Evaluating Web Content Management Systems Compatibility for Implementing Online Communities

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TIIVISTELMÄ

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WWW-sisällönhallintajärjestelmien yhteensopivuuden arviointi online-yhteisöiden toteuttamiseen

Tämän työn tarkoitus on selvittää voiko www-sisällönhallintajärjestelmiä käyttää online-yhteisöjen toteuttamiseen. Työ jakaantuu kahteen osaan. Teoriaosassa on selvitetty mikä on www-sisällönhallintajärjestelmä sekä online-yhteisön ja sosiaalisen ohjelmiston välinen suhde. Ensimmäisessä osassa on myös selvitetty www-sisällönhallintajärjestelmän tärkeimmät parametrit liittyen sosiaalisiin ohjelmistoihin sekä mitä sosiaalisia ominaisuuksia online-yhteisö tarvitsee toimiakseen.

Käytännönosuudessa tutkitaan kolmen www-sisällönhallintajärjestelmän, Drupalin, Liferayn ja Plonen, teoriaosuudessa tunnistettuja ominaisuuksia sekä teknisestä että sosiaalisesta näkökulmasta. Päätavoite on selvittää voiko edellä mainittuja järjestelmiä käyttää online-yhteisöjen toteuttamiseen. Jos yhteisön toteuttaminen on mahdollista, niin toissijainen tavoite on tutkia vaikuttaako valittu www-sisällönhallintajärjestelmä online-yhteisöön.

ABSTRACT

The purpose of this study is to study whether a Web CMS can be used to implement and host an online community. The study is divided into two parts. The theoretical part contains the definition of Web CMS and clarifies the relation between an online community and a social software. The first part also defines the parameters, which must be taken account when choosing a Web CMS for hosting an online community.

The practical part of the study contains analyses of three Web CMSs, Drupal, Liferay and Plone. All the three Web CMSs were analyzed using the technical and social parameters discovered in the theoretical part of the study. The primary objective is to investigate whether the selected Web CMS can be used to implement and host an online community. If hosting is possible, the secondary objective is to investigate whether the selected Web CMS have an effect to the online community.

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ABBREVIATIONS

AJAX   Asynchronous JavaScript And XML

ASCII   American Standard Code for Information Interchange

BBS   Bulletin Board System

CIA   Central Intelligence Agency

CMC   Computer-mediated communication

CMF   Content Management Framework

CMS   Content Management System

CoA   Community of Action

CoC   Communities of Circumstance

CoI   Community of Interest

CoP   Community of Practice

CSS   Cascading Style Sheets

FTP   File Transfer Protocol

GIF   Graphic Interchange Format

HTML   Hypertext Markup Language

IM   Instant messaging

JPG   Joint Photographic Experts Group

JSP   JavaServer Pages

MMORPG   Massive(ly) Multiplayer Online Role-playing Game

MOO   MUD, Object Oriented

MUD   Multi-User Dungeon

NASA   National Aeronautics and Space Administration

PHP   PHP: Hypertext Preprocessor

PLATO   Programmed Logic for Automated Teaching Operations

PROFCOM	Product Internationalization with Firm-Hosted Online Communities
TBRC	Technology Business Research Center
Web CMS	Web Content Management System
WELL	The Whole Earth 'Lectronic Link
WOW	World of Warcraft
WYSIWYG	What You See Is What You Get
ZMI	Zope Management Interface
ZMySQLDA	Zope MySQL Database Adapter
ZODB	The Zope Object Database
XHTML	eXtensible Hypertext Markup Language

1 INTRODUCTION

People have formed social relationships and communities for thousands of years. Industrialization and technological advance have reshaped this phenomenon within the last hundred years. Telephones and the Internet have made possible for people to build and maintain social relationships over a long distance. Communities have also seen the change. Nowadays traditional small close-knit community has an alternative, an online community accessible worldwide by using the World Wide Web. Whether the social dynamics of an online community differs from a traditional community, we can say that the both types of communities are made of people participating for the community's benefit.

Building a website or a web based social software from a scratch doesn't seem reasonable nowadays. Web content management system offers a framework which eases the development process and makes maintaining and updating process more standardized. As well as social software also Web CMSs are made for a variety of different purposes by using a variety of different solutions supporting sociality. Choosing the right Web CMS for the right purpose is important.

The purpose of this study is to investigate which technical characteristics a Web content management system must possess in order to provide a basis for a successful online community. Although social dynamics does play a big part in any kind of a community, whether it is a traditional offline or an online community, this thesis concern only to the technical aspects leaving the social aspects out. Any Web CMS or a social software can only provide tools to enable user's social experience. What user actually does with the tools provided is completely another matter. Nevertheless it also seems to be impossible to analyze a Web CMS by its possible social dynamics solely provided by community's users.

1.1 BACKGROUND

The beginning of twenty-first century has been the golden age for social websites. Wikipedia, Twitter, Facebook, YouTube and hundreds of other websites have enabled virtual places for people to socialize and build communities around certain subjects and goals. Successful online community is always a sum of many variables and it is impossible to predict which online community will succeed and which one will fail. This is one reason why online communities have been studied.

Research for online communities started around year 2000 when Preece (2000) and Kim (2000) published their books. At that time Kim was developing online communities and had noticed that there was no literature or guidelines how to establish and develop one. In year 2008, Technology Business Research Center (TBRC) started a project called PROFCOM (Product Internationalization with Firm-Hosted Online Communities) to study online communities. Goal in this project is to study how firm-hosted online communities can be utilized in firm's internationalization efforts. This project has produced master's and bachelor's theses concerning to different areas of the subject, but emphasizing to company hosted online communities.

1.2 RESEARCH QUESTIONS

Web CMS provides technical guidelines, frameworks and solutions for social software and then the social software makes the online community technologically possible. The first research question concerns whether it is possible to built online community using a Web CMS.

- Does a Web CMS provide all the functionalities needed for an online community?

The second research question concerns to the features a social software has to offer in order to provide basis for an online community.

- Which features does a social software have to provide in order that developing an online community is possible?

The last research question centers whether the chosen Web CMS will ultimately shape the online community.

- Does the Web CMS have an effect to the online community?

1.3 STRUCTURE OF THE THESIS

This study is divided into eight chapters. This first one described what does this thesis concern including research questions and the main structure of the thesis. Chapters from two to four consist of the theoretical part. The second chapter tries to identify online communities. The third chapter describes the concept of social software and its relation to online communities. The fourth chapter reveals the mystery of content management system and Web CMS. Chapters five and six describe the principles taken account in the analysis. The chapter five defines which Web CMS's technical parameters are analyzed. The chapter six on the other hand defines the social characteristics and which technical solutions are needed to provide a social practice. The seventh chapter contains the actual analyses of three Web CMSs, Drupal, Liferay and Plone. The last chapter, discussion and conclusions, studies the outcome of the analyses.

2 COMMUNITIES

Community doesn't have a clear definition and communities along with their definition have changed over time. The overall image people have about communities is positive and supportive, even though, communities have also a negative side, where people who are up to no good are networking and plotting against others. Similar to all communities, regardless whether they are open, secret, legal or illegal, is that a community is made of people who are interacting with each other in some manner. Since people and social relationships are important in communities it seemed natural to find out how the sociologists have defined this phenomenon. Sociologists have defined and redefined the concept for over sixty years and once some of them even concluded that communities don't exist anymore in modern urban societies (Wellman, 1982; Preece, 2000; Heller, 1989).

2.1 TRADITIONAL COMMUNITIES

First communities, tribes and small villages, were place-oriented and characterized by their physical features, such as size, location and their boundaries. People were more often born to the community rather than chosen to join it by free will. Communities were close-knit and communication between the members was mainly face to face (Haythornthwaite & Wellman, 1998; Wellman, 1997; Wellman & Gulia, 1999; Heller, 1989).

Urbanization along with the invention of telecommunication and modern transportation made sociologist rethink the concept of communities. The physical characteristics were no longer crucial parameters for defining communities. Modern communities don't require face-to-face communication and might exist only in virtual space, which are often referred as virtual communities. Therefore sociologists have considered that strength and nature of relationships between individuals are more useful basis for defining modern communities (Gergen, 1997; Jones, 1997; Rheingold, 1993; Heller, 1989).

2.2 ONLINE COMMUNITIES

First online communities were identified as virtual communities which would lead to the conclusion that these communities were not real. Later on the term online community became more used to describe communities which are located in the Internet. Online communities can be defined and categorized many different ways and some of those are presented in this chapter.

PLATO (Programmed Logic for Automated Teaching Operation) from 1973-74, Usenet from 1979 and The WELL (The Whole Earth 'Lectronic Link) from 1985 were the first online communities in the world. They all rely on text-based communication which made them seem unreal, even artificial for some people. Like the Internet and computers, first online communities were also only for tech-savvy people. Today things have changed and the Internet is everyday life (Eskelinen, 2009; Rheingold, 1993).

Kim (2000) have pointed out that online communities don't differ much from offline communities in terms of their social dynamics. People socialize with each other and develop social networks in both types of communities. Offline face-to-face socializing is limited to a certain time and a location, whereas online communities erase these boundaries making it easier to maintain social connections. Building new and maintaining old relationships using online communities can be done from a computer using the Internet without traveling anywhere. The internet's asynchronous nature makes it also superior compared to telephone which is mostly time dependent, synchronous communication. Not to even mention the variety of different methods of communication the Internet enables.

Kim (2000) also states that online communication offers a strange and compelling combination of anonymity and intimacy which brings out the best and the worst in people's behavior. The same phenomenon was also recognized when telephones became to our everyday life. People were rude to each other on the phone and also rude to the

operator whose job was to connect the calls. Whereas being rude in face-to-face could result a black eye or bloody nose, conversation on a phone or in the internet results usually only a bad mood (Kim, 2002; Martin, 1991).

2.3 DEFINING ONLINE COMMUNITIES

Online community as well as traditional offline community doesn't have a clear definition. This chapter contains two definitions and two classifications for online communities.

Preece (2000) claims that an online community consists of four basic elements:

- *People*, who interact socially as they strive to satisfy their own needs or perform special roles, such as leasing or moderating.
- A shared *purpose*, such as an interest, need, information exchange, or service that provides a reason for the community.
- *Policies*, in the form of tacit assumptions, rituals, protocols, rules, and laws that guide people's interactions.
- *Computer systems*, to support and mediate social interaction and facilitate a sense of togetherness.

Preece's definition for online community applies to a range of different communities:

- Physical communities that have become networked.
- Communities supported by a single bulletin board, a listserver or a chat software.
- Communities embedded in a website.
- Multiuser dungeons or domains (MUDs) and object-oriented MUDs (MOOs).

Physical communities that have become networked are communities where members are continuously communicating by using computer-mediated communication (CMC) channels and may periodically meet face-to-face. These communities can be hobby-based such as pet owners, collectors, football team and other group that socialize periodically at meetings, competitions, conferences and practices. (Lazar, Tsao, Preece, 1999; Schuler, 1996; Lazar & Preece, 1998)

"Communities supported by a single bulletin board, listserver or chat software" is a technical definition that centers to the social software which allows community to exist. Bulletin board, nowadays usually referred as a forum, is the most used social software to host an online community. Modern forums are embedded with a website and the messages are positioned or threaded along with a particular topic. Listserver relates to electronic mailing lists which aren't used that much anymore. A chat software such as Internet relay chat (IRC) allows people to interact with each other in real time over the Internet.

"Communities embedded in website" relates to web 2.0 concept, where website's users are bringing the content to a website. As we know, within the last 10 years many new websites which rely on user generated content have been founded. Wikipedia founded in 2001 and YouTube founded in 2005 are probably the most known web 2.0 websites the Internet holds. Also many older websites, such as Amazon, have adopted web 2.0 components which allow users to give feedback and review the products sold in Amazon.

Multiuser dungeons or domains (MUDs) and object-oriented MUDs (MOOs) are adventure games where players can wander around and talk to the other players. These text based virtual worlds were invented in the year of 1980. MUDs and MOOs are the ancestors for the fully graphical Massively Multiplayer Online Role-playing Games (MMORPGs). Whereas MUD could have as much as 100 users, MMORGs, such as World of Warcraft (WOW), have over 10 million players. The interface to the community is provided by a unique character called avatar, which allow user to interact in the community.

A multidisciplinary group of academics defined roughly ten years ago the following as five core characteristics for online community. (Whittaker, Issacs, & O'Day, 1997, p. 137):

- Members have some shared goal, interest, need, or activity that provides the primary reason for belonging to the community.
- Members engage in repeated active participation and there are often intense interactions, strong emotional ties and shared activities occurring between participants.
- Members have access to shared resources and there are policies for determining access to those resources.
- Reciprocity of information, support and services between members.
- Shared context (social conventions, language, protocols).

From this definition it is hard to find a difference between a modern offline and an online community. The characteristics can be probably found from any modern community. Conference and journal reviewers have also rejected papers because they felt that use of the term community had been trivialized (Preece, 2000).

Both of the definitions for online community mentioned above are ten years old and the Internet has changed rapidly in those years. Unlike then, today almost anybody in the western world has a mobile phone and a computer with an access to the Internet. This means that the use of the Internet isn't only for special groups with an interest towards technology and computers, but for everybody.

The technological advance within the last ten years have turned faceless and partly nameless chats into social software that allow users to share pictures, videos and audio with each other. This has resulted that mysterious people behind nicknames are nowadays sharing pictures and videos about themselves and therefore became less mysterious. Online and offline communities have become closer to each other.

Nevertheless, the Internet is still a full of online communities where users intently want to stay anonymous and being identified only by their nicknames. These communities can provide anonymous peer support for people who want to share information about a sensitive topic, such as certain illness. What online communities has made possible compared to traditional communities is the possibility for "complete" anonymity.

Whether the community is online or offline it is still made of people interacting with each other. Online and offline communities might differ many ways, but basic human behavior, motivation and psychology still applies to all of them. Therefore it might be best to let sociologists define communities.

2.4 CLASSIFICATION OF ONLINE COMMUNITIES

Online communities can be classified under many different criterions. One way of classifying online communities is by their purpose. Preece (2000) defines purpose as one of the four basic elements for online communities and Kim (2000) has also discovered that purpose is important in online communities. Eskelinen (2009) has studied the literature and collected the following types of communities when categorized by purpose.

- Community of Practice (CoP).
- Community of Action (CoA).
- Community of Interest (CoI).
- Communities of Circumstance (CoC).

An another way of classifying online communities is to use a typology by Porter (2004), which establishes two branches; Member-Initiated communities and Organization-Sponsored communities. This topology is illustrated in the figure 1.
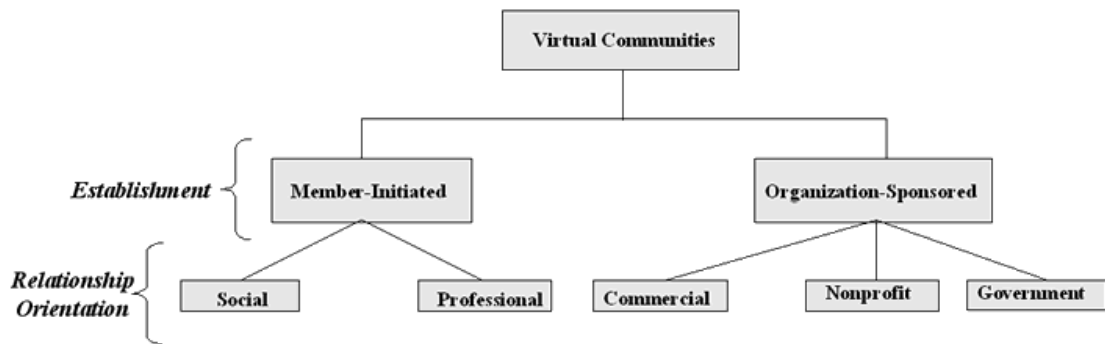
Figure 1. Topology of virtual communities (Porter, 2004).

In Member-Initialed communities, members are fully responsible of establishing and maintaining the community. Members also have the absolute power to administrate it even when it's hosted by some sort of an organization. The hosting organization doesn't pay any attention to community's purpose or goal. This type is further divided into social and professional communities. In Social communities, members share common interest to leisure activities, hobbies and other non-professional matter. Professional communities on the other hand centers to professional interests and include expert-based knowledge networks and student-based learning communities (Porter, 2004).

Organization-Sponsored communities are established for organization's benefit and administrated by the organization. Community's members (e.g. customers or employees) are considered as stakeholders for the organization sharing a part of the organization's mission and goals. Whereas Member-Initialed communities foster relationships only among members, in Organization-Sponsored communities relationships are fostered both among members and between individual members and the sponsoring organization. Three types of organizations were identified by Porter (2004); Commercial, Nonprofit and Government (Porter, 2004).

Organization-sponsored communities are also known as firm-hosted online communities. Basic idea behind these communities is to get company and consumer closer together so they can interact with each other. Consumer's direct feedback can be very useful for the company and since the best innovations always come from the consumer. Online community can therefore boost the company's product development. Also an existing interaction between a company and a consumer lowers the threshold for consumers to give feedback and share their innovative ideas.

In member-initialed communities, members are working for themselves and pursuing their own goals, but in organization sponsored communities they are a labor force for the organization. In commercial communities people can basically have one of the two roles: company's paid employee or a regular user. Employee's motivation to participate is of course financial, since he or she is getting paid for doing it. Regular users on the other hand have individual motives to participate and they don't benefit financially from the community or from the company. It is important to find how to reward people when they do something useful for the company. In some software development communities regular users are consumers of some product that the company produces. This also gives their motivation to make the product better (Antikainen, Väätäjä, 2008).

3 SOCIAL SOFTWARE

"The principle of social software is to break down the distinction between our online computer-mediated experiences and our offline face-to-face experiences" (Davies, 2002).

This chapter concerns to the concept of social software including the history, the applications and the relation to the concept of online community. For clarification, the term social software has two completely different definitions which should not be mixed. Praikh (2002) has suggested that term social software is used to describe computer programs that mimics human behavior by using probabilities and algorithms. The term social software is also being used to describe a software that makes Computer-Mediated Communication (CMC) possible, commonly, to allow users to interact with each other via the Internet. This thesis concerns to the latter definition.

3.1 THE HISTORY OF SOCIAL SOFTWARE

In 2002 the Internet had over 600 million users worldwide and was expanding to our everyday life and to our everyday social experience. The traditional concept of online community, which had problems already, didn't anymore fit to all the social experience that the internet holds. The internet had become the largest and most fully connected social network (Wellman, 2001; Davies, 2002).

Term social software was introduced in the early years of 2000. Blogs such as Weblog software was the first one considered as social software. This happen probably because blogs cannot be considered as online communities, but they still support sociality. Other existing inventions were quickly added to this new definition; email, bulletin board, instant message, online role-playing games and collaborative editing tools (Tepper, 2003).

In the last couple of years we have seen new kind of social software arise; websites supporting (online) social networking and building (online) identity. Websites such as YouTube, Facebook and Friendster are the newest social software inventions. Compared to old social software such as email and bulletin board most new ones don't rely only to text based communication.

3.2 SOCIAL SOFTWARE AND ONLINE COMMUNITY

The last chapter concerned to online and offline communities and it became clear that defining communities isn't easy and the definition has changed during time. Term community refers to human behavior and human sociality which is something that should let to psychologists and sociologists to define. The term online community has imbibed many technical aspects which don't belong to the definition of traditional offline communities. When we add the term social software to this equation, it takes most of the technical features from the term community and therefore suits better for technical analysis. The figure 2 describes the relation between human, social software and (online) community.
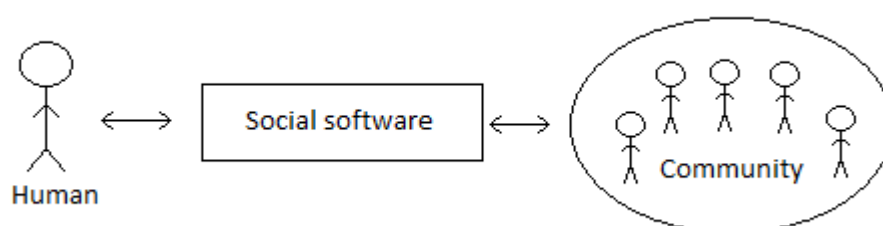
Figure 2. The relation of human, social software and community

Basically all online communities need a social software to exist, but social software doesn't always necessary provide an online community. For example a single blog doesn't really qualify as a community, but both, a forum and a wiki, can provide a basis for an

online community. One online community can also use multiple social software that support sociality. For example My Opera community uses blogs and forums.

My Opera community also provides connectivity to other social software such as Twitter and Facebook. When social software provides the possibility to combine different online communities together, it changes the concept of an online community completely. A new term called social networking has emerged to describe websites such as Facebook and Friendster. Online identity isn't any more limited to a particular online community, but is accessible to all users in the Internet. Compared to old online communities in social networking sites people don't hide behind nicknames, but instead appear with their own name and own picture. Online identity is then a continuum for offline or real life identity (Boyd, Heer, 2006).

Modern social software can enable social practice in many different ways. Since human face-to-face communication is much more than just words, basic textual computer-mediated communication (CMC) doesn't compete with a real social experience. Fast Internet connections and computers have made possible to implement textual, audio and video based communication to social software (Boyd, Heer, 2006).

This thesis centers to social software and doesn't concern that much about online community's life cycle, user roles or user interaction. Technical analyses are also easier to conduct to a social software than to an online communities. The idea is therefore to investigate social software.

3.3 TYPES OF SOCIAL SOFTWARE

Basically all applications that support social practice are considered as a social software. Davies (2002) has identified following types of social software, which are all studied more closely.

Table 1. Types of social software (Davies, 2002).

Software	Examples
Email	Outlook, Sendmail, Pine, Hotmail
Weblogs and Wikis	Movable Type, Blogger, Wikipedia
Messenger Systems	ICQ, MSN, Trillian
Document Editing System	Groove, Hydra, Lotus Notes
Group Diaries	Livejournal
Introducer System	MeetUp, Update, Ryze
Group discussion System	SmartGroups, BBS, Usenet

Note the absence of social networking sites. Social networking sites, such as Facebook and Friendster, are missing because those weren't invented yet in year 2002. Nevertheless, introducer systems and group diaries are similar to social networking sites.

3.3.1 Email

A lot of social software is a result of mimicking existing offline communication tools and email is doubtlessly one of these. Email was the first social software, but it wasn't identified as one until the term social software was invented. Compared to traditional mail, email is technically better and faster way to distribute information. Sending an email to one receiver or to one thousand receivers costs exactly the same.

As we all know, email is one-to-one communication and therefore doesn't qualify as a social software for an online community. Mailing list, which can be considered as an add-on to email technology provides one-to-many type of a communication. When email is sent to the mailing list it's resent to all list's subscribers. Whereas email doesn't qualify as a tool for online community, mailing list provides the characteristics which online community needs to function. Subscribing to a mailing list can be considered as joining to a community.

Although email is technically better and faster for distributing information compared to traditional mail, mail wasn't originally designed for a Computer-Mediated Communication (CMC). An email message can reach its destination in less than 30 seconds, which is impossible for a traditional mail. Mimicking older solutions too closely can cause problems. For example email lacks utilizing this remarkable speed advantage it has against the traditional mail.

3.3.2 Weblog and blog

Weblog, nowadays better known as blog, was the first social software identified when the term social software was invented. As we can see from the table 1, Davies (2002) has decided to put blogs and wikis in the same category. Although these software have some similarities, blogs and wikis are discussed separately.

Weblog was originally a web page with a collection of links to other web pages which the author found interested. Collecting interested links was considered as logging web pages, publishing a 'web log'. The author had to learn the HTML language in order to publish weblog, since there was no weblog software available at that time. In late 1999, Blogger and several other companies released a software which made weblog publications easier and available for everybody. It was the start for the revolution of the blogs (Blood, 2004).

As where the old weblogs were only collection of links, today's blogs are much more than just links. Blogs are used by individuals and organizations to publish information. Personal blogs can concern to everyday life, personal thought, to share a travelogue or it can be a journal that everybody can read and comment. Blogs can also concern to a particular interest such as hobby, art, food, work or anything at all. Organization blogs are used to promote new products, publish information about products and announce special events and so on.

Blogs are technologically pretty straight forward; users post small amount of text, usually less than one A4, pictures, links or other content to a website which everybody connected to the internet can read. The simple design makes it easy enough for everybody to use. Blog posts can be aligned by one after the other in a big web page or every post in a separated page. Newest post is usually shown first to the reader. The author can also receive a feedback from the readers. Usually the readers can comment blogger's post and the blogger can comment to the comments.

3.3.3 Wiki

The name wiki comes from a Hawaiian word wikiwiki which means quick or hurry. Quick and hurry describes wiki well, since the new content is published instantly and the content is produced in an easy manner. Blogs share common characteristics with wikis; both allow users to publish something quick and they are both easy enough to be used by everybody. Biggest difference between them is that wiki is a collaborative tool with good editing capabilities, whereas blogs are more personal and blog posts aren't usually meant to be edited afterwards. Both of the social software are also popular among the internet users (Ebersbach, Glaser, Heigl, 2004).

The First wiki was developed in 1995 by Ward Cunningham. His idea was to develop a new word processing tool which would suit better for programmers. The goal was to build

a software which would make sharing a program code easy and quick. This would enable the possibility for collective work on program codes. Since the same document can be edited by many people, the software have to keep automatically track of all the changes made in documents along with the complete traceability of document's history (Ebersbach, Glaser, Heigl, 2004).

Even though Wiki was originally designed for programmer's needs, it's nowadays widely used in social websites where the content can be edited by everyone. Wikis and blogs have many technological advantages compared to traditional web publishing. As where traditional web pages are first written in html locally and then transferred into a web server via the File Transfer Protocol (FTP). Wiki and blog pages can be instead created and edited with a web browser. Wiki's own special markup language is easier to adopt and faster to write compared to Hypertext Markup Language (HTML). Lastly, the good traceability of the document history ensures that the community can evaluate every edit and if necessary, restore of the any older version of the document.

Today the Internet is full of Wikis concerning to a variety of topics. Wikipedia, the free encyclopedia, is the best known of them all. An average Wiki is free to use and edit and built with a voluntary work. Even though Wiki doesn't provide a chat or any other face-to-face discussion tools, wikis have online communities which purpose is to manage the Wiki's wellbeing and guide people how to contribute.

3.3.4 Messenger systems

Messenger systems are today better known as instant message (IM). IM systems are usually used in one-to-one communication, even though they do support group interaction. The typical characteristics of an IM system are that the messages are short and the interaction is fast and done in easy manner. In home, IM can be used to connect with love ones just for general socializing and casual talk. IMs are also used in office to connect with

co-workers. It doesn't provide an online community, but it can be used as a communication tool. Compared to email, IM offers brief, fast and more informal way to communicate. IM is more interactive than an email, but less interactive than a phone or a face-to-face conversation (Nardi, Whittaker, Bradner, 2000).

ICQ was a pioneer in messenger systems by launching their product in 1996. In year 1999 when Microsoft launched their competing IM called MSN Messenger, ICQ had over 40 million registered users. At MSN Messengers tenth birthday in year 2009, the service had more than 330 million active users every month. IM, just as a email, have found their place even through new websites are taking some of the users from these older technologies (ICQ 1999; Microsoft, 1999; Microsoft, The Windows Live Messenger Team, 1999).

Many new social software can be used with a web browser, but IM requires a program to be installed into a computer or a mobile phone. IM application is usually bounded to certain network. For example with an ICQ application, a user can only communicate with other ICQ users. MSN Messenger works exactly the same way; user with a MSN messenger cannot contact anyone using ICQ. IM programs have a buddy-list which indicates who you can connect with and are they online at a particular moment. New buddies can be added and old buddies deleted from the list. Users usually don't send messages to unknown recipients and seek for new buddies.

3.3.5 Document editing system

Microsoft Groove and IBM Lotus Notes are commercial heavy weight software for industrial use. The main purpose of these software is to optimize collaborative work inside the company. The software offers solutions and principles which are found from other social software also. Since the document editing systems presented here are commercial and complement of a variety of social software technologies, the specific introduction is left out.

3.3.6 Group diaries

Davies (2002) has identified group diaries as one type of a social software and more specifically introduced a social software called LiveJournal as an example. LiveJournal is a community-centered blogging service which offers the standard blogging capabilities and an additional tool for social networking and community building. LiveJournal resembles social networking sites since it allow users to create groups, identify friends and socialize in other ways also than just with writing a blog. Livejournal doesn't offer new social software in terms of inventing a new way to communicate in the Internet, but instead uses a complication of already existing technologies to a provide social software for an online community.

3.3.7 Introducer system

Introducer systems and social networking sites (SNS) go hand in hand. Ellison and Boyd (2007) have defined social network sites as web-based services that allow individuals to

- Construct a public or a semi-public profile within a bounded system.
- Articulate a list of other users with whom they share a connection.
- View and traverse their list of connections and those made by others within the system.

The definition applies to most of the introducer systems also. The idea behind this concept is to introduce new people together and allow them to socialize with each other. People have different motivations to search new people and the social networking sites are also built for different uses, purposes and users. Ryze was founded in 2001 to help people to leverage their business networks. Ryze allows users to create networks also known as groups where other users can join and have collective discussions. Meetup, which was also

founded in 2001, allows people to create groups concerning to any topic or interest they might desire. The idea differs from Ryze slightly, since in Meetup people, who share something common, are also intended to meet face-to-face. These groups or networks can be considered as online communities (Nicole, Boyd, 2007).

Online dating services can be considered strictly as introducer systems, since they don't provide an online community or any communal features which are common in social networking sites. The idea in online dating services is of course to introduce new people to each other based on the personal information they have provided to the software. People join to these services with an objective of developing a personal romantic relationship.

It is hard to define the difference between group diaries, introducer systems and social networking sites. They all use similar kind of software solutions. All are accessible by a web browser and doesn't require user to install anything into a computer. Online identity presented by a user profile page is also a common feature. In some services, the user profile page is more important than in others, but in order to participate properly, users must take the time to create a proper user profile page. The differences come when we look the purpose why do people participate in a particular community and what is their individual goal in it.

3.3.8 Group discussion system

Group discussion systems involve different kind of technologies which allow users to discuss with each other. Davis (2002) have defined three social software to describe group discussion systems; SmartGroups, BBS and Usenet. Today, only Usenet is still operating from these three systems, but the popularity of Usenet is declining. Lack of moderating, user identification and the possibility to build a community are Usenet's disadvantages compared to modern a social software (Miller, Riedl, Konstan, 1997).

Bulletin Board System (BBS) is a paragon for a Web-based forum. Forums provide basic user and group interaction. Users are allowed to send private messages to each other, but also to create threads and post messages to them. Posts are usually displayed in chronological order and different threads are concerning to different topics. There are many free forum software available in the Internet which are easy to install, maintain and use. Forum's simplicity and sufficiency for providing an online community have made it the most used social software for an online community. Many organization-hosted online communities use forum as its primary social software.

3.3.9 Summary

Davis (2002) have found and identified a bunch of different kind of social software. Some of those are already old and discontinued, and some new, such as social networking sites, are taking their place. Group diaries, introducer systems and social networking sites share similar features. It is not uncommon that in a social networking site users can find new friends or that users can write blogs as a group.

The current trend is to combine a variety of existing social software technologies together. Nowadays social web sites, such as Facebook and My Opera, are combination of a variety of different social software which allows users to write blogs, send messages, share pictures, comment and build social networks and so on. Some social software even allow different online communities to be linked together so that the users can use a social software provided by another company inside the online community.

4 CONTENT MANAGEMENT

"Content management system (CMS) is not a CD-ROM that you install, start, and forget about. Rather, it is an ongoing process of knowing your information and your audiences and how to match the two in a set of publications." (Boiko, 2005)

Content management is truly a wide concept, which usually relates to web and computer environments, although content management can also exist in offline. Basically content management system is about managing a flow of information or content collected, stored and published in a certain agreed manner. In this thesis we are interested about computerized web content management. To understand content management we have to first understand the concept of content.

4.1 CONTENT

Generally content can be defined as something that is stored digitally; text, video, audio, pictures, and so on. At least in web content management systems and other modern systems, functionality is also considered as content which can be stored as data. Content has also more profound definition which clarifies why content is important and what are the special characteristics content possesses. Understanding the purpose of content will ultimately reveal why content management is necessary in modern information industry and in modern websites.

Content is a combination of information and data. Data, such as "five" and "apple", are something that is for computers to process and storage. People find pure raw data useless. Data can be refined to information by giving it a meaning. Information, such as "a basket contains five apples", is something that humans can understand, but computers cannot process. Since humans understand only information and computer can only process data, we have to make information appear as data without losing its meaning. This can be

achieved by adding a layer of special data called metadata around it. When we add metadata to information it becomes content, which enables computer to organize and systematize information's collection, management, and publishing. Successful content management system allows computer process and storage information as data without losing the interest and meaning of the information along the way. Although adding metadata to information makes it content which computer can process, it still is significant what kind of data we add. When correct data is added, the outcome is information with purpose, content (Boiko, 2005).

Boiko (2005) have discovered that content has a format and a structure. This probably doesn't come as a shock to anyone since in computers everything has a format. Two types of format have been identified: a storage format and a rendering format. Content is stored in a storage format and displayed in a rendering format. Typical storage formats are JPG and GIF for web pictures and ASCII and Unicode for text. Rendering format concerns on how the content is presented. This guarantees that the content is presented in a format as that it was intended by its author. In text this means a variety of typographic qualities as such bold, italic, underline, color, margins and so on. This is done by adding metadata to the file which isn't shown on the screen, but instead used by the application to determine how the content should be presented.

Structure and format are both important factors in content management. Whereas the format is about presentation, the structure is about management. Without understanding the format, content cannot be retrieved from a database and processed and therefore presented as information. Without a proper structure the correct information is hard or even impossible to find in a reasonable amount of time. Structure divides large qualities of information to smaller chunks and which are therefore easier to manage. Structure enables access to the different chunks of information in well formatted content. Information about a document, such as author, topic, date, and version, are common characteristics in most documents. When the content is well structured, it is easy to retrieve certain document or certain information based on a given parameters such as an author or a topic (Boiko, 2005).

4.2 WEB CONTENT MANAGEMENT SYSTEM

The figure 3 presents the structure of a typical web content management system. The structure, created by Micam (2009), consists of three sections and it follows the guidelines from Boiko (2005). The collection system is responsible for collecting and bringing new information to the system. New information can appear in a variety of different formats which has to be inputted in a correct manner. The management system consists of database which holds all the content and other essential information about the content management system. It includes user profiles, data about how the content can be processed, log files and other technical data used by the system. The publishing system's job is to generate dynamic web pages from the data retrieved from the database corresponding on the user's actions. Although figure 3 presents a Web CMS, offline publications such as printouts, books and magazines are present (Micam, 2009).
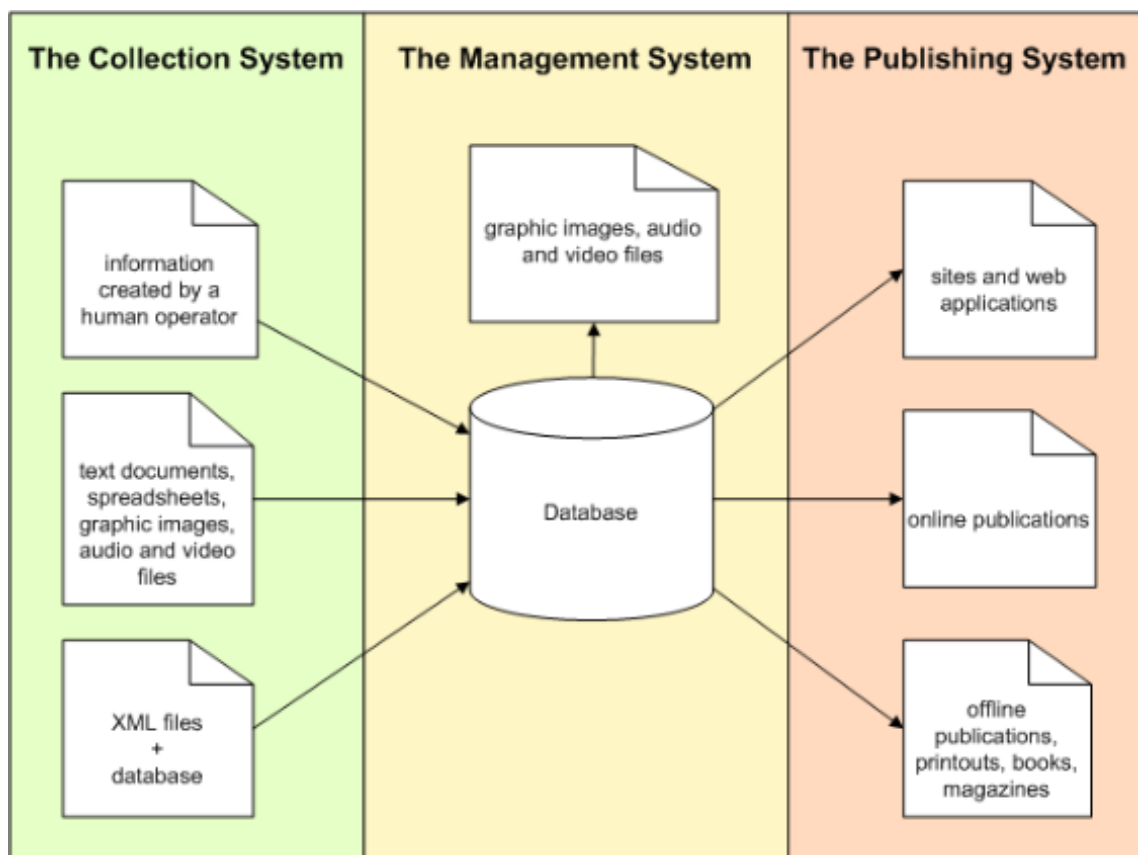
Figure 3. The Structure of a Web CMS (Micam, 2009).

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4.3 CONTENT MANAGEMENT IN DYNAMIC ENVIRONMENT

In traditional static websites, the same content or page is shown to every visitor. The content of a web page is either wrote directly to the HTML page or published as a HTML page using a content management system only when webpage needs an update. Nowadays the static websites have moved to history making room for the dynamic websites. The Dynamic web pages are generated separately for every visitor and the content is stored in databases. This phenomenon has made possible new functionalities such as user identification and user interaction in websites. All web-based social software and other web sites, where user can affect to the web pages content, are must be dynamic.

Whereas the content management makes it easier to manage content in static web pages, in dynamic web pages the use of a web content management system is basically mandatory. Building and maintaining dynamic database-centered websites are almost impossible or at least too time and resource demanding without a use of a Web CMS. Also all dynamic websites need at least some sort of content management for storing and processing user input. Modern Web CMS is designed for handling the content in dynamic web pages and luckily the internet is full of commercial and free content management systems for both, small and large web sites.

Modern web content management system and Boiko's (2005) definition of content management system differs from each other. Boiko (p75-76, 2005) doesn't recognize database-centered dynamic web environments as a part of a content management system. This means that static and dynamic web sites are published in same manner and have same characteristics whereas the only difference is in the functionality of a web-application itself. This approach can be also seen from figure 3. To make things even more complicated, Web CMSs are identified with other terms as well. For example Drupal, which is widely used Web CMS, states itself as an open source content management platform instead of content management system. Another term, content management framework, is also identified. Our example, Drupal, is identified as all of these three.

It is safe to say that a modern Web CMS is more than just a regular content management system. Whereas a traditional content management system only covers the sections for content collection, storage and publish in general manner, a modern Web CMS also offers special features, such as user account management, WYSIWYG-editors and built-in web-application components which provide dynamic web site's functionalities. In this thesis we are interested about dynamic web pages, social practice and user generated content, which means that the three sections identified isn't enough. It doesn't give us a clear image how dynamic web pages and user interaction shapes the system. In order to understand this we have to observe a typical dynamic website in its technical level.

4.4 STRUCTURE OF A DYNAMIC WEBSITE

Figure 4, which is partly adapted from Boiko (2005), presents basic essential technical parts required for a modern dynamic web site. Starting from the left, the content is stored in a database as in any content management system. The connector code runs on the web server providing access to database and it is responsible for creating the dynamic web pages in real time. The connector code is written with a programming language such as Hypertext Preprocessor (PHP) and JavaServer Pages (JSP) which are suitable for creating dymanic web pages. The web server's purpose is to serve these dynamic web pages to the users. The last component, the user browser, is user's interface to the website, which ultimately presentates the requested web pages to the user.
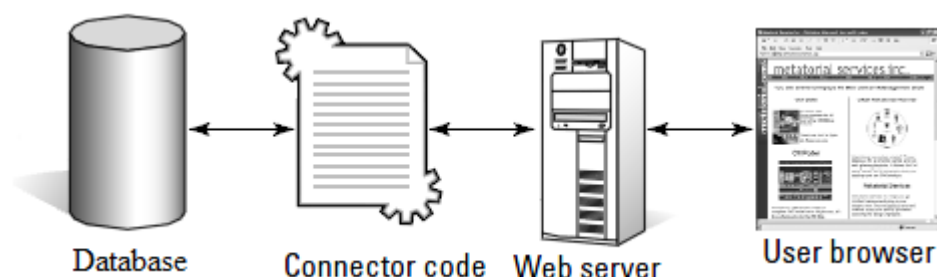
Figure 4. Technical view of dynamic web site (Boiko, 2005).

Database and Web server software doesn't affect much on how the dynamic database-centered web-application operates. The important part is the connector code where the functionality lies. When using a Web CMS, the connector code is built using the functionalities provided by the Web CMS. Connector code controls how and what kind of content it takes from database and process. It also concerns to how the content is presented to the user. This means that the Web CMS plays a big part in the web site's functionality and it also determines which features can be implemented and which has to be left out. Therefore choosing the right one from a variety of different available solutions is important, although it doesn't have much to do with the original purpose of content management system.

5 CHOOSING A WEB CMS FOR ANALYSIS

The internet is full of different Web content management systems for different purposes. Choosing the right one might evolve to a problem. In this thesis we are centering to five principles which typically has to be taken account when choosing a Web CMS.

- Web CMS's designed purpose
- Platform
- Database
- WYSIWYG (What You See Is What You Get)
- Web CMS's license

5.1 WEB CMS'S DESIGNED PURPOSE

Web content management system limits what kind of web sites it can be used to produce. This means that different Web CMSs are designed for different kind of web sites and selecting the correct Web CMS is important. Since this thesis concerns to social software, it is important that selected CMSs support social practice and are well known for their implementations towards sociality.

5.2 PLATFORM

The programming language of a Web CMS defines the platform where the Web CMS functions. Even though it is a big decision to select suitable platform aka programming language, it doesn't necessary limit what kind of web sites it can be used to create. Sometimes it is even impossible for a user to know which platform or which Web CMS

has been used to develop a certain website. Nevertheless, for the developers and administrators Web CMS's platform is an important matter.

Some Web CMS only provide functions and guidelines for developer's help, which means that developer has to build web pages using the same programming language. Others might provide tools, such as built-in editors, which allow developers to create web pages more easily. These editors usually refer to What You See Is What You Get (WYSIWYG) concept, which helps developers who don't understand much about programming languages to develop web pages. Even so, not everything can be done with a built-in editor. Understanding the platform and knowledge about the system is still required when customizing and maintaining the Web CMS.

The five most used platforms are Java, Microsoft ASP.NET, Perl, PHP and Python which all have their pros and cons. A Web CMS is always tied to one particular platform, which means that choosing a platform limits the number of Web CMS candidates. Nevertheless, it is essential that people who are working with the Web CMS and builds the web site understands the programming language. The plan is to choose at least one Web CMS from each five platforms for analysis if possible.

5.3 DATABASE

As already stated, every Web CMS need to have a database. The database isn't usually built-in to a Web CMS, but provided by a third party company. Database also doesn't affect to the functionality of Web CMS and it is therefore safe to select any supported solution. This is probably the reason why a majority of Web CMSs prefer only one particular database solution, even though the Web CMSs usually support multiple database solutions. Web CMS produced for java platform often prefer PostgreSQL database, where as PHP based solutions favors MySQL for its database. Both solutions are similar to each other and usually it doesn't matter much which database to use. In some cases, for example

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if a company already has databases, it might affect which database and ultimately which Web CMS is chosen.

5.4 WYSIWYG

The term WYSIWYG comes from words What You See Is What You Get and it pretty much describes the concept. WYSIWYG allows non tech-savvy people to create web pages without the understanding of programming languages. Web pages are built as it shows on the screen without writing even a one line of program code. This obviously doesn't have anything to do with the basic concept of content management system, but many Web CMS offers these web page editors to ease web pages building process.

5.5 WEB CMS'S LICENSE

Software license is the last issue which has to be taken account when choosing Web CMSs for analysis. Licensing issues were already discussed in platform, where it was discovered that the Microsoft ASP.NET platform has a proprietary license. It was also already discovered that the four remaining platforms, Java, Perl, PHP and Python are free. Nevertheless, all the five platforms have Web CMSs both with commercial and with free licenses.

In some cases it is possible for a platform to possess a proprietary license, but the Web CMS designed for it is free. A Web CMS called Umbraco, which is built to Microsoft APS.NET platform, is a good example for this. However, using Web CMSs designed for platform having a proprietary license is impossible without the license for the platform itself (Umbraco, 2010).

Most of the Web CMSs are open source and free to use. For this reason this study favors open source solutions. Open source solutions are also easier to customize. Analyzing commercial solutions with no budget could turn out to be impossible, even though there are no intentions to actually install and test the Web CMSs in this study. Most of the solutions with a proprietary license use Microsoft ASP.NET platform.

For choosing a Web CMS with a proprietary license to gain support and warranty isn't needed. Although the free solutions don't come with a warranty, it is possible that the Web CMS's developer sells technical support, a hosting and a consulting service, and also hosts training events. Open source solution can therefore be as reliable as any solution with a commercial license.

6 DESIGN PRINCIPLES FOR WEB BASED SOCIAL SOFTWARE

Today's social software lies on a web site. Social software, such as Facebook, YouTube and My opera, are all accessible from all over the world with just a use of a web browser. Easy access combined with the independency of operating system and hardware has made web-based application superior compared to traditional social software, such as instant message, which had to be installed to a computer. This chapter will clarify what kind of features a web site must possess in order to be qualified as social software. Later on, these features will be searched from the selected Web CMSs.

6.1 A DESIGN FRAMEWORK FOR SOCIAL SOFTWARE

As already discussed, any social software must allow its users to interact with each other in some manner. Therefore, social practice is obviously the most important feature for social software, but there are also other features that must also be taken into account. A design framework for social software presented in "The realm of sociality: notes on the design of social software" provides guidelines for which features a proper social software must possess.

The design framework, presented in table 2, consists of four design domains (Bouman, Hoogenboom, Jansen, Schoondorp, Bruin, Huizing, 2007).

- The realm of enabling practice
- The realm of mimicking reality
- The realm of building identity
- The realm of actualizing self

These realms are considered as important and which have to be taken account when designing a successful social software. All four realms presented above are then divided into four design elements.

- *Design criteria* defines the domain which a certain realm concern
- *Design principles* indicates what has to be achieve
- *Design parameters* indicates how it can be achieved
- *Design dilemma* concerns to what problems are pursuing of a certain goal cause and how to deal with it.

Table 2. A design framework for social software (Bouman, Hoogenboom, Jansen, Schoondorp, Bruin, Huizing, 2007).

Design Domains	The realm of enabling practice	The realm of mimicking reality	The realm of building identity	The realm of actualizing self
Design Criteria	Economic criteria Use, purpose, value	Empirical criteria Empirical reference ability	Social criteria Trust, connectivity, identifying with, trajectories	Individual criteria Love, social needs, esteem, cognitive needs, aesthetics
Design Principles	Supportability Social software needs to be designed in such way that a (possible) social practice is supported	Alignment Social software needs to be designed as a real life social experience with valuation, rating, individuation, repudiation	Belonging Social software needs to be designed to support identity and group information	Discovery Social software needs to be designed to help people explore new territories, and in that way help develop one-self
Design Parameters	Practice Facilities of engagement and imagination	Metaphor Metaphors of engagement, alignment and imagination	Presentation Conversational interaction, social feedback, social network	Feedback Guided exploration sharing
Design Dilemma	Creating new practices while economizing on old ones	Finding new ways, words and worlds without losing reference ability	Balancing between factual and self depiction	Balancing between the known and unknown

6.1.2 The realm of enabling practice

The realm of enabling practice argues that the use, purpose and value are important factors in social software. To support this theory they state that users will ultimately value social software if it enable or create practices that play a certain part in their social life (Keiser et al, 2007; Lesser and Strock 2001; Russel et al. 2001). It is not enough that practices exist, users also has to know how, why and when to use a certain social software or practice. Any social software must therefore have its use, purpose and value clearly presented in both software functionality as well as user communication (Bouman et al, 2007).

Design principle states that any social software needs to be designed in such way that a (possible) social practice is supported. To archive this, the social software must support mutuality such as have virtual places and spaces, joint tasks and things to do together. It should be obvious that any social software must support social practice, since only then it can play a certain part in user's social life and ultimately to be useful for its users (Bouman et al, 2007).

In this thesis, all selected Web CMSs will support sociality in a way or another. But since the analysis doesn't concern to actual social software, but to Web CMS and its components, some of the principles cannot be taken into account.

6.1.3 The realm of mimicking reality

The realm of mimicking reality states that any social practice must have an empirical reference. Social software is only a tool which enables the social practice between human begins. Therefore users will find social software and the social practice it provides appealing and easy to adopt when it mimics real life social experience. Using metaphors and logic from real life to help users to understand functions and practices don't limit only to social software, but is widely used in all kinds of user interfaces (Bouman et al, 2007).

The realm of mimicking reality concerns also to valuation, rating, individuation and repudiation, which are all known from real life social experience. This means that social practice concerning to face-to-face or group discussion doesn't provide all the characteristics concerning sociality. There are areas which cannot be achieved only by enabling people to discuss with each other. For example Amazon and other modern web stores allow people to comment and rate products which they sell (Bouman et al, 2007).

6.1.4 The realm of building identity

Identity and sociality go hand by hand. It is not enough if people can socialize with each other, they must also be able to create social bonds. Wegner (1998) has concluded that identities are based upon trust, persistency and the ability to present a desired image of self within the social environment. Also identifying the partner in a conversation is mandatory for the continuance of the social relationship. If the participants of certain social interaction cannot identify each other, it is impossible them to socialize later on. This will result that no trusts can be achieved between the participants. Therefore social software must provide ways which help user to identify other members in the community.

In social networking sites, user profile page enables user to build online identity. Users are allowed to express themselves trough profile pages by publishing personal information and information about their social network. Identifying friends is also one way to build identity. User profile pages and identity building concern deeply to the Web CMS's capabilities to handle information related to user accounts. Therefore these capabilities are searched from the selected Web CMSs.

6.1.5 The realm of actualizing self

Maslow (1943) has stated that people's ultimate social need is to actualize self. This means that any social software should be built in a way that it helps its users for their quest for self-fulfillment. This is achieved by allowing people to encourage and give feedback to each other. Positive feedback from the community helps its members to build their self-esteem. On the other hand, the possibility to give negative feedback enables community's members a tool to build social pressure towards unwanted behavior inside the community (Bouman et al, 2007).

In the realm of actualizing self, the analyzing therefore doesn't concern to general social interaction, but especially for user's capabilities of commenting others' contributions towards to the community.

7 THE ANALYSES

This chapter contains the analyses of three Web CMSs. The analyses concerns to three different sections, to the overall image about the system, to the technical characteristics of the system and to the design principles of a web based social software. The overall image concerns to the documentation and clears how the Web CMS is installed, maintained and used. The technical characteristics centers to the Web CMS's designed purpose, platform, database support, WYSIWYG-editor and licensing, whereas the design principles are for understanding the social characteristics related to social software and online communities. The technical characteristics were introduced in the chapter 5 and the introduction to the design principles is found in the chapter 6.

The web content management systems chosen to this analysis are Drupal, Liferay and Plone. They all use a different platform and were originally designed for a different purpose. All three Web CMSs have also recognizable features for supporting sociality. Choosing Web CMSs from different platforms for the analyses was done to guarantee the variety between them. It was also important that selected Web CMSs support at least some features towards sociality and communities, because choosing a Web CMS which doesn't support sociality at all would be a waste of time. The Web CMSs analyzed in this thesis all offers at least an online community for the product's developers and users.

7.1 DRUPAL

The first web content management system to be analyzed is called Drupal. This Web CMS is used by many Fortune 500 companies such as General Motors[1], Nokia[2], Nike and Intel[3], and a great number of governmental websites including National Aeronautics and Space Administration (NASA) and The White House. News services Reuters and CNN plus universities such as Duke and Stanford are also using Drupal, and therefore Drupal has well earned its place to be analyzed first.

Originally Drupal was based on a social software called Dorp, which was designed to help a small group of people to interact with each other. The members in Dorp were allowed to leave messages to each other and to announce general everyday information within the community. Dorp, established in the year of 2000, quickly evolved from a simple closed intra community to a public social software offering a variety of different social practices. The first version of Drupal was released in January 2001 (Drupal History, 2010).

Drupal uses a modular approach, which allows designer to add and remove functionalities according their needs. Since Drupal is open source and community oriented Web CMS, the designers are allowed to create their own modules and share them in Drupal's website. Even though modules solely make website building easy in large teams, layers, each concerning to a different task makes it even more scalable. The figure 5 illustrates the five layers of Drupal: data, modules, blocks & menus, user permissions and template (Drupal Overview, 2010).

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[1] http://www.gmexpo2010.com/
[2] http://research.nokia.com/
[3] http://appdeveloper.intel.com/
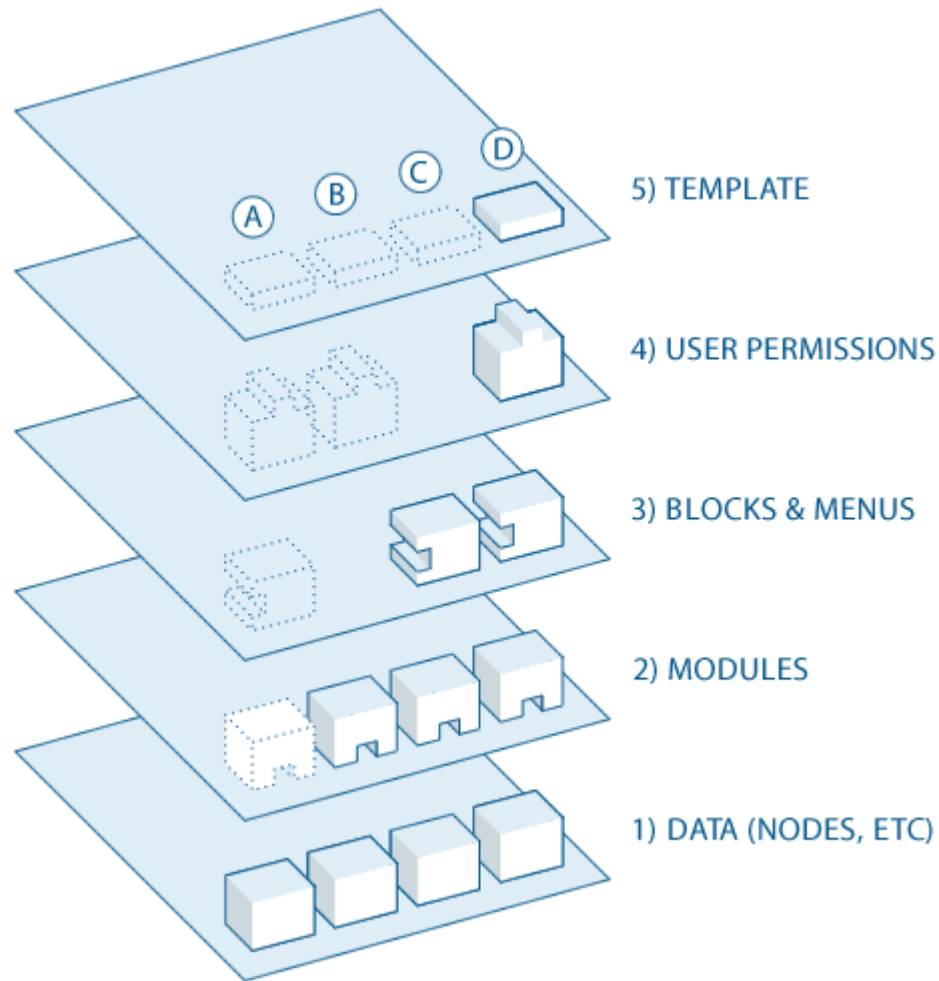
Figure 5. The Drupal flow (Drupal Overview, 2010).

The first layer contains all the data of a website. This data is stored as a bunch of nodes where every node holds a data of a single web page, a blog post or a news item. Node defines data's structure and for example a blog post can consist of a data structured as title, content, author and date. When data is properly structured, it can be easily processed by a computer and reused for any additional purposes. As we know, data structure is one of the content management system's main principles (Drupal Overview, 2010).

The second layer contains modules which provide all the functionality. The modular approach enables designers the possibility to leave unwanted functionalities out and take only those which are needed for the website. Drupal contains some mandatory core modules which provide the basic functionalities of the system. In addition, many modules

providing a variety of different functionalities created by Drupal team and volunteers are available for designers to use in their websites. Since Drupal is open source, all modules including the core modules are customizable, although customizing a well-tested core module is not recommended (Drupal Overview, 2010).

The third layer contains blocks and menus. Block takes raw input from module and provides a refined output to the web page. Block in conjunction with a used template from fifth layer determines where in a certain web page module's output is published. It is also possible to limit which pages or which users certain refined output from a module is shown. Menus work similar compared to blocks. Users are allowed to modify or even create new menus, which can be placed to a web page same way as blocks (Drupal Overview, 2010).

The fourth layer handles the user permissions. Website needs user permissions in order to operate reasonable. Every user is not able to neither access to every page nor use all the functions provided by the system. Therefore system needs to determine which users can access to which modules and which web pages. Certain permission to use a certain module and its functionality is associated with a certain roles. Users are then also associated with a certain roles and thereby they are granted the permission to use certain functionality (Drupal Overview, 2010).

The fifth and last layer is template. The output generated by a template using XHTML, PHP and CSS is the complete web page shown to users. PHP tokens are used to create the needed dynamic content provided by the modules. Templates also include a set of functions that can be used to override standard functions in the modules and therefore gain control over how module outputs markup to higher layers. Templates ultimately determine what is shown to which user and where in the web pages it lies (Drupal Overview, 2010).

7.1.1 The technical parameters

The left side of the table 3 contains the technical parameters, which have to be taken account when choosing a Web CMS and the right side presents the finding concerning Drupal. These technical parameters were already introduced and explained in chapter 5.

Table 3. The technical parameters of Drupal.

Web CMS's designed purpose	Originally for social software
Platform	PHP
Database	MySQL, PostgreSQL
WYSIWYG editor	Module by 3rd party
Web CMS's license	Open source

The first principle to be taken into account is Web CMS's designed purpose. Drupal was originally developed from a social software which indicates that social practice is well supported. Although Drupal has changed a lot from early years, the general building blocks for social software such as blog and forum are still present. Drupal should be a working Web CMS for more traditional websites as well as for a modern dynamic social websites.

As already stated in chapter 5, Web CMS's platform is important. Table 3 states that Drupal uses PHP platform. When looking at Drupal's history, PHP programming language seems an obvious choice. PHP is open source and easy to adopt which has lead to that many originally small non-organizational and non-commercial websites are created by using it. Dorp and later Drupal is no exception (Drupal system requirements, 2010).

Database is an essential part in a Web content management system as well as in a dynamic website. Drupal supports two different database solutions, MySQL and PostgreSQL. The support to both of these databases comes from the PHP platform. Initially MySQL was the only database supported by PHP until PDO (PHP Data Objects) database extension was introduced (PHP Data Objects, 2010; Drupal System Requirements, 2010).

WYSIWYG (What You See Is What You Get) editor allows people to create web pages as they appear in screen directly without knowledge or usage of any markup or programming language. These editors are made to help non tech-savvy people to create web pages. Drupal doesn't have a built-in WYSIWYG editor, but one can be installed as a module (Drupal WYSIWYG editor, 2010).

Licensing issues concerns to three different areas: platform, Web CMS and database. PHP programming language is free to use for non-commercial and commercial solutions without any restrictions. Drupal is licensed under GNU GPL (General Public License) and is therefore open source and free. Both databases supported, MySQL and PostgreSQL have similar licenses which allows databases to be used without any financial compensation. As a conclusion we can say that Drupal and its components are free to use (PHP License information, 2010; Drupal Licensing FAQ, 2010; PostgreSQL License, 2010; MySQL Legal Policies, 2010).

7.1.2 The design principles for web based social software

Design principles for web based social software consist of four realms, enabling practice, mimicking reality, building identity and actualizing self, which were all already introduced in chapter 6. As we know, Drupal uses modular approach which means that every solution is a module which can be added or removed from the system according to designer's decision. When analyzing social characteristics provided by Drupal, we have to search and analyze modules which provide the functionality.

7.1.2.1 The realm of enabling practice

The realm of enabling practice concerns to facilities of engagement, alignment and imagination. Drupal offers a variety of different ways for users to socialize with each others. Most common implementation, the discussion forum, is well supported with at least three different solutions. Advanced Forum module is based on Couleen Region forum which offers basic functions needed for forum. phpBBforum Integration module on the other hand is based on one of the world's most used forum application called phpBBforum. phpBB claims that there are more than a million installations worldwide. Third solution found, OG Forum, specializes to group forums.

Even though forum can be considered as a basic tool for providing social practice, there are other solutions present as well. Blogging is another popular method for socializing over the internet. Advanced Blog module offers blogging capabilities for Drupal systems. For more instantaneous communication Drupal has to offer chat rooms via module called chatroom. Wikis are also considered as social software although they don't directly mimics face-to-face or group communication. Wikitools module offers wiki application. Since Drupal offers more than five thousand different modules, there are probably other modules supporting social practice as well.

7.1.2.2 The realm of mimicking reality

Whereas the realm of enabling practice concerns to facilities for supporting social practice, mimicking reality is about how these facilities are made appealing to users. Social software must mimic real life social experience in order to appeal its users and the realm of mimicking reality therefore concerns to mechanisms and metaphors from ordinary life. All functions supporting sociality in Drupal are more or less borrowed from original solutions and therefore analyzing these modules more closely for metaphors from ordinary life don't seem reasonable.

Facilities of social practice only enable a part of social experience. Validation, rating, individuation and repudiation are common social activities which don't necessary involve direct communication. Drupal offers a variety of different modules for voting and rating such as Fivestart, Voting API and Vote Up/Down. These modules mentioned can be used to rate and vote almost anything the designer has in mind.

7.1.2.3 The realm of building identity

The realm of building identity refers to the mechanisms that allow users to presents one or many images of self to the community. User profile pages are designed for this kind of purpose. Drupal offers Advanced Profile Kit module which allows users to create profile pages well known from a variety of social networking sites available in the internet. Blog, which were already mentioned in the realm of enabling practice, fits also to this domain. Modern blogs are made to publish personal information such as desires, opinions and other things about self.

Social networking is popular activity at least in the western world. Defining identity also concerns to defining social relationships. Today Facebook is the biggest social networking site which relies to this phenomenon. Drupal offers user relationships module which in conjunction with another eleven modules allow users to identify a variety of different types of social relationships. Drupal is therefore fully qualified software for building identity and for social networking as well.

7.1.2.4 The realm of actualizing self

The realm of actualizing self notes, that any social software must provide mechanisms to build self-esteem. Users should also be able to discover something new and useful while using the social software. All this is archived by allowed users to give feedback and

encourage each other according user's actions inside the community. For example a blog application usually allows users to comment the blog posts. This means that the realm of actualizing self mostly concern to features a particular social application possess, and as already stated, this analysis don't concern to the modules itself which provide the sociality.

7.1.3 Summary

The results weren't surprising, since it was pretty much expected that Drupal, which was originally based on a social software called Dorp, provides solutions needed to support sociality. Drupal's website offers more than five thousand different modules with different purpose and functionality which guarantees support to a variety of different solutions for social practice as well as online communities. Modules itself weren't closely analyzed, because many modules are more or less direct copies from the solution provided in the original social software.

A Web CMS using PHP platform combined with other free open source solutions enable good grounds at least for a small website. The fact that free software doesn't have a warranty could be seen as a disadvantage compared to commercial solutions when dealing with large commercial websites, even though the solutions might be well used and tested. In Drupal, scalability between small and large websites is solved by using a modular approach. Never the less, it seems that Drupal is mostly used to build small websites.

Overall, the popularity of Drupal speaks for itself. A Web CMS that is widely used must offer something unique or better compared to its competitors. For this reason, latter solutions analyzed in this paper will be also compared against the features Drupal has to offer. Secondary objective in these analyses is therefore to find out how does to analyzed Web CMSs differ from each other.
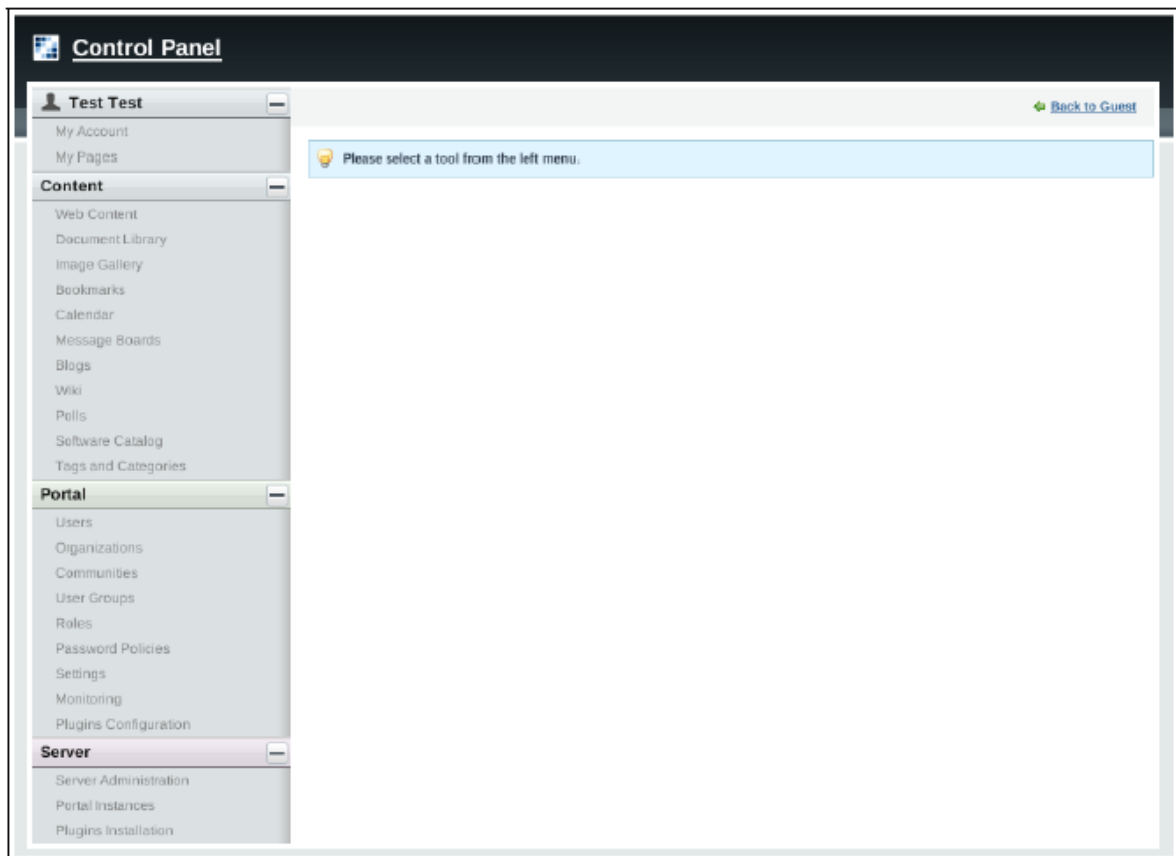
7.2 LIFERAY

The second Web CMS analyzed in this thesis is called Liferay. Liferay, as well as Drupal, are both used by big companies and organizations from a variety of different industries. The most notable companies using Liferay are Cisco, Honda and China mobile. In the field of education, Penn State University, York University and Harvard Business School are using Liferay. When comparing Liferay and Drupal in terms of clients, we can see that both are used by large companies and universities. It was discovered that Drupal were used by news services whereas Liferay had found its way to the banking industry. There are at least two banks using Liferay, a small Finnish bank called Aktia and a larger named Société Générale, which is worldwide known for its financial services.

Liferay was originally developed as an open source portal solution for non-profit organizations in the year of 2000. Liferay, Inc. was founded four years later in 2004 as a response to growing demand of Liferay Portal, which was back then market's leading independent portal product. Today, Liferay, Inc. houses a professional services group that provides training, consulting and enterprise support services in the Americas, EMEA, and Asia Pacific. Liferay, Inc. also donates money to AIDS relief and the Sudan refugee crisis through well-respected organizations such as Samaritan's Purse and World Vision (Liferay About Us, 2010).

Liferay offers good user's guide for installing and configuring Liferay Portal product. This guide works also for good documentation. The figures from Liferay Portal, which are later presented in this thesis, are also taken from the guide. Whereas Drupal clearly presented their layer and modular approaches in documentation, Liferay don't offer same kind of detailed documentation about the system. Liferay Portal is configured and maintained through specially designed control panel, which is presented in figure 6. This makes Liferay seem more professional product compared to Drupal. The control panel consists of four sections: User name, Content, Portal and Server (Sezov, 2009).

The user name section in the control panel is for changing personal account information and for managing own personal pages. The content section contains links to all of Liferay's content management functions which allows administrator to maintain all the content in website such as documents, images, bookmarks and much more. Portal section concerns to issues related to managing the portal. In this section the administrator can add and edit users, organizations, communities, roles, and configure other settings related to the portal. The server section is for configuring portal in system level including portal instances and plug-ins (Sezov, 2009).

Figure 6. Liferay Portal Control Panel (Sezov, 2009).

Content section clearly refers to content management whereas the portal section centers to user account and access controlling. It seems that these two concepts are merged together in modern Web CMSs, even though traditional content management systems don't recognize dynamic content. It is hard to define whether Liferay is a Web CMS, a portal or

just a web application, which provides all kind of different concepts. Nevertheless, this thesis centers to web content management systems which support the managing of dynamic web content and enable user control.

7.2.1 The technical parameters

The left side of table 4 contains the technical parameters, which have to be taken account when choosing a Web CMS and the right side presents the finding concerning Liferay. These technical parameters were already introduced and explained in chapter 5.

Table 4. The technical parameters of Liferay.

Web CMS's designed purpose	Portal for non-commercial organizations
Platform	Java/JavaServer Pages
Database	MySQL, PostgreSQL, Oracle, much more
WYSIWYG editor	Built-in
Web CMS's license	Open source and proprietary

The first principle to be taken into account is Web CMS's designed purpose. Liferay portal was originally developed for non-commercial organizations. There is nothing which indicates that Liferay would have been originally designed with a social perspective in mind. Liferay feel more organizational product compared to Drupal. It is also clear that Liferay is more suitable for larger web sites than smaller ones. Once again the origin and original purpose is still strongly present although years of development have shaped the product.

Liferay Portal is built to Java platform, which is along with PHP the most used programming language in websites. Whereas PHP is mostly used for small, probably even hacker type, web sites, Java language is the choice for more serious products. For example in banking industry there are no web sites made to PHP platform, but many banks use Java. Starting a website using JavaServer Pages is more time consuming compared to PHP, but it is hard to measure which language is faster for creating the actual web pages. More important factor than speed is the fact that web sites for PHP and Java platforms are done for slightly different purpose.

Database support in Liferay is excellent. Java, as well as, PHP has created an API which enables support to a huge amount of database solutions. Currently Java's JDBC data access API support more than 200 different databases. It seems that at least for Drupal and Liferay database support isn't an issue. Even though support for a variety of databases are provided, it is obviously recommend to use a solution which is well known and well used with Liferay (Java JDBC, 2010).

WYSIWYG (What You See Is What You Get) concept fits well to Liferay Portal environment. Liferay actually offers five different WYSIWYG editors and the control panel presented earlier indicates that with Liferay people don't have to get their hands dirty. Whereas WYSIWYG editor only allow non tech-savvy people to create web pages, the control panel turns the whole website easy to configure.

Liferay Portal is released under The GNU Lesser General Public License (LGPL), which is an open source license. Whereas standard Liferay Portal community edition comes with no support and warranty, the enterprise edition, which is also an open source, comes with instant phone support. Even though Liferay Portal product is free, the company generates income by providing support and other services related to their product. Java and PHP are both free for anyone to use creating software.

7.2.2 The design principles for a web based social software

Design principles for a web based social software consist of four realms, enabling practice, mimicking reality, building identity and actualizing self, which were all already introduced in chapter 6. When analyzing the social characteristics in Liferay Portal, we have to search functionalities that support sociality from Liferay's documentation. Since all the functionality in Liferay Portal is built-in to the system to guarantee product's stability and quality, it gives us additional way to analyze the social features provided by the Liferay Portal software. This analysis is therefore based to the documentation, but also to the Finnish Liferay community.

7.2.2.1 The realm of enabling practice

The realm of enabling practice concerns to facilities of engagement, alignment and imagination. As well as Drupal, also Liferay offers a variety of different ways for users to socialize with each others. Wikis, blogs and message boards aka forums are present providing different kind of social practices. Wikis are more for collaboration than sociality whereas blogs are considered a way to express self. The function of forums is mostly to enable group discussion. Again, the functionality of these three solutions is common as they are more or less cloned from the original solutions.

Wikis, blogs and forums are considered as basic tools for web based social software, which offer also essential communal features. Instant message systems and email usually have a different type of an approach. Never the less, Liferay offers AJAX-based IM client for instant messaging and a solution for email, which is the oldest social software, is also provided by offering webmail functionalities.

7.2.2.2 The realm of mimicking reality

Whereas the realm of enabling practice concerns to facilities for supporting social practice, mimicking reality is about how these facilities are made appealing to users. Social software must mimic real life social experience in order to appeal its users and the realm of mimicking reality therefore concerns to mechanisms and metaphors from ordinary life. As well as in Drupal, Liferay Portal relies on solutions borrowed from others instead of inventing new ways to support sociality. Since this analysis doesn't concern directly to certain solution supporting sociality such as forum or blog, therefore metaphors from ordinary life isn't searched or identified.

Facilities of social practice only enable a part of social experience. Validation, rating, individuation and repudiation are common social activities which don't necessary involve direct communication. To support these additional activities Liferay allow members to vote in different kind of polls. Never the less, Drupal seemed to have better support in this area. Whereas both have polls, Drupal offers also simpler fivestar voting application, which seems to be missing from Liferay's product.

7.2.2.3 The realm of building identity

The realm of building identity refers to the mechanisms that allow users to presents one or many images of self to the community. User profile pages are designed for this kind of purpose. Liferay portal offers documentation about a variety of different functionalities, but the documentation refers mostly to technical parts and configuration than presenting the functionality in sociality point of view. Liferay's Finnish community gives as the needed perspective which features are provided for identity builders.

The user profile page is pretty straight forward allowing user to publish pictures and presenting user's latest activities performed in the community. Blog is tied to the user profile page, which allows users to share their thoughts with rest of the community. Liferay also allow users to identity friends, but more importantly this feature makes it easier to keep track their activities. At least in theory social networking site such as Facebook could be done by using Liferay Portal.

7.2.2.4 The realm of actualizing self

The realm of actualizing self notes, that any social software must provide mechanisms to build self-esteem. Users should also be able to discover something new and useful while using the social software. All this is archived by allowed users to give feedback and encourage each other according user's actions inside the community. For example a blog application usually allows users to comment the blog posts. User profile pages in Liferay contain a "wall" where members of the community can leave notes. The realm of actualizing self seems to concern more about which manner people are communicating instead of how it's technologically provided. As talked earlier, Web CMS or social software cannot shape the social dynamics within the online community.

7.2.3 Summary

Liferay Portal was originally designed as a software for modern websites or more precisely for portals. Comprehensive documentation about the product's functionalities makes Lifefay Portal look as professional and considerable for serious websites. For example products used by banking and other similar industries must be one hundred percent reliable. The commercial enterprise edition is designed for this market offering an enterprise-tested product with long-term support. The community edition on the other hand is free and can be used in smaller non-critical websites. Overall, the both editions of Liferay Portal feel professional and reliable.

Java platform compared to PHP is considered as more reliable and even some times more professional. PHP is also considered more a hacker type of programming language for small projects than Java. This phenomenon is seen when comparing Drupal's and Liferay's clients, even though Liferay does offer enterprise edition with support and warranty. Although Liferay Portal is better solution for large commercial based websites, it doesn't scale that well to extremely small hobby type of online communities, where Drupal with PHP language works better.

Liferay rely closely to functionalities provided by the company itself, whereas Drupal allow people to publish their own achievements with the rest of the Drupal community. When functionalities are developed, tested and published by the company itself, the solutions are proven reliable. Drupal rely on a different kind of an approach which allow community to develop all kind of functionalities without any type of a restrictions. This of course takes all kind of a warranty and a support away, but provides faster development cycle and allows a larger range of functionalities to be published.

Liferay Portal provides solutions to support social practice. Forum and wiki allow people to socialize where as user profile pages and blogs help users to present an image of self to the community. Social networking is present by allowing people to identify friends and follow their actions in the community. Validation possibilities in Liferay Portal were poorer compared to Drupal, but Liferay Portal's wall portlet, which allows user's friends to leave comments for the user, is present in both of the Web CMSs. Overall, Liferay Portal does offer all the basic functionalities needed in social software and online community.

7.3 PLONE

The third web content management system to be analyzed is called Plone. Plone is used by over 2000 governmental, profit and non-profit organizations. The most notable clients in the governmental field include Central Intelligence Agency (CIA) and National Aeronautics and Space Administration (NASA[4]). In information technology most recognizable companies using Plone are Novell and Nokia[5]. Plone is also used by several museums and universities such as Chicago History Museum and The Technical University of Munich[6].

Initially Plone was a usability layer on top of a content management framework (CMF) called Zope. In year 2001, Plone was separated from it and released as a standalone web content management system (Web CMS). After the separation, Plone quickly evolved to one of the best known Web CMS on the market. In year of 2004, Plone Foundation was created to organize the ownership rights over the code, trademarks, domain names and other related issues (McKay, 2009).

Even though Plone was separated from Zope, Plone and few other Web CMSs are still built on top of Zope and needs Zope to function. Whereas Zope as a content management framework provides the grounds for building a complicated website or a Web CMS, Plone is more of a higher level system with a web interface. Plone also provides complete tools for not only building, but also for maintaining a website. Zope on the other hand is built to Python platform. Python is one of the most used programming languages in the world. The relation of Plone, Zope and the platform Python is illustrated in the figure 7 (Aspeli, 2005; McKay, 2009).

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[4] http://science.nasa.gov/
[5] http://qt.nokia.com/
[6] http://portal.mytum.de/
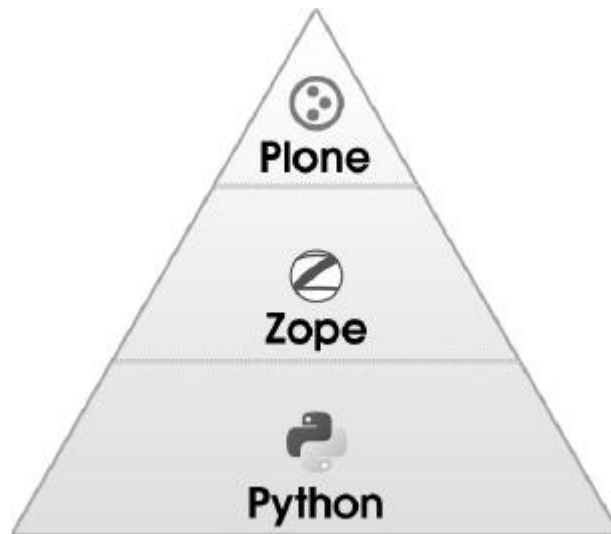
Figure 7. The relationship among Plone, Zope and Python (McKay, 2009).

For Liferay and Plone the best way to get to know the system was to read a book about it. At least in Plone's case, the documentation found from website was limited to certain issues, such as installing and upgrading the system, instead of explaining what the Web CMS is all about. Plone provide wizards for everything needed to run the website, such as adding and managing content or user accounts. The mentality of making everything configurable by a well guided web page is probably inherited from the early days when Plone was still an interface layer on top of Zope. Never the less, there are some low-level options that need to be configured trough Zope Management Interface (ZMI), but some of the ZMI options are configurable from Plone's control panel as well (McKay, 2009).

The figure 8 presents Plone's control panel which enables an administrator to configure the system. The Site Setup section is divided into three different parts: Plone Configuration, Add-on Product Configuration and Plone Version Overview. The first section, Plone Configuration, provides a set of options to customize and modify the system. The second section, Add-on Product Configuration, allows administrator to configure the add-on products settings. In figure 8, there are no add-ons installed. The last section, Plone

Version Overview, presents information about the setup and which software versions have been installed the system (McKay, 2009).

Figure 8. Plone's control panel (McKay, 2009)

Plone's control panel allows a lot of things to be configured. Troubleshooting errors is done trough this panel as well as site, language and security related configuration. Running and maintaining Plone can be done without understanding of the Python programming language at all. Compared to Drupal, which doesn't have specially designed web pages for system's configuration and everything is more or less done by hand, the solution in Plone does have its pros and cons. When everything is done by using wizards, the possibilities

how a skilled administrator could modify the system is narrowed down. Even though Plone is open source software, modifying the source code might break the configuration wizard for the particular function. On the other hand, modifying the core components of Drupal could also break the whole system.

7.3.1 The technical parameters

The left side of table 5 contains the technical parameters, which have to be taken account when choosing a Web CMS and the right side presents the finding concerning Plone. These technical parameters were already introduced and explained in chapter 5.

Table 5. The technical parameters of Plone.

Web CMS's designed purpose	Originally an interface for Zope (CMF)
Platform	Zope/Python
Database	ZODB, a plug-in for SQL databases.
WYSIWYG editor	Built-in
Web CMS's license	GNU General Public License

The first principle to be taken into account is Web CMS's designed purpose. Plone was originally an interface for Zope, but that really doesn't tell us what kind of web sites for it was originally designed. This will remain a mystery, but the fact that Plone's common services such as authentication, search and topology management are needed in most business applications, might give us a hint. Today Plone is used in a variety of different websites, but the governmental field is emphasized. Plone pages are also compliant with US Section 508, and the W3C's WAI-AA standards for accessibility. This allows people with disabilities to properly access websites built with Plone (Aspeli, 2005; McKay, 2009).

Plone and Zone are both built to Python platform. Although Python might not sound familiar, it is one of the most used programming languages used to make websites. For example a part of the web pages of YouTube and Google are made by using Python. Python falls to somewhere between PHP and Java as how serious the language is. Python and PHP are very similar whereas the Java is more apart. There are claims that Python performs better than PHP, but it is always hard to measure the real performance. Even if there is a slight difference for one way or the other, choosing a platform, Python or PHP, solely for the Web CMS's performance in mind doesn't seem reasonable. As already discussed, selecting a platform which is already well known by the developers makes more sense. Slight performance issues can be always fixed by buying faster servers.

In default Plone comes with an object-oriented database called Zope Object Database (ZODB), whereas all SQL databases such as MySQL and PostgreSQL are relational databases. This might of course cause problems if Plone is wanted to integrate to some already existing relational databases. Fortunately this issue has been fixed by releasing a Zope MySQL Database Adapter (ZMySQLDA) which allows MySQL database to be used in Zope and in Plone. Also other relational SQL databases are possible to use in Plone.

As being originally an interface for Zope, the WYSIWYG (What You See Is What You Get) concept is one of the driving forces in Plone. The essence in Plone is that everything is done by guided web pages including adding content, user accounts and modifying the system. Therefore as the WYSIWYG editor is build-in to the system, we can say that it seems only natural.

Plone is released under The GNU General Public License (GPL) and doesn't offer dual licensing at the time. Plone itself doesn't offer any commercial support services, but there are many companies doing it. These companies are selling services such as consulting, designing and hosting Plone websites and providing a technical support. Whereas with Liferay the company provides commercial technical support directly for the clients, Plone's approach is a bit different allowing hosting and consulting companies sponsor

them. Sponsoring companies get their information posted to the commercial plone.net website, where potential clients can look up for the company to host their Plone website.

7.3.2 The design principles for a web based social software

Design principles for web based social software consist of four realms, enabling practice, mimicking reality, building identity and actualizing self, which were all already introduced in chapter 6. When analyzing the social characteristics in Plone, we have to search functionalities that support sociality from Plone's documentation. At least McKay (2009) claims that Plone is a good platform for creating large community portals and social networks.

Plone consists of built-in core functionalities and additional add-ons, which can be added and removed according designer's discretion. Currently there are more than 3500 add-ons released for Plone. The add-ons cover a variety of different areas not only related to sociality or communities. The same phenomenon was seen in Drupal, where a huge amount of modules created by the community was discovered. As well as in Drupal, in Plone a lot of functionalities have duplicated solutions. For a developer it gives more choices, but on the other hand it is hard to separate good solutions from the bad ones.

7.3.2.1 The realm of enabling practice

The realm of enabling practice concerns to facilities of engagement, alignment and imagination. As well as Drupal and Liferay, also Plone offers a variety of different ways for users to socialize with each others. Ploneboard offers the basic forum solution for Plone whereas Zwiki claims to be a powerful, innovative and user-friendly wiki engine based on the Zope 2 platform. Built-in internal inbox message service allows users to send messages to each other. When searching add-on database for blogs, the result is more than 10

different add-ons, but not all are complete solutions for blog. The first blog solutions to pop up was Scrawl and there are at least three another similar solutions called Quills, CoreBlog2 and SimpleBlog. All the basic solutions are at least present, but searching is hard because add-ons aren't organized as well as in Drupal (McKay, 2009).

7.3.2.2 The realm of mimicking reality

Whereas the realm of enabling practice concerns to facilities for supporting social practice, mimicking reality is about how these facilities are made appealing to users. Social software must mimic real life social experience in order to appeal its users and the realm of mimicking reality therefore concerns to mechanisms and metaphors from ordinary life. As well as in both Web CMSs analyzed earlier, Plone relies on solutions borrowed from others instead of inventing new ways to support sociality. Since this analysis doesn't concern directly to a certain solution supporting sociality such as a forum or a blog, therefore metaphors from ordinary life isn't searched or identified.

Facilities of social practice only enable a part of social experience. Validation, rating, individuation and repudiation are common social activities which don't necessary involve direct communication. To support these additional activities Plone allow developer to make polls by using the Plone PoPoll. EasyRating add-on allows users to rate and validate things in same way than Fivestar module works in Drupal.

7.3.2.3 The realm of building identity

The realm of building identity refers to mechanisms that allow users to presents one or many images of self to the community. User profile pages are designed for this kind of purpose. When hosting a social software it is important that people can register to the system by themselves. Plone supports autoregistration, which means that administrators

don't have to add people by hand, instead people can just register and use all the features provided to all other registered users as well (McKay, 2009).

Identifying friends is one of the basic functionalities in social networking sites and a popular activity at least in the western world. Plone does support identifying friends along with allowing users to write blogs and publish pictures. Plone allows users also to publish image galleries. Plone can be also used to host training courses, which led to the conclusion that Plone support different roles within the community. It seems that Plone can be modified and then used for many purposes when needed (McKay, 2009).

7.3.2.4 The realm of actualizing self

The realm of actualizing self notes, that any social software must provide mechanisms to build self-esteem. Users should also be able to discover something new and useful while using the social software. All this is archived by allowed users to give feedback and encourage each other according user's actions inside the community. For example a blog application usually allows users to comment the blog posts. Since Plone allow people to have different roles in the community, it might have affect the nature of given feedback. For example a feedback from a teacher to a student in an education environment differs from a feedback from a student to a student. The realm of actualizing self seems to concern more about which manner people are communicating instead of how it's technologically provided. As talked earlier, Web CMS or social software cannot shape the social dynamics within the online community.

7.3.3 Summary

Originally Plone's main focus was on governmental and business websites, but nowadays companies such as Nokia and Novell are using Plone as well. Drupal is also used by governments, but US Section 508 and the W3C's WAI-AA standards for accessibility were

only discovered from Plone. Later checking for Drupal and Liferay revealed that Drupal have a project concerning the issue, but for Liferay there were only a talk about the issue, but no plans at the moment. Nevertheless, custom designed themes can provide the standards for accessibility.

Even though Web CMSs might originally had different areas of specialty, today web content management systems are closing up on each other in the term of available features. We can say that the Web CMSs are trying to offer it all and the additional functionalities provided by the Web CMS's community eases the process. Both, Drupal and Plone, offer a huge amount of add-ons or 3rd party modules wrote by the users themselves participating in their communities. With Plone it was hard to find an add-on with a particular functionality and even when one was found the vital information about how popular the add-on is or how well does it work was not available. Compared to Drupal, which have a completely separated website[7] for finding and rating modules, the process of finding good modules for implementing certain functionalities was much easier. As for the contrast, Drupal offers more than 5000 modules, whereas for Plone there are more than 3500 add-ons available.

The Python platform is not as known or as used in websites compared to PHP or Java, but for example Google and YouTube are using Python. Python's reliability or the reliability of software wrote by Python, is somewhere between PHP and Java. Since many governmental websites are using Plone, the reliability must be good enough. Hosting and consulting services provided by 3rd party companies makes Plone of course a potential Web CMS for serious use. The documentation and overall literature concerning Plone also makes Plone look a professional system.

Plone do provide solutions to support social practice, but during the analysis the solutions were hard to find when there were more than 3500 add-ons available. Fortunately the literature turned out to be useful when finding out which functionalities were supported. All the basic functionalities such as forum, blog, wiki and user profile pages were

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[7] http://drupalmodules.com/

supported. In this analysis it was not possible to see the actual solutions in action and the analysis is based only to literature and to the information found from Plone's website. There are just too much unorganized add-ons to be analyzed in a reasonable amount of time, so some solutions supporting sociality might have left undiscovered.

7.4 THE RESULTS

Three Web CMSs were analyzed in this thesis, Drupal, Liferay and Plone. They all have their differences, partly because they are all made for different platforms, but for other reasons too. The documentation available was used in these analyses instead of actually installing and testing each Web CMS. It was discovered that Drupal, Liferay and Plone are all well documented Web CMSs with a few books published about each. For Drupal, the documentation found from the website provided all the information needed for analysis, but for Liferay and Plone a book was the best source of information. The e-book version of the Liferay portal administration's guide is downloadable for free from Liferay's website, but the Plone's equivalent has to be bought. Nevertheless, Drupal, Liferay and Plone, all have a variety of different books about the system, which can be bought.

7.4.1 The technical parameters

The Web CMS's original designed purpose has shaped the system even for solutions older than ten years. Drupal, which was originally based on a social software, provides a lot of features supporting sociality and doesn't give as a professional feel as for example Liferay. Liferay on the other hand was based on a portal, which was recognizable from the design as well as from the documentation. Plone's user interface oriented approach couldn't also be missed. The platform could also explain the limitations and advantages a certain Web CMS possess or on the other hand the platform could have been selected according to the original requirements.

The platform was the most distinguishing difference between the three analyzed Web CMSs. The decision to choose three different platforms was well considered. An analysis concerning only to a one particular platform could have produced even more similarities between the systems. The platforms did shape the systems and it is also noticeable which fields of industry prefer which platform. Java is the most used platform in banking industry, where as the PHP is used by Facebook and other social software. Python on the other hand is used by YouTube and is kind of in middle, but the difference between PHP and Python isn't that big when measuring the difference of Java and Python platforms. Java is considered being the most professional platform whereas the PHP is considered as the most unprofessional one. Nevertheless, all the platforms have been developed approximately more than ten years now and all the platforms are considered as reliable for any kind of use.

Databases were also one concern when it came to choosing a Web CMS. In the analysis it was discovered that there were two kinds of databases supported, relational databases and object databases. Drupal and Liferay both supported a variety of different relational database solutions including MySQL and PostgreSQL. The support to these solutions is done in the platform level and therefore it doesn't concern to the Web CMS that much. Unlike Drupal and Liferay which support relational databases, Plone's primary database solution is the Zope Object Database (ZODB), which is an object database. The database support to Plone comes from the Zope, which is the layer between Python and Plone. The design in object and relational database is different and they are not directly compatible with each other. Nevertheless, there are solutions available for converting databases between these two and for more importantly Plone do offer additional solutions, which allow the use of relational databases possible in Plone Web CMS.

What you see is what you get (WYSIWYG) editors were found in all three Web CMSs. In Drupal there were many modules providing the function, whereas in Liferay and Plone the editor was built-in. This wasn't expected, because the overall assumption about the function of a Web CMS was closer to content management framework, which provide only a framework, not a complete system that could be installed and then used right away. Web

CMSs offer a huge amount of functionalities, which are easy to adopt and the systems were easy to use for non tech-savvy people as well.

The licensing was the last issue in the technical analysis. All the solutions analyzed in this thesis were free and open source, although the licenses had a slight difference. Drupal and Plone are licensed under the GNU General Public License, whereas Liferay rely to the Lesser GNU Public License. It is safe to say, that choosing a Web CMS from these three doesn't come down to the license issues. Open source solutions also dominate the Web CMS market and there is only a handful of solution with a propriety license. Most of the Web CMS released under commercial license are using the Microsoft ASP.NET platform. One reason to this might be that software using Python, PHP and Java platforms can be written and complied using free solutions, but Microsoft's ASP.NET platform requires the commercial Microsoft Visual Studio.

7.4.2 The design principles for a web based social software

Bouman et al (2007) have studied social software and online communities and published design principles which have to be taken account when building a successful social software. The study concluded that there are four different design domains to concern: enabling practice, mimicking reality, building sociality and actualizing self. When designing a successful social software, these principles has to be taken account. Therefore all the four realms must be supported by the Web CMS or it cannot be used to implement a successful social software.

The realm of enabling practice centers to virtual places, where community's members can socialize. This is the most important phenomenon in social software. When searching the solutions, it was discovered that basic solution for socializing, a forum or a discussion board, was present in each three Web CMSs analyzed. Some of the solutions, such as wiki and blog, don't actually provide a place to socialize, but are still considered to enable

social practice. Other solutions for supporting social practice were also discovered and none of the analyzed Web CMS lacked a solution or provided something special compared to the others.

Mimicking reality mostly concern to how a particular solution e.g. a forum was implemented. This didn't fit to the nature of the analysis, because analyzing a particular solution would have forced us to install and test all the Web CMSs instead of concentrating only to the documentation. Nevertheless, member's possibilities to validate and rate things inside the community were analyzed. When searching solutions implementing this feature, all kind of voting tools were discovered. All the Web CMSs had at least one tool for rating, but Liferay seemed to offer the least amount of tools compared to the other two.

As we know, building identity is important feature in introduction, dating and social networking sites, but in any online community it is also important to separate people from each other. Usually in the world of computers it is done by using a username. Username will lead us to the user profile and to the user profile pages, which were found from all the three Web CMSs. All the systems have also solutions available for personal blogs. Identifying friends and social networking is also considered as building identity. All three systems also provided the possibility to identify friends.

The realm of actualizing self is the last issue, which needs to be taken account when designing social software and online communities. This realm concerns to the human psychology and states that any social software must provide mechanisms to build self-esteem. In practice this is achieved by allowing users to give feedback to each other inside the community. For example users could comment blogs posts and leave messages to each other. This phenomenon relates to the functionalities which are provided in certain social software and cannot be analyzed when the analyses concern to the Web CMS instead to the social software directly.

Overall, there weren't that much a difference when it comes to the social criteria. New ways to enable practice is of course hard to come up and also for the analyzer it is hard to discover the newly invented practices among other few thousand add-ons. Drupal and Plone are expected to provide more compared to the Liferay, because of allowing users to create and publish add-ons to both of the systems. Even though, Liferay doesn't lack any of the essential functionalities needed for building a social software. Therefore it is up to the developer whether he or she can use to solutions provided by the Web CMS to build a successful social software.

Building a successful online community is a completely different and more complex matter compared to building a successful social software. This thesis didn't concern to the concept of online community or to the roles the users have in communities generally. Centering only to social software and to the Web CMSs limited the analyses many ways when it comes to analyzing the social principles. Even though social software do concern to different issues than online community, there's a connection between them. Social software cannot be analyzed completely without concerning to the online communities as well. The same applies when analyzing Web CMSs compatibility for implementing social software and online community. Nevertheless, these limited analyses and the study overall gave us a plenty of new information about the subject.

8 DISCUSSION & CONCLUSION

The goal of this study was to study whether a Web CMS could be used to provide a basis for an online community. Secondary objective was to study which features have to be present in a Web CMS and later on in a social software in order that it can provide a successful online community. All the Web CMSs chosen to this analysis prove that they can be used to build a social software which could then provide a basis for an online community. One of the reasons could be that the selected Web CMSs all had known communal features.

Along the thesis there were a couple of discoveries made. The first discovery was that online communities are made of people and can't be built or analyzed in technological manner. Further study revealed that social software, which provides the online community, is suitable for technical analysis. Since the analysis in this thesis concerns to the technical principles instead of being a psychological or a sociological study, the focus was on the social software. The second discovery was that Bouman et al (2007) had made a paper about the principles of designing a social software. The paper was then used as a basis for analyzing which solutions supporting sociality a Web CMS needs to offer. Thirdly it was discovered how sophisticated software the Web CMSs really were. The initial assumption was that a Web CMS would need a much more configuration and the developer would need more knowledge about the platform in order to get the system to function. But actually the systems were easy to adopt even for non tech-savvy persons.

8.1 EVALUATING RESEARCH QUESTIONS

Three research questions were set at the beginning of the study and now the questions are evaluated to see how well the study provided the answers.

- Does a Web CMS provide all the functionalities needed for an online community?

Yes, all the three Web CMSs, Drupal, Liferay and Plone, provided functionalities, a social software, which was needed to run an online community. The provided features didn't have that much variety and the solutions were copied from other software.

- Which features does a social software have to provide in order that developing an online community is possible?

This was mostly answered in the paper wrote by Bouman et al (2007). Firstly social software has to provide virtual places, which allow people to socialize. Secondly community's members have to be able to rate and validate things. Thirdly the social software must be able to allow people to build identity. Lastly users need to be able to give feedback to each other.

- Does the Web CMS have an effect to the online community?

The last research question is a bit harder to answer. The selected Web CMS of course have an effect to the social software and therefore the question is whether the social software has an effect to the online community. We can say that Drupal and Plone, which both offer thousands of functionalities in their systems, could provide a richer environment for an online community compared to Liferay. Nevertheless it doesn't guarantee anything, because the developer ultimately decides which functionalities include to the social software. Another issue, which was already mentioned few times, is that online communities are made of people and it is impossible to predict how the community will turn out. The last research question is therefore left at least partly unanswered.

8.2 FURTHER WORK

Online communities have been under study for the last ten years after Preece (2000) and Kim (2000) released their books. Since then there haven't been released that much of new material concerning to online communities. Preece and Kim studied online communities from a social perspective concerning to the social aspects and dynamics of online community and therefore offers only a part of the puzzle. The paper from Bouman et al (2007) concerned to the social software leaving the social dynamics out. The social principles from the paper also fitted better for the analysis of the Web CMSs.

The Internet have gone through a huge change within the last ten or twenty years. We have seen new social software, such as YouTube and Facebook, to arise. Regardless of the new inventions, the most important change for the Internet has been the change of the users' demographics. While even ten years ago the Internet was mainly used only by universities, special interest groups and other professionals, today it is used by everyone regardless of their social status, education, sex or age. The Internet has become a one big community, where everybody is connected. This phenomenon haven't been studied, instead online communities are still considered as something special compared to traditional offline communities. Since online communities and the Internet are made of people, studying this phenomenon should be more or less left to the sociologists. Nevertheless, online communities concern also to technical parts, such as to the social software.

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