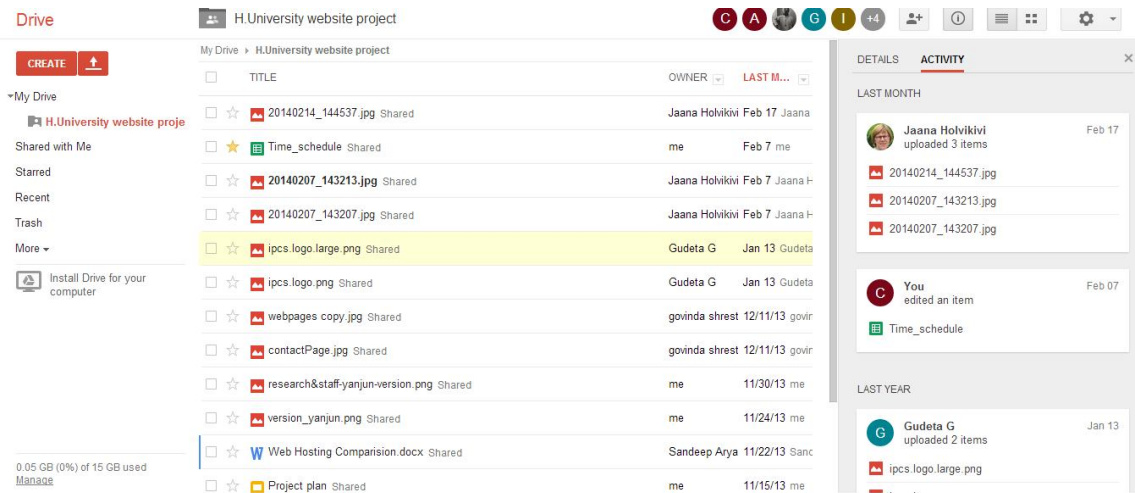


Figure 7. Google Drive User Interface screen shot

Google Drive supports various document types such as docx, excel, ppt, image file as the basic default settings. There are also several plug-in applications that are free to install and use. We can see the screen shot of our project file list on Google Drive.

2.1.3 Server and domain

To build a website requires three important factors: domain name, server and program. Let us assume the website is a store, so then the domain name is like the shop's name or logo, and the server is just like the storefront, and the program is the operating system for the store. Certainly, the owner of the shop can create his own operating system by himself/herself or use others' achievements and experience as a reference. In this case, we had the option to create the website by ourselves or choose one of the popular content management systems.

The domain name is one of the important resources for Internet, which is an effective way to change the tedious IP address into number and character combinations. To gain a domain name is the first step of building one's own website. The IPCS administrator selected the domain name we purchased. We made several domain names for different uses as figure 8 shows: <http://www.uoh-ipcs.com> as the main domain name for the main site. Uoh-ipcs is the abbreviation for the University of Hargeisa - Institute of Peace and Conflict Studies. The portal by using the domain name - <http://portal.uoh-ipcs.com> is oriented for internal access by teachers and students. Also we created a sub domain - <http://dev.uoh-ipcs.com> for development use. It is really necessary to try everything on the development site and bring the final version to the real main site. In

order to keep the main site running with no errors and redundant files or images, <http://docs.uoh-ipcs.com> was made for administrations in Hargeisa. We put the guidelines for how to update the website content and administration works into this address.

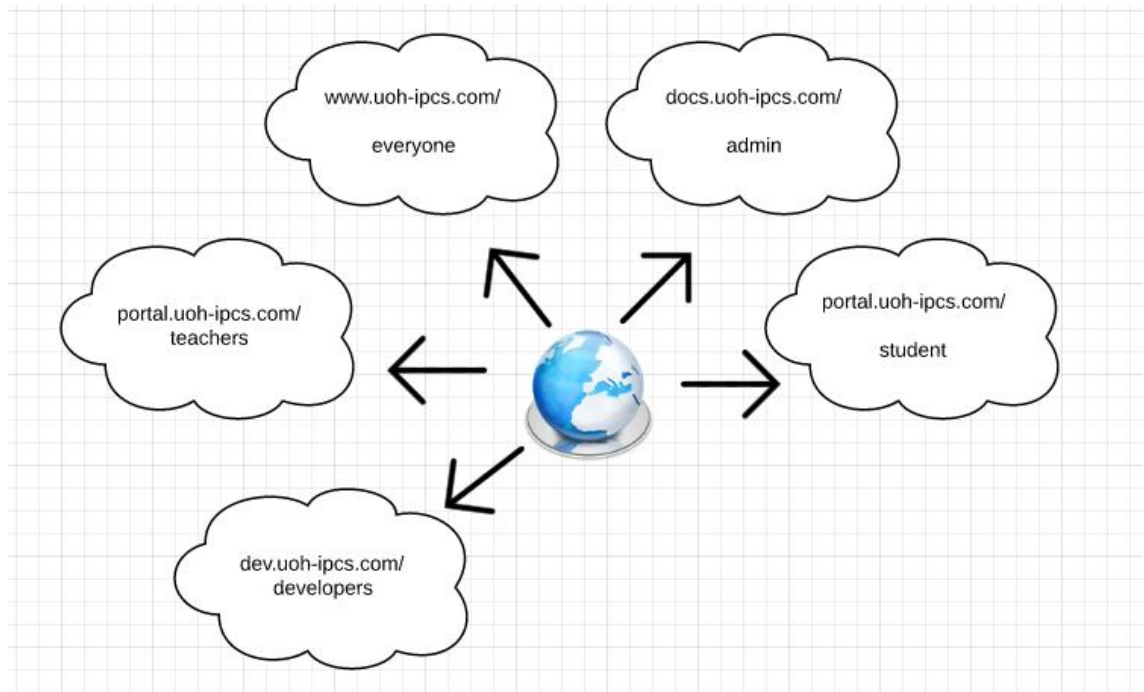


Figure 8. Domain names

The domain name choice and server choice are separate issues. Some server providers also provide free domain in order to attract the customers but one may buy a domain name and server service from different places. After we have finished the domain registration, we need to put the DNS (domain name resolution) into the IP address on the server.

Server

Currently server types are divided into virtual hosts, VPSs (virtual private servers), and independent hosts. [8] In this case the virtual host was good enough for host this project. Some of the virtual host services are free and some are not, but most of the free ones are not stable. As we know, most of the web hosting services are American. Due to fact that we wanted to find a middle point between Somaliland and Finland, we wanted to find a host service in Europe.

We compared the host services in different countries in Europe, as table2 shows below:

Countries	Distance to Hargeisa(Km)	Company	Price(Euro)/month	Contact language	Rank(Based on Alexa)
France	8910	http://www.ovh-hosting.fi/	6.2	Finnish	858
Germany	8606.5	http://www.1und1.de	6.99	German	949
Greece	7724	http://www.tophost.gr	5.9	Greek	56045
Italy	8026	http://www.register.it	20	Italian	7793
Netherlands	8848.1	http://www.leaseweb.com	4.99	English	2533
Spain	8061	http://www.tsytglobal.net	5.95	Spanish	9468
Turkey	6173.2	http://www.isimtescil.net/	12.91	Turkish	7443
United Arab Emirates	6097.5	http://tophostingco.com/en/	2.5	Abrabic	1E+06

Table 2. Comparison of host service in different countries

Eventually we chose Arvix which is hosted in the Netherlands. It provides unlimited disk spaces, unlimited data transfer and unlimited email accounts as the customer wants. After we bought the service space, we bound the server and the domain name, which was the final step of the preparation work.

2.2 Integration design

2.2.1 Content and structure design

In general, the webpage includes the important elements shown in figure 9. The header is the eye catcher of the site, and it should contain the logo and the institution's name because it would be the first element a visitor sees on the site. Breadcrumb is a quick link to show the source pages with layers, it is very useful for the website with plenty contents and layers. Besides the menu, there is also a sub navigator either on the right hand side or left-hand side, and then the page content and footer. The footer normally contains some information and quick links. The footer includes the a set of static quick links that does not refresh with the page. So we put some contact information and links that makes it easier for customers to find the information they want.

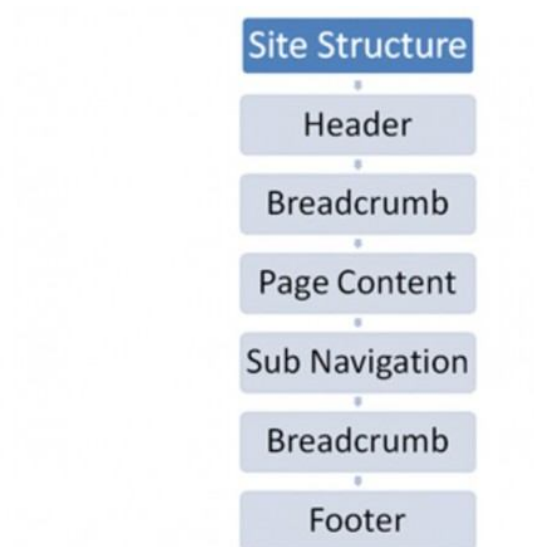


Figure 9. Site structure [9]

The site structure is shown above, in figure 9 and figure 10 shows a common way where to put the components. The reason we chose this old-fashioned content structure design was based on its user friendliness and also that it was professional for academic purposes. This structure is familiar to users, so it is easier for users to understand and find the information they want faster.

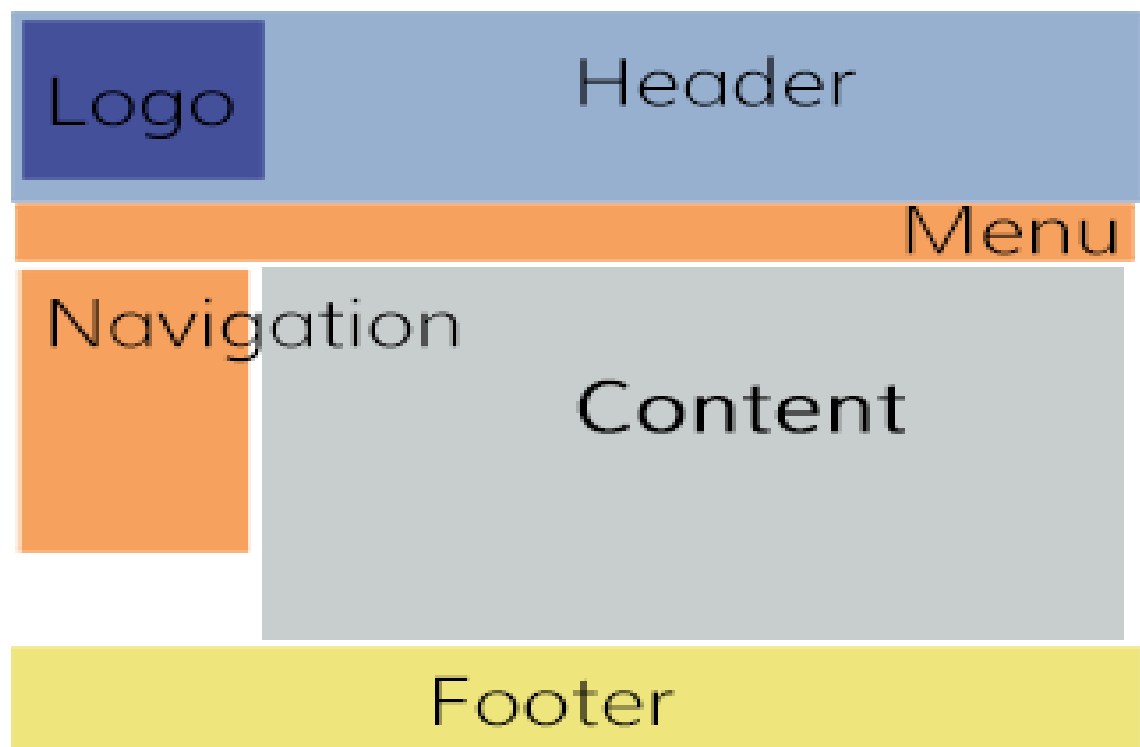


Figure 10. Site structure 2 [10]

The table 3, the project content requirements we received from the University of Hargeisa after the initial graphic design was finished (Appendix 1). However we kept the color scheme and the main structure of the initial graphic design on our actual final webpage design (Appendix 2).

Menu	Submenus(Drop down)
About IPCS	IPCS History Vision & Mission Directors Message Faculty/Staff
Programmes	PGD in Peace & Conflict Resolution MA in IR & Diplomacy Short Courses Town Hall Meetings
Publications	Articles Special Reports Research Papers Book Reviews Seminar/Conference Reports
Latest News	
Events	Upcoming Events Completed Events
Partners	
Photo Gallery	
Social Media Buttons	Facebook Twitter
Contact us form	Contact Details (Email, mobile) Emails must be official e.g adam@uoh- ipcs.com Contact form (To, Subject, message and then Submit button)
Go Back to UoH website	We also need to add a button that visitors can click when they want to go back or visit the University's Official website www.hargeisauniversity.com)

Table 3. Project requirements

According to the project requirements in table 3, we decided to make six different pages on the main menu: About, Programmes, Publications, Contact us, University of Hargeisa and Gallery. The first three pages come with a submenu by dropdown functionalities.

2.2.2 Graphic design

Paint.net and Photoshop are the tools I used to create the graphics by. Both of them are professional and good to use. Paint.net is a professional edition of the Windows default program - Paint is which made by Microsoft. It is simpler than Photoshop, which is used by graphical artists. It has less components and is easier to understand.



Figure 11. Logo design

Figure 11 shows the new logo we designed by Photoshop. The inspiration comes from the tent of Somaliland. We used the unique features of a Somali tent to create the new logo for the IPCS institution, and in the real outcome we changed the color of the IPCS characters to correspond to the main color scheme of the whole website in order to keep the consistency of the whole design.

2.2.3 Portal and database design

The Hargeisa IPCS portal is a web interface where students can follow up their studies online. This makes a smooth connection between the student and the university. Students are able to follow up each and every aspect about their studies. This web portal makes administration tasks easier. The web portal will have features such as student record information, management of staff, course management system, schedule management system and announcement system. Administrative tasks are easier to follow up as the system keeps track of what has been done before.

As the figure 12 shows, all together there will be about eight different features. Each feature will be very practical to make whole organization live and better. All features work in relation to each other. Students and teachers can go online on the web portal with their user-identification and password. Students can see a list of the courses they are enrolled, different announcements made by the departments and announcements from enrolled courses. Students can also see assigned assignments and can submit those assignments online.

Course Enrolment

Students are able to see a list of the courses they are enrolled, and furthermore they can enrol to available courses online, themselves. Approving those enrolments will be in the hand of teachers. The teacher of a particular subject will get a message either to approve or disapprove a request made by a student.

Assignment system

The teacher can create assignments for students, and students can submit assignments online as text or as different files.

Calendar

The portal system will have online calendar where students can see their schedules according to their study group (e.g. IPCS12). The calendar system will be maintained by the administrator.

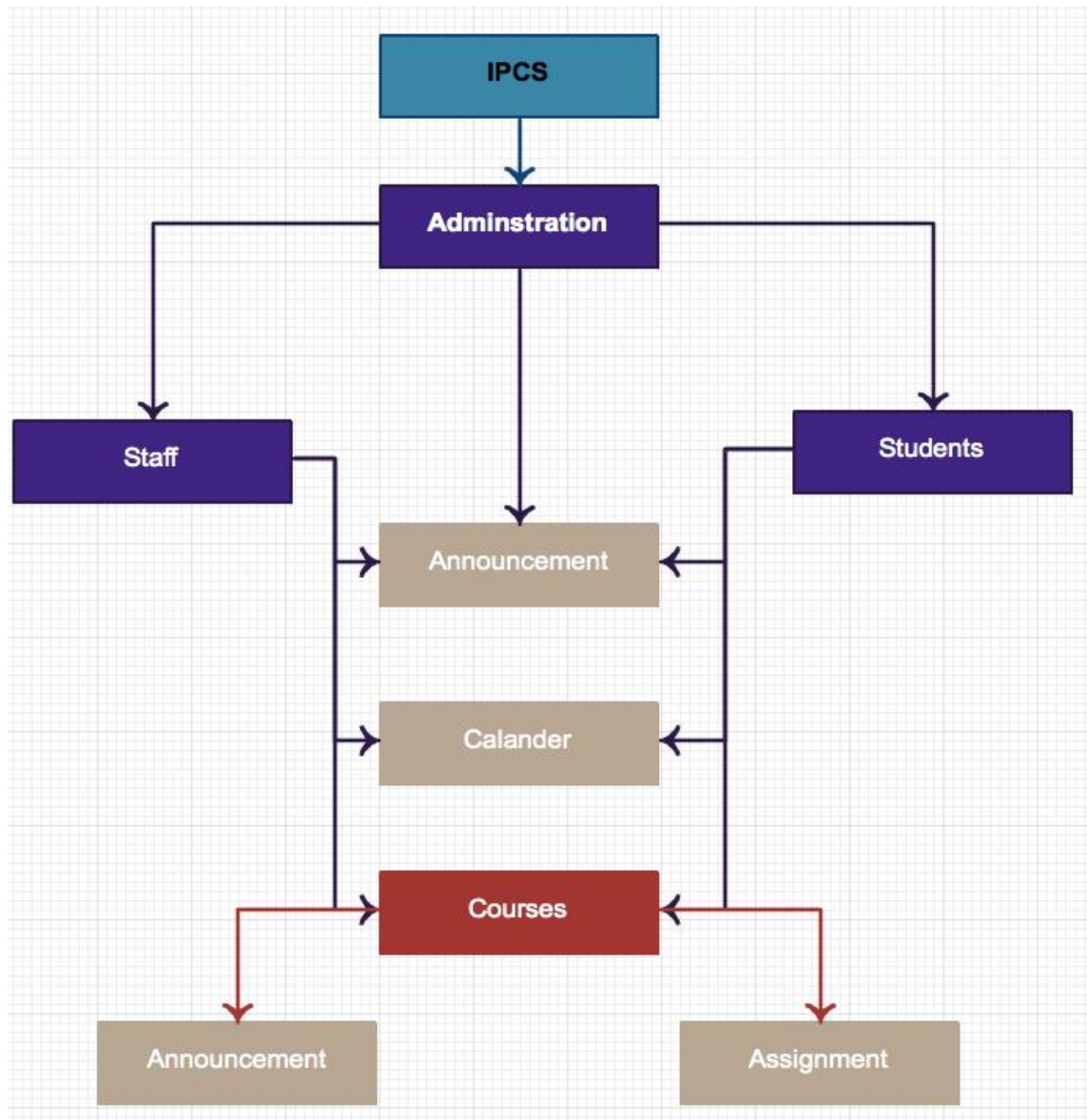


Figure 12. The relations between the different entities of the system

Network drive

The network drive is a cloud storage where the students and the teacher can store their files online. They can also share them with others.

Course management

Head of department is able to assign courses to teachers and make possible changes. He/she is also able to create new courses which will be offered to students.

Student and teacher record

All the contact information about students and teachers will be stored online and they are searchable by anyone within that system. This makes easy access to contact information. The administrator is able to add a new student and teacher to the system and likewise he/she is also able to alter the information stored.

Email services

Students and teachers will be able to have an email address provided by the university and they can read and send their emails online via portal.

These eight features corresponding to the database design.

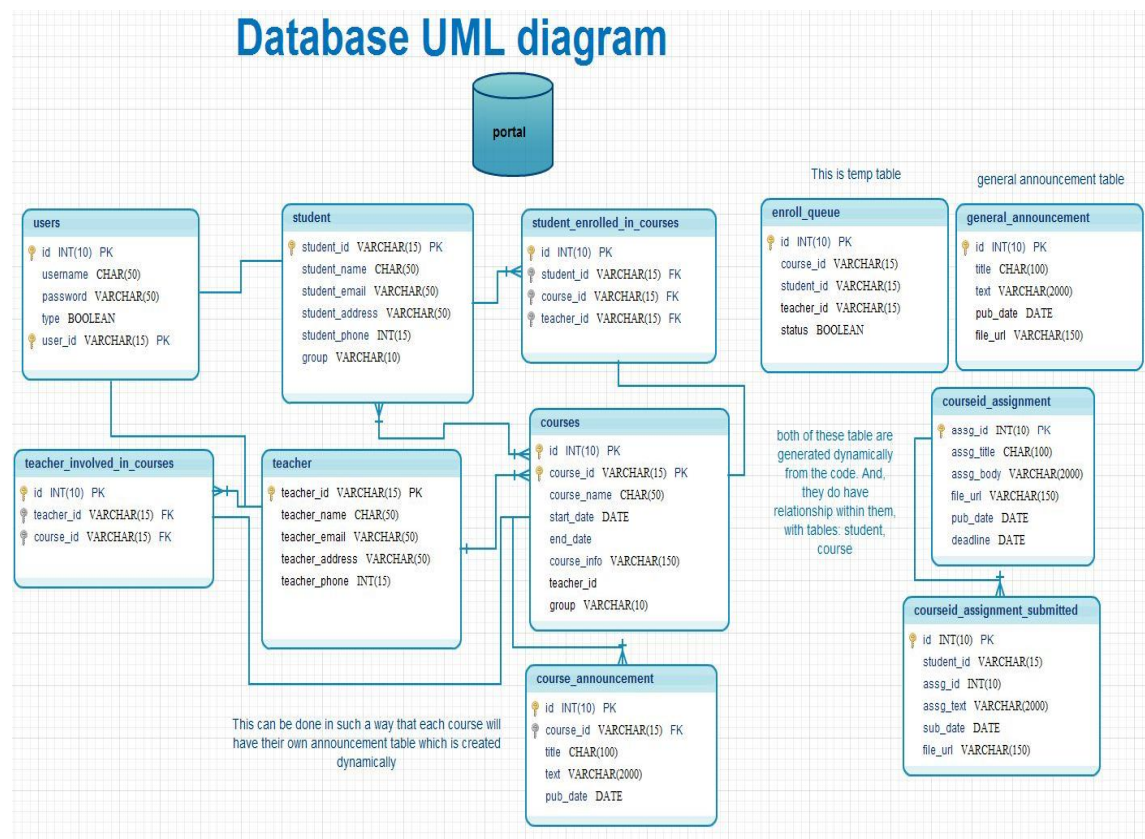


Figure 13. table relationships in database

As one can see, we have eleven tables: users, student, teacher_involved_in_courses, student_involved_in_courses, teacher, courses, courses_annoucement, general announcement table were generated by ourselves and table enroll_queue is a temporary table, courseid_assignment and courseid_assignment_submitted are both generated

dynamically from the code. Some of the keys in the table are connected with other tables with the same key present. With this connection the tables are linked together.

For example, the table users contains the elements of

```
id          INT(10)    PK
username   CHAR(50)
password   VARCHAR(50)
type       BOOLEAN
userid     VARCHAR(50) PK
```

PK in the database means the primary key with a key logo in front of the element. Also one can call it a unique key which means the content of it is unique. Different of terms have a unique id in the table. Int(10) means the maximum input is limited to 10 integers. Char(50) means the maximum numbers of the characters are 50 characters. In the context of relational databases, a foreign key(FK) is a field in one table that uniquely identifies a row of another table. In other words, a foreign key is a column or a combination of columns that is used to establish and enforce a link between two tables. The table containing the foreign key is called the referencing or child table. [10,2014]

3 Drupal

3.1 About Drupal

3.1.1 Content management system

The content management system shortened as CMS is the result of an organization and associated with the content. Content can be any kind of combination of digital information. It can be text, images, web pages, business documents, database forms, video, sounds, XML, etc. The definition of content management is to assist an organization or individual by information technology to implement the content to be created, saved, shared, applied, or searched. And the content management system is a tool or a set of tools of software system to support the content management. [11]

The content management system can be defined narrowly. Normally it indicates a system published and managed by a portal or commercial website, whereas it can also be defined broadly, like a personal website system, wiki, or blog as a type of content management system.

Nowadays, the most popular CMSs online are Joomla, Drupal, and Wordpress. The usage amount of Wordpress is the largest. From my personal opinion Wordpress is the easiest to learn and user-friendly. There are more than 68 million websites which use Wordpress, which makes it the most favourite blog software. There are several advantages of Wordpress such as user-friendliness, multiple authors, a huge plugin library, etc. However it has also low security. Wordpress is often the target of hackers. One needs to install a plugin from a third-party to boost the installation's security. Also it was limited design options and content management capabilities, so it is more suited for small projects such as personal blogs, and small-size company web pages. Compared with Drupal and Joomla, Drupal has strong SEO capabilities that are designed from the ground-up to be search-engine friendly. Drupal is more stable and more friendly oriented to developers. The design of Drupal is more to encourage developers create their own solutions. It is more difficult to learn to use it compared with Joomla, but we chose Drupal as the development tool. [12]

3.1.2 History and development environment

Drupal is a free open-source framework and template, which are all written in PHP. Because of the functionality is beyond the general definition of a content system, it can also be called a content management framework. Drupal is able to run on Windows and Unix/Linux operation system, it support IIS and Apache Web server, and needs MySQL or PostgreSQL database.[13.2]

Drupal comes from a set of community discussion software developed by Dries Buytaert. Today, it was already turned to the websites which holds a huge number of visiting records, such as Whitehouse.gov, The Onion, KernelTrap, Ourmedia and etc.

Drupal is a tool to build websites with a completely modular and open source web content management system framework. The published version of Drupal contains core functionalities, and extra functionality can be added by module installations.

The design goal of Drupal is not only that it can operate on a cheap web host but it is also able to adjust with distributed sites with a huge amount of operation. However it signifies using the most popular technology and is strictly programmed.

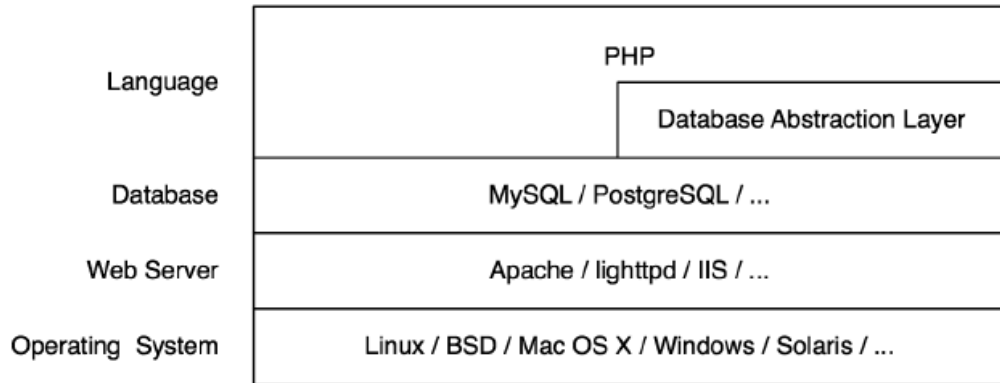


Figure 14. Drupal technology stack [13.2]

As figure 14 shows us the Drupal technology stack, the operating system are placed on the lowest level of the stack. Drupal does not pay attention to this level. It can run on any operating system which supports the PHP language.

The common web server which Drupal uses is Apache and certainly other web servers (like Microsoft-IIS). Due to the long-living good relationship between Drupal and Apache, the default root index of Drupal has .htaccess to make sure the security of Drupal installation. When users intend to install Drupal by using other web servers instead of Apache, they need to change the regulation of .htaccess to some language which their systems are able to understand.

Drupal uses database abstraction layer and the next level of the stack (database level) for interaction. This abstraction layer disposes the cleaning work of SQL search statement, and supports the use of different databases made by different manufacturers without code reconstitution. The most common database in Drupal is MySQL. Drupal uses PHP as the coding language. All Drupal core code strictly follow the coding regulation(<http://drupal.org/nodes/318>).[11]

Core

The Drupal core is composed by a lightweight level of framework. One obtains it automatically downloading Drupal from drupal.org. The core is in charge of providing the basic functionality to support the other parts of the system. The core is involved when Drupal receives a calling request of system code instruction, a Drupal conventional

library, and provides the basic functionality of modules such as user management, template, and session management, like figure 15 shows.

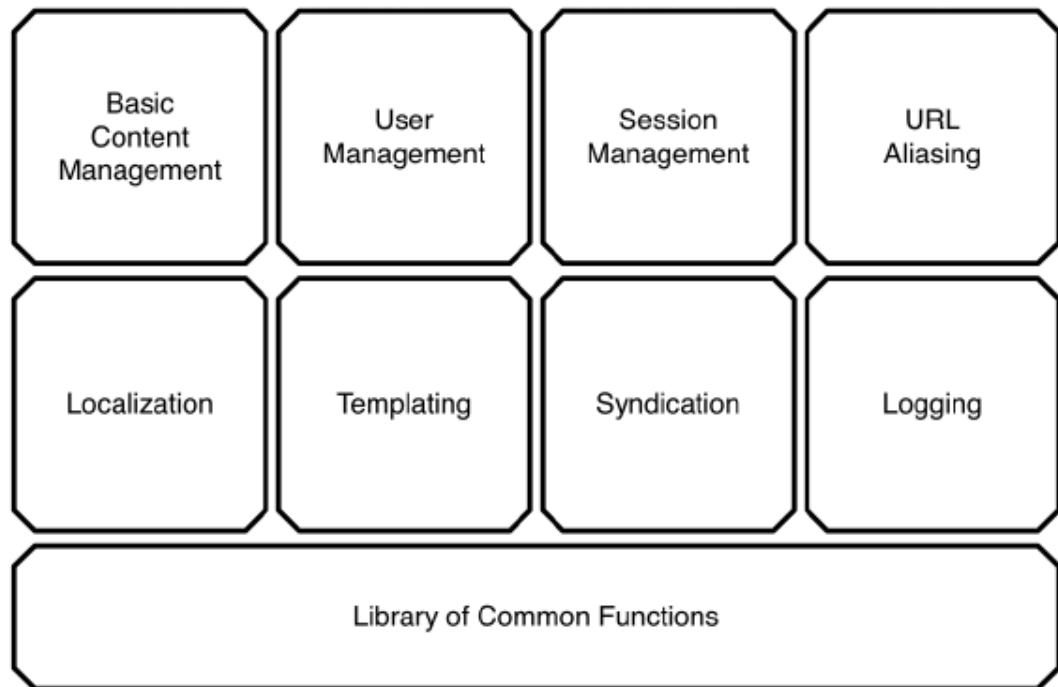


Figure 15. An overview of the Drupal core (Not all core functionality is shown.) [13,3]

Some core functionality comes with Drupal default settings. However if one wants to add more functionalities, either one can install existing modules contributed by the Drupal developers or other users, or one may customize one's own module by oneself. The core elements of Drupal include modules, theme, content, nodes, hook and blocks. All in all, Drupal is a powerful open source content management for use in web developing.

3.1.3 Drupal backend management

We used some tools to access and manage the files from Drupal backend. First of all, Filezilla is free FTP client-side software. Although it is free software, the functionality is not weak at all. FTP is short for File Transfer protocol, which is used as a set of standard protocols for file transfer on the web. It belongs to the communication protocol on the application level.

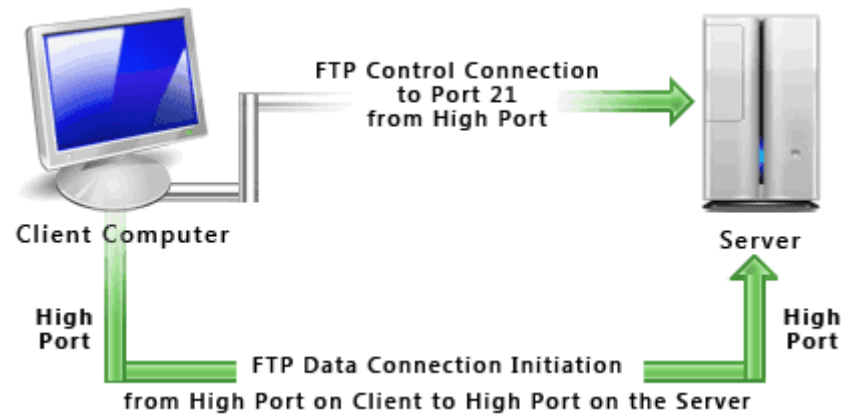


Figure 16. FTP[14]

As figure 16 shows, the service of FTP is running between port 20 and port 21. Port 20 is used as the transfer data flow between the client side with the server, and port 21 is used as the transfer control flow and also is the entrance for commands to the FTP server. Most of the latest website browser and file management are able to create connection with FTP server. This makes FTP able to remote control files only through one port which is just the same as controlling the local files.

The other really important backend management tool we used was Cpanel. I believe everybody who has built a website would understand how inconvenience is that when one wants to use some functionality but has to connect with the vendors to activate the new functionalities. It is a waste of time and also sometimes the vendors cannot provide the functionality in time what one asked for. However on cPanel host, one can control everything by oneself without connecting with the vendors at first. cPanel is a set of automatic hosting management software based on the web, build base on LAMP environment and implemented by PHP language_(products of .NET environment are still under development). According to cPanel official websites, cPanel is a hosting automation company driven by technology and dedicated to providing the most feature rich, easy to use, practical applications. We are committed to the hosting community and our continued role as a market leader.[15]

The cPanel virtual host management system includes cPanel user interface and a WHM server management interface. The cPanel user interface brings the convenience to clients for manage their own websites and the WHM server interface brings the efficiency for the administrators to manage and maintain the server.

3.2 Technical development

3.2.1 Drupal administration

Unlike the other CMSs, there is a separate banner backend administration tool from the frontend website. Drupal management integrates the administration tools and the website itself. In order to build the website, there is also a convenient option symbol sitting next to each piece of contents. They allow to be clicked to edit or configure the piece of content one wants to.

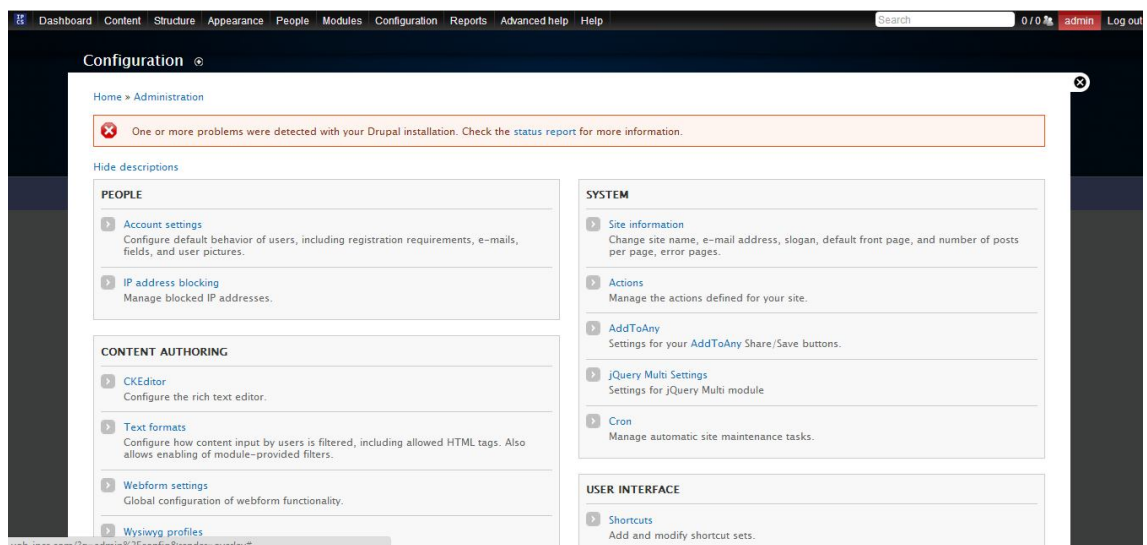


Figure 17. Administration tool screen shot

The administration tool bar appears on top of the site as figure 17 shows. The administrative interface of Drupal is split into the following section:

Fav-icon is like a control panel for the Drupal system. There are functionalities such as flush the cache, run updates, a link to Drupal main site etc.

Dashboard is where we can see who are the recently registered users or the comments that are awaiting approval.

Content is a content administration link and include a list of content types and allows us to create, edit or delete contents.

Structure means that after the content is created, we need to find a position to put the content. This section allows us to manage and configure blocks and menus.

Appearances is involved with theme configurations to control the outlook of our website.

People gives the right to manage administrators of our website, as well as the right of what they are allowed to do.

Modules gives us the list of default modules and new modules we have installed by ourselves. We can manage modules by disabling and enabling them. Also this is where we can install the new modules.

Configuration is where, after the modules are successfully installed, we can choose to configure them and it also allows us to configure the default settings and core modules.

Report and Help are both useful for keeping up with maintenance, then gives one the guidelines about the common problem solutions.

3.2.2 Theme

One of the default cores of Drupal is the theme. The Drupal theme applies to the Drupal default look and interface. Without changing any content of the website, the theme defines the default looks of the site with HTML and CSS frontend programming language, such as the fonts, the size of the characters, the colour of the banner, the space between blocks etc. Many themes are written by the PHPTemplate engine and some templates use the hard-coded PHP. Drupal comes with four default themes when one gets started: Bartik, Seven, Garland, Stark, but most people are not satisfied with the default theme options. We found our theme on <http://www.zymphonies.com/>, as the figure 18 demonstrates.

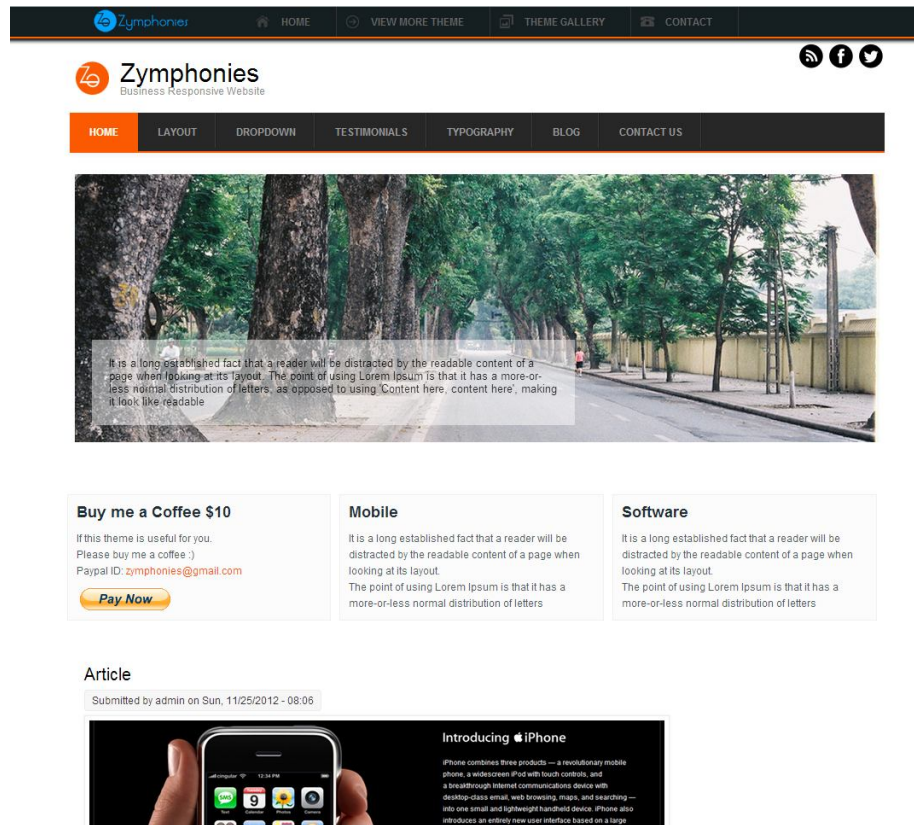


Figure 18. Theme used on our main website[16]

The new theme installation can be processed in two ways, either click the "Install new theme" link at the top of the appearance page and walk through the installation wizard, or download the file and extract it into the directory sites/all/themes. The new theme would show on the Appearances administration page. After the installation we enabled the new theme by visiting Appearances page, and changed the favicon in the setting option right next to the default-enabled themes. The slogan can be found from Configuration->System->Site information. According to the content structure design and initial web user interface design, we did some of the modification based on this theme we downloaded. I used Google Chrome as my main web browser. To click on the right button of the mouse on the website page to find the view source code choice as Figure 19 shows. The purpose was to adjust the color and space of each block. Then we could try the code without uploading the changed files every time. This increased the efficiency of our work.

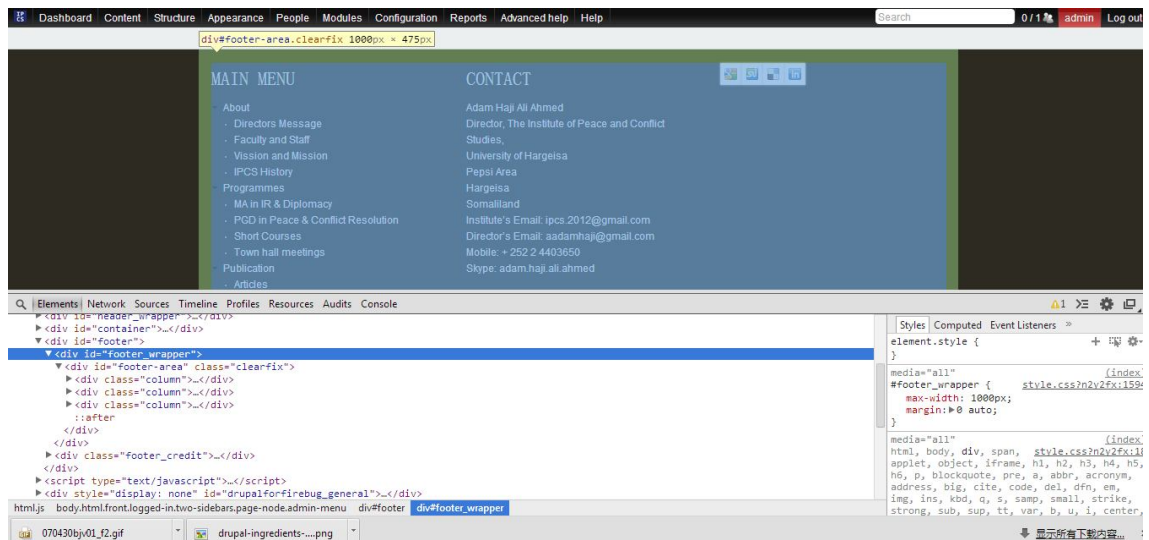


Figure 19. Google Chrome source review screen shot

Here I have a short example of our theme modification. I wanted to make the height of the footer longer. First I found the piece of code in the source code by Google view source code option. Then I tried to find the theme files storage directory by logging on FileZilla, which is shown in figure 20.

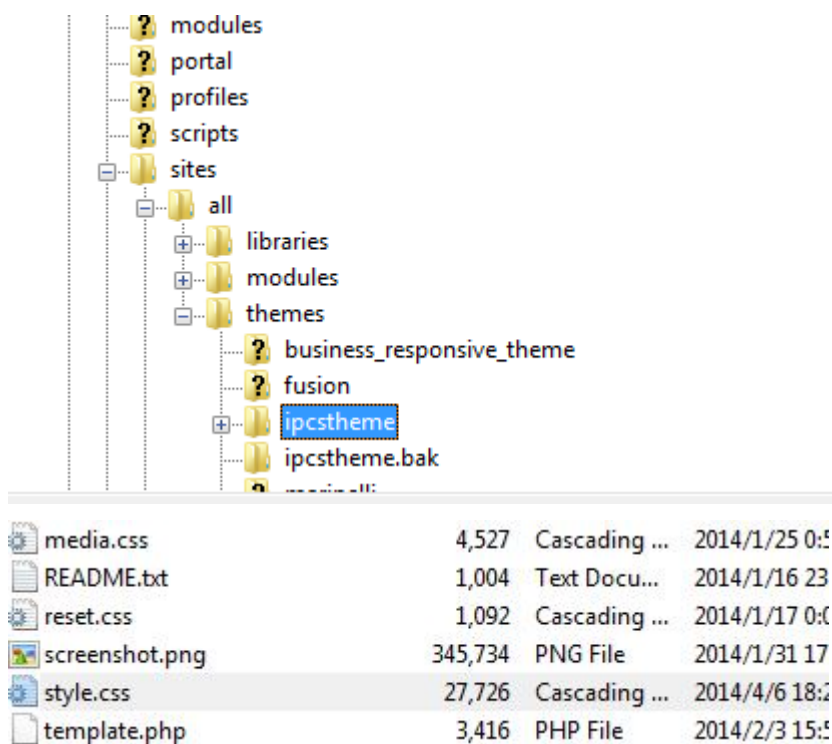


Figure 20. FileZilla accessing the original files screen shot

I find the piece of code shows below in the style.css file in the folder named after the theme.


```
#footer {
  clear: both;
  color: rgb(34, 34, 34);
  background: #2C2A21;
  border-top: 1px solid #CFD7DB;
  height: 480px;
}
```

Listing1.example CSS code from theme

The height: 480px is the target element we wanted to change. At last we uploaded the changed file on the server by FileZilla which was the final step. This, although a simple example, covers the procedure about the Drupal backend management, code modification, installation and problems fixed.

3.2.3 Module

By using modules we could turn on or off the functionalities of our website. There are two types of modules: core modules come with the Drupal default installations, and contributed modules are either created by Drupal developers or other Drupal users. I myself was able to create the customized module or download the existing modules from Drupal.org.

The screenshot shows the Drupal Modules administration interface. At the top, there is a navigation bar with 'LIST', 'UPDATE', and 'UNINSTALL' buttons. Below the navigation bar, a security update notification is displayed: 'There are security updates available for one or more of your modules or themes. To ensure the security of your server, you should update immediately! See the available updates page for more information and to install your missing updates.' Below the notification, there is a section for 'Download additional contributed modules to extend Drupal's functionality.' and a link to 'Install new module'. The main content area is titled '- CORE' and contains a table of core modules.

ENABLED	NAME	VERSION	DESCRIPTION	OPERATIONS
<input type="checkbox"/>	Aggregator	7.26	Aggregates syndicated content (RSS, RDF, and Atom feeds).	
<input checked="" type="checkbox"/>	Block	7.26	Controls the visual building blocks a page is constructed with. Blocks are boxes of content rendered into an area, or region, of a web page. Required by: Dashboard (enabled)	Help Permissions Configure
<input type="checkbox"/>	Blog	7.26	Enables multi-user blogs.	
<input type="checkbox"/>	Book	7.26	Allows users to create and organize related content in an outline.	
<input checked="" type="checkbox"/>	Color	7.26	Allows administrators to change the color scheme of compatible themes. Required by: Stylizer (disabled)	Help
<input checked="" type="checkbox"/>	Comment	7.26	Allows users to comment on and discuss published content. Requires: Text (enabled), Field (enabled), Field SQL storage (enabled) Required by: Forum (disabled), Tracker (disabled)	Help Permissions Configure
<input type="checkbox"/>	Contact	7.26	Enables the use of both personal and site-wide contact forms.	

Translated into different languages.

Figure 21. Module administration screen shot

I could activate the modules by checking the Enable checkboxes. Depending on the different modules' properties, the activation of some modules are required to active and install some specific modules beforehand. These are called modules dependencies.

The requirements of the modules are shown next to the module name below in the description category, as shown in figure 21. According to the description, one may find the right modules and install them.

Project Information

Maintenance status: [Actively maintained](#)
 Development status: [Under active development](#)
 Reported installs: **746,726** sites currently report using this module. [View usage statistics](#).
 Downloads: 5,138,445
 Automated tests: Enabled
 Last modified: November 7, 2012

Downloads

Recommended releases

Version	Download	Date	Links
7.x-3.7	gz (1.56 MB) zip (1.79 MB)	2013-Apr-09	Notes
6.x-2.16	gz (1.21 MB) zip (1.35 MB)	2011-Nov-14	Notes

Other releases

Version	Download	Date	Links
6.x-3.0	gz (1.13 MB) zip (1.31 MB)	2012-Jan-04	Notes

Figure 22. The View module page

The method of installing a new module is really simple. First, one can visit the drupal.org website to find the right module. After that, the module page shows up, as in figure 22. Look for which version of release is needed and in our case it was version 7.x(for Drupal 7). Then, right click gz to copy the link address. At last, go back to the module administration page, as figure 19 shows, click on the install new module and paste the link according to the Drupal guideline. Then the newly installed module can be found at the module administration page, or there is another way which is a little more complicated than this one. Instead of right click gz, click on the zip and download it. Then upload the compressed file to the backend folder, which stores the modules, and unzip the compressed file into the folder to complete the installation step.

Some of the modules require to be configured. One may find the module configuration under configuration option shown on the administration menu bar.

3.2.4 Content Management

Nodes

Nodes are related with the next step building of blocks. A node is a piece of content. It can be a page containing the company's privacy policy or post a blog entry on the site or the posting links. Another way to say is that the node is referred to by Drupal as content types. The default content types of nodes are "Basic page" and "Article". Their default configuration settings are different. "Basic page" nodes do not provide the information about the author and date, which suits for the content types with the original author being irrelevant. "Article" nodes provide the information which allow the content creator to add tags and images to the content. All nodes share common properties like author, creation date, title and body content. The beauty of Drupal is that allows you to create new types of content by oneself. Some of the modules can add new kinds of nodes to the Drupal content system with new features and some of the modules can add new properties to the nodes, which brings more functionalities.

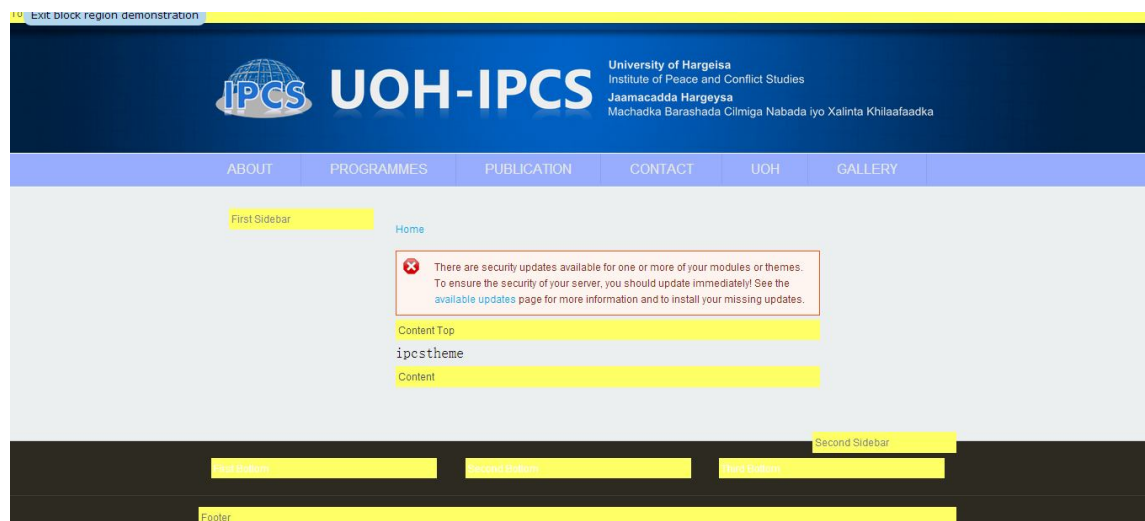


Figure 23. The Block module function demonstration

Block and navigations

As figure 23 shows, this block module consist of a set of contents that are placed within a region of a page. Blocks need to be configured on different theme basis. Example regions of the theme we selected are: "First sidebar", "Content tap", "Content", "Second Sidebar", "First button", "Second button", "Third button", "Footer". We can use the arrow handles on the side to drag blocks to different regions. The difference between

blocks and nodes is blocks are typically supplementary information to the actual content on the page, block content is changing often or like temporary information would always be updated. The content of blocks also cannot be searchable. The default navigation includes four menus: Main menu, User menu, Navigation, Management. It allows adding more menus by administrators.

Taxonomy

The taxonomy module is one of the Drupal default core modules. It is the kind of module that can add new pieces of information to nodes. It functions like the tag for the blogs, it contains categories of the topics that nodes can be associated with when they are created. One can label the pages by selecting different taxonomies, and provide the pages with a list of description terms that are used on the sites.

View

The view module was really important in this project. It does not come with the Drupal default installations, so we had to find this module and install it by ourselves. It is basically a graphic interface for building highly customized listing. By using the view module, we could create a slideshow with recent pictures we uploaded on the site or listing recent content to the calendar of events.

4 Portal technology

4.1 Portal frontend development

The frontend always consists of two parts: the design and frontend development. The frontend developments always require knowledge of Photoshop, HTML and CSS as basics, or sometimes require a more advanced programming language such as JavaScript, jQuery. Everything we can see that uses the web is a combination of HTML, CSS and JavaScript. These include features such as fonts, colours, positions, drop-down menus, sliders, and other effects.

HTML is short for Hyper-Text Markup Language. It is the standard of description of website contents and looks on WAN. HTML itself can be displayed on a browser. The markup language goes through analyzing and compiling by the browser, to display the

content of the HTML markup language. The simplest grammar is `<markup>` content `</markup>`. The tags are always used by pairs.

The CSS(Cascading Style sheet) is one of the markup languages, which is used for controlling website style and allows for separate style information and website content, to introduce CSS in order to make HTML gain better adaptation to the website graphic design.



Figure 24. Portal login user interface

The tags' names correspond to figure 24. Listing 2 illustrates log in the page frontend code example:

```
<html>
<head>
  <title>IPCS</title>
  <link rel="stylesheet" type="text/css" href="style.css">
</head>
<body>
  <div id="warp-body">  <!--for whole body-->
```

```

<div id="warp-lgbox"> <!--for login box-->
  <div id="warp-logo">
    
    <p class="header">IPCS Portal</p>
  </div>
  <form name="loginform" method="post" action="login.php">
    <div id="content">
      <div id="msgbox"><!--for displaying error msg-->
      </div>
      <table border="0" cellpadding="5" id="login">
        <tr>
          <td><font color="white">Username</font></td>
          <td><input id="username" name="username" size="25"
tabindex="1" accesskey="n" /></td>
        </tr>
        <tr>
          <td><font color="white">Password</font></td>
          <td><input id="password" name="password" size="25"
tabindex="2" accesskey="p" type="password" /></td>
        </tr>
      </table>
    </div>
    <div id="footer">
      <p><input class="button" accesskey="l" name="login" val-
ue="LOGIN" tabindex="3" type="submit"></p>
    </div>
  </form>
</div>
</div>
</body>
</html>

```

Listing 2. frontend code- HTML and CSS

All websites are composed of all kinds of tags and the contents between the tags. When one is browsing the website, one should right click the webpage to select the view source code, and one can find the structure of the website.

4.2 Portal backend development

The backend usually consists of three parts: server, application and database. The common backend technology includes: PHP, Ruby, Python and etc. PHP is a server-side script language which is designed for the web. PHP can be embedded in HTML page and executed when the page being visited. MySQL is a fast and strong relational database management system. The database allows one to save, search, sort or find data effectively. The MySQL server control access to data, thereby assure multiple

users can use it at the same time. Meanwhile provide quick access and insure only authenticated users can get data access. phpMyAdmin is a very powerful tool to be used as managing the MySQL database. We used it to create tables, delete tables, modify table content and etc. It was really easy to use and functioned well.[17,155]

Embedding PHP in HTML:

PHP always use" <? php "as a star and "?>" as the end. For example, when the HTML code are shows as listing 3:

```
<body>
<h1>Example code</h1>
</body>
```

Listing 3. HTML code example

To embedded PHP into the code above, the changes are made as in listing 4:

```
<body>
<h1>Example code1</h1>
<?php
        echo '<p>Example code2</p>';
?>
</body>
```

Listing 4. Embedded PHP into HTML

If we right click the webpage to view the source code, we will see:

```
<body>
<h1>Example code1</h1>
<p>Example code2</p>
</body>
```

Listing 5. View source code

The code above did not show the original PHP language. This is because after the PHP interpreter run this script and then export a new script. This means that through PHP, we can generate pure HTML that can be checked from all kinds of browsers, and the users' browser will not need to understand PHP.

Establish a connection of PHP to MySQL

PHP provides a function library - mysqli to connect MySQL. We inserted the statement below into the script to connect to the MySQL server:

```
@ $db = new mysqli( 'localhost', 'username', 'password', 'data-
basename' );
```

Listing 6. code of connection between MySQL and PHP

When connecting to the database we always used error suppression operator @ as the first line code. This is a clever way to solve any errors.[17,205]

Web database architecture

The basic operation of web server consisted of two objects: web browser and web server. There is a communication connection between these two parts. The web browser sends a request and the server sends a response back.

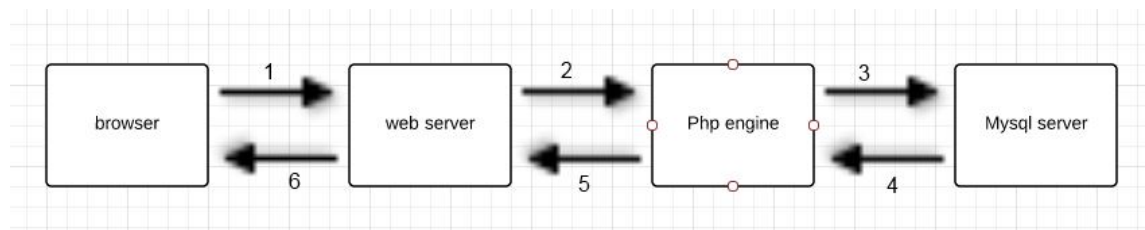


Figure 25. Web database structure

As shown in figure 25, there are six steps of a typical web database objects:

1. The browser of the client side sends an HTTP request for particular website. In our project, the clients asked to search for a new course which the University of Hargeisa offered, for example, the result page name as results.php.
2. The web server receives the request - results.php, obtains this file and sends it to the PHP engine in order to ask for an action.

3. PHP starts to analyze the script. There is a connection to the database command in the script and an execute the query (search the new course) command. The PHP opens the connection to the MySQL database.

4. MySQL server receives and handles the request, then sends the result (new course information) back to the PHP engine.

5. The PHP engine finishes running the script. Usually, it includes formatting the result into HTML form and exporting the HTML back to the web server.

6. The Web server sends the HTML to the browser so the clients are able to see the result.[14:162]

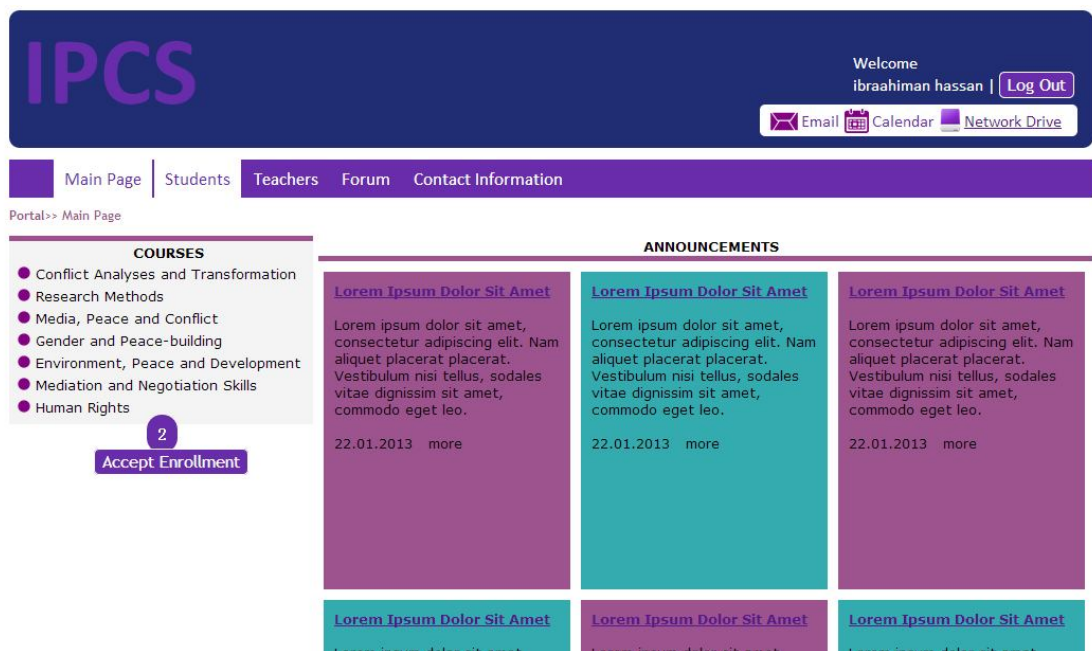


Figure 26. Portal user interface

In the portal interface, shown in figure 26, we can see the functionalities of the portal including the announcement, courses list, email, calendar, net drive and some other information. The database of the portal I introduced in the chapter 3 in this thesis already.

5 Discussion and Result

5.1 Result

The project lasted for six months in total from October 2013 to April 2014. We gathered seven people to participate in this project from the beginning. Three of us were in charge of making the website by Drupal and four others were in charge of making the portal by web developing programming languages. The main development phase was during January to February. We made three web design proposals and continued to develop on the purple one chosen by the customer (see appendix 1). Although the colour scheme is slightly different in the final product, but we mostly kept the design consistency as we aimed for. We made a database by MySQL for a portal education system including net drive, calendar, announcement and other basic practical functionalities for users. The result was satisfactory because not only did we the website creation as the customer wanted, but also we made a portal education system for university internal use. We mainly finished all the technical parts like the structure and framework both for the portal and website, and now we are still waiting for the information from customers to be put into the website and portal.

5.2 Evaluation

5.2.1 Problems and solutions

The problems we met during the six months can be summarized into two parts: team cooperation and technical issues. The website development by Drupal, we had an argument of the theme we should choose. At first, I proposed to use web design automation software Artisteer, to create the theme according to the initial design of the website. By using Artisteer we could create the theme without coding in CSS and HTML, also would support to export to Drupal. After we installed the theme we created by Artisteer, we noticed there were too many files related to the theme on the backend of Drupal, which made customized modification more difficult. But still, I insisted on using it until I found out the theme we created by Artisteer was too powerful to over write some module code which cause the picture position was changing. So I agreed with the other two website developers to use another theme we found, as I mentioned in the above chapter. The new theme had fewer regions and less files compared to the previous one, and this made it easier to modify the code base on the original files.

5.2.2 Strengths and Limitations

The functionality of Drupal is very powerful and also easy to operate, and therefore it exceeds the performance of other kinds of content management systems. The code and database can automatically generate parameters. I have some experience of using other kinds of content management systems before. One of the strengths of Drupal is web developer friendly. We can create various new core features by ourselves by using the default core modules. As there were two different content types at first, we could create more content types by ourselves and configure them the way we wanted it to be used.

Because of our knowledge and time was limited, and we are still waiting for more response from the University of Hargeisa, our website content is still less compared with that of other universities. Improvements in the future include maintenance, update information, and dual languages (Somali and English). The portal was made by hard coding by ourselves, which causes the security and cryptography become potential problems. We still have much learn and we hope we can do better in the future.

6 Conclusion

Under the supervision of our teacher, we spent half a year to finish this project. During project development I learned the Drupal content management system and open source modules, improved my web programming skills and gained international working experience. Not only that I gain valuable practical experience, but also I gained the team cooperation skills in an international environment. However of course, due to this project, I also increased the ability of self study. Because the school had not offered a course involved with Drupal development, we spent plenty of time to get used to operating on Drupal. I solved simple problems by myself independently instead of always relying on teachers and other team members. I asked for help for the problems beyond my capacity which reflected the importance of good collaboration. What I learned in the past was the foundation for this project, and I meet new problems and technologies every day. This project was a start but it is not the end. I did my best in this project but I aim to do better and more perfect in next time.

We understand that designing and building a successful academic website requires persistence and effort. Each person in this project had a different role : designer, Drupal developer, Portal programmer, and management tool master. The project included planning, graphic designing, content designing, Drupal development, client-side and server-side coding, such as HTML, CSS, PHP, JavaScript, and MySQL database was established. Further study on the subjects discussed in this thesis is highly recommended to those interested in web development by CMS.

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Initial design of the main website - Home page



Initial design of the main website - Research page

Home	About the university	search
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University of Hargeisa



The Institute of Peace and Conflict Studies

Centres and programmes	Publications	Latest news	Research clusters	Contact information
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Latest news

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Final demonstration of the main website - Home page

Homepage Screenshot

Dashboard Content Structure Appearance People Modules Configuration Reports Advanced help Help Search 0/1 admin Log o

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Institute of Peace and Conflict Studies
Jaamacadda Hargeysa
Machadka Barashada Cilmiiga Nabada iyo Xalinta Khilaafaadka

ABOUT PROGRAMMES PUBLICATION CONTACT UOH GALLERY



EVENTS

New events will be placed here.

NEWS

New website for the University of Hargeisa - Institute of Peace and Conflict Studies IPCS.

Seminar/Conference Reports

Submitted by admin on Mon, 2014-03-24 15:41

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Research Papers

Submitted by admin on Mon, 2014-03-24 15:38

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Special Reports

Submitted by admin on Mon, 2014-03-24 15:34

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Articles

Submitted by admin on Mon, 2014-03-24 15:33

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New website for the IPCS

Submitted by admin on Tue, 2014-03-04 11:55

The University of Hargeisa IPCS has got a new website!

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Welcome by the Director

Submitted by admin on Tue, 2014-03-04 11:54

Hello and welcome to the Institute of Peace and Conflict Studies at the University of Hargeisa. Somaliland has so far managed to survive the chaos and violence that has engulfed the rest of Somalia, even with little to no help from the international community. The peace and stability enjoyed by the people of Somaliland owe much to the survival of traditional structures, and the continuing importance of indigenous peacebuilding methods.

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EVENT CALENDAR

March

M	T	W	T	F	S	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

MAIN MENU

- About
 - Directors Message
 - Faculty and Staff
 - Vision and Mission
 - IPCS History
- Programmes
 - MA in IR & Diplomacy
 - PGD in Peace & Conflict Resolution
 - Short Courses
 - Town hall meetings
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<http://web.ipcs.com/> Tue Apr 01 2014 15:07:57 GMT+0300 (EAT Daylight Time)

A list of Drupal module used to create the website:

https://drupal.org/project/views_slideshow

<https://drupal.org/node/903244>

<https://drupal.org/project/views>

<https://drupal.org/project/ctools>

<https://drupal.org/project/libraries>

<https://drupal.org/project/imce>

<https://drupal.org/project/ckeditor>

<https://drupal.org/project/webform>