The Pennsylvania State University

The Graduate School

Department of Electrical Engineering

ACHIEVETOGETHER.COM: DEVELOPMENT & EVALUATION OF A WEB 2.0

APPLICATION FOR WEIGHT LOSS AND DIABETES PREVENTION

A Thesis in

Electrical Engineering

by

Dheepak Ramaswamy

Submitted in Partial Fulfillment
of the Requirements
for the Degree of

Master of Science

May 2010

The thesis of Dheepak Ramaswamy was reviewed and approved* by the following:

John Metzner
Professor, Dept of Electrical Engineering & Computer Engineering
Thesis Co-Advisor

Kenneth Jenkins
Head of the Department of Electrical Engineering

Madhu Reddy
Assistant Professor of Information Sciences & Technology
Thesis Co-Advisor

Bernard J. Jansen
Assistant Professor of Information Sciences & Technology
Thesis Co-Advisor

*Signatures are on file in the Graduate School

ABSTRACT

Medicine 2.0 applications, services and tools are defined as "Web-based services for health care consumers, caregivers, patients, health professionals, and biomedical researchers, which use Web 2.0 technologies such as AJAX, Open APIs, RSS, Wikis and Social Software to enable and facilitate specifically social networking, participation, mediation, collaboration, and openness within and between these user groups."[1]

The purpose of this research is to identify the requirements and design a medicine 2.0 internet application that helps patients address their weight loss issues and evaluate its usability. The research was done in two phases. First I used Drupal – an open source content management system [2] that embodies features of a people-centric social Web to create a new flexible and modular framework to satisfy requirements of a Web based weight loss research study, address the usability concerns of existing Web based weight loss solutions, incorporate collaborative and interactive features and serve as a data gathering tool while acting as a base for future online health projects. Next a user study was conducted where user behavior was observed, feedback was obtained and user logs were analyzed using quantitative methods in an attempt to understand the "architecture of participation" and the impact of rich user experiences in online wellness programs.

Throughout the iterative design process that I employed to create the framework, I was able to identify common themes that users expect from an effective Web based tool for weight loss. Many features in Drupal especially the messaging, blog, video, notifications, content updates and dashboard modules played an important role in enhancing the interactive user experience which was found to be as important as the quality and source of content for the users. I also identified a number of unexpected challenges that were both technical and social in nature

and have attempted to create a future roadmap for creating successful Web based applications to combat obesity and encourage a healthy lifestyle.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACKNOWLEDGEMENTS

Chapter 1

Introduction

Obesity is a serious threat to public health. Over the last 20 years, the percentages of overweight and obese Americans, as well as the rate of diabetes, have grown tremendously. Currently 66% of adult Americans are overweight or obese [3]. Overweight and obesity increase the risks for many chronic medical conditions, including diabetes, heart disease and stroke [4].
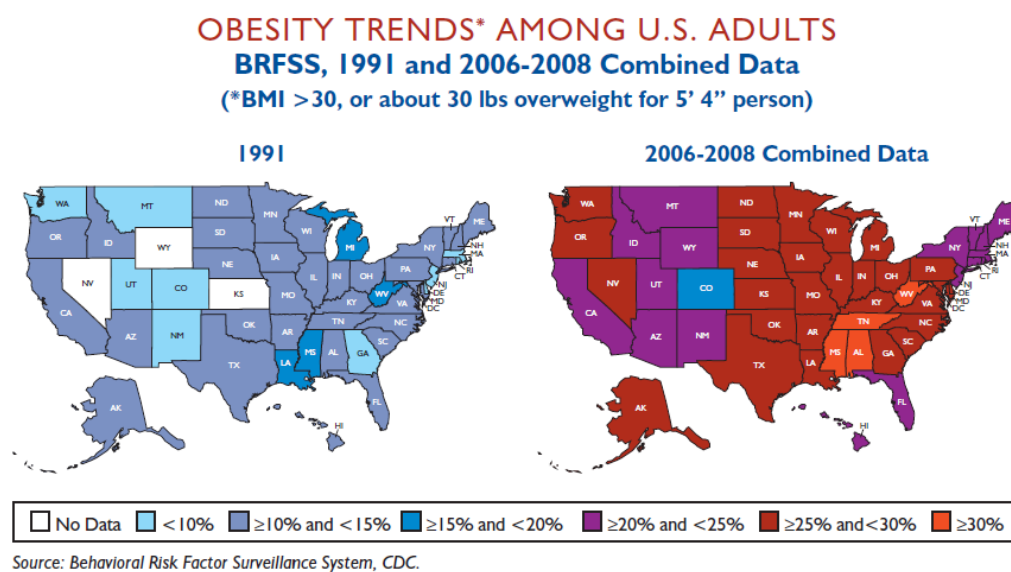
Fig 1-1 Obesity Trends among US Adults

With over 75% of Americans having access to the internet, a large percentage of internet users in America are looking for solutions to their weight problems online [5]. Data from Google Insight which provides analysis of Google's search data and offers comparisons of search volume patterns across specific regions, categories, time frames and properties also supports this fact as highlighted in Fig 1-2. A study of the reports generated by top search engines like Google, Yahoo and Ask shows that queries related to weight loss consistently fall in the top searched queries over the past 5 years. Data from Google trends, Google Insight and Ask! Interesting Queries, which are analysis tools of the vast Web search data, suggests that in a list of top 16 queries each year,

there are 6 queries related to users looking to lose weight or find if they are over-weight [6]. The top queries for weight loss are highlighted in Fig 1-3.

Fig 1-2: Web Search volume for the term "weightloss" from 2003-2009

Figure 1-3 Google Insight normalized results for search terms related to "weightloss".

The reports from Google and iCrossing market research [5, 6] also suggest that the number of queries continues to increase each year. This might indicate a dissatisfaction of online users with current content on weight loss. In spite of numerous websites including physician recommended sites, online users are still looking for the right mix of information and content delivery that will help them lose weight and keep it off over an extended period of time.

Problem Motivation

Although there are several commercial internet weight loss programs, very few have been effective when it comes to long-term weight loss and maintenance. This is primarily due to the technical obstacles faced by the websites of the Web 1.0 era that made creation of rich user experiences online extremely difficult. For example, AJAX, one of the technologies that enable building of highly responsive Web user interfaces was still in its infancy during the Web 1.0 era. Research has proven that loyalty and user experience are directly related [7]. The absence of a unique and memorable experience led to an inability to maintain a continuing relationship with the large number of "visitors" to their sites that is critical to long term weight loss. Very few Web-based treatments for weight loss have been shown to be effective for long term weight loss [16].

Research Motivation

Most of research carried out in the area of long term weight loss was done by National Weight Control Registry (NWCR) which followed over 4000 individuals who have achieved long-term weight loss [9]. The NWCR is designed to help understand what it is about these individuals that make them successful at long-term weight loss. Individuals in this study were regularly surveyed about their diet and exercise habits, to understand what habits (e.g., eating breakfast) are associated with long-term weight loss. However the study and interviews had not been in-depth in nature making it difficult for participants to understand what exactly they need to do in order to successfully lose weight and maintain this weight loss. Although the research provided successful weight strategies, it did not address how these strategies were implemented and what the participants did to overcome barriers that may have hindered their goals.

Thus the three main problems that were not addressed by the NWCR study are:

- Creating an efficient long-term focused online weight loss program that is successful in helping participants keep their weight off.
- Focusing on how strategies are implemented.
- Helping participants overcome barriers to implementing these strategies.

Research Goals and Benefits

To address these issues, researchers at the Penn State Hershey College of Medicine led by Dr.Christopher Sciamanna created the AchieveTogether project. The first step of the project was the completion of 50 in-depth interviews with individuals who have been successful at losing weight and keeping it off. These individuals were asked specifically about which strategies they use to maintain their weight loss, how these strategies are implemented and how barriers to using these strategies are overcome.

At the core of the project was the idea of a website that would disseminate information gathered by the researchers during step 1 to everyday users. My research focus was to create a fully functional and interactive website "AchieveTogether.com", to meet the needs, in a cost-effective manner, of the 80 million overweight Americans who will need life-long help in losing weight and in maintaining their weight loss.

AchieveTogether.com assists participants in identifying, reviewing and modifying a personalized list of reasons and motivations to lose weight and weight-loss strategies while taking advantage of the functionality offered by Web 2.0. The website acts as a forum that allows users to post or share their lists of reasons and strategies so that users may expand their own lists to include what has worked for others. It was designed be effective, engaging and inexpensive, while at the same time gathering valuable research data to understand if this unique approach is able to deliver results to the users.

Through this research, I had three primary goals:

1. Identify the set of requirements, features and functionality for the website based on the requirements of the AchieveTogether project stakeholders.

2. Design and develop the front-end user interface and the back-end architecture including databases and recommendation algorithms.

3. Evaluate the usability of the website through a user study involving user interviews and observations and offer recommendations for future development.

Some of the potential benefits from the outcome of my research include:

▪ Lessons for better design of Web 2.0 based applications for online solutions to long term weight-loss and other health related problems for which a lifestyle change is critical(e.g.: diabetes, asthma) in terms of features, content publishing and delivery.

▪ Understanding of the privacy concerns of online users who supply critical information about their health to websites such as AchieveTogether.com expecting personalization and accurate feedback. This can prevent a full exploration of the benefits of online programs as people might not be forthcoming of their health conditions.

▪ Understanding the possibilities of delivering health solutions that encourage the patient to actively participate in an online environment and the creation of online spaces where people can not only manage their conditions but are encouraged to create, participate and collaborate in driving online health applications.

▪ Methods to ensure credibility and integrity of user created content in online health programs.

▪ Inputs for further research into the efficacy of such Web-based health improvement programs and an understanding of the role Web 2.0 has to play in the education and empowerment of patients.

Research Approach

There are 2 main phases to this research: specification of features and requirements &
development based on these specifications and finally data collection, analysis, verification and
recommendations for future development. I took an iterative design approach which has been
found to be one of the most effective design practices in the modern Web development industry.
(Fig 1-4)
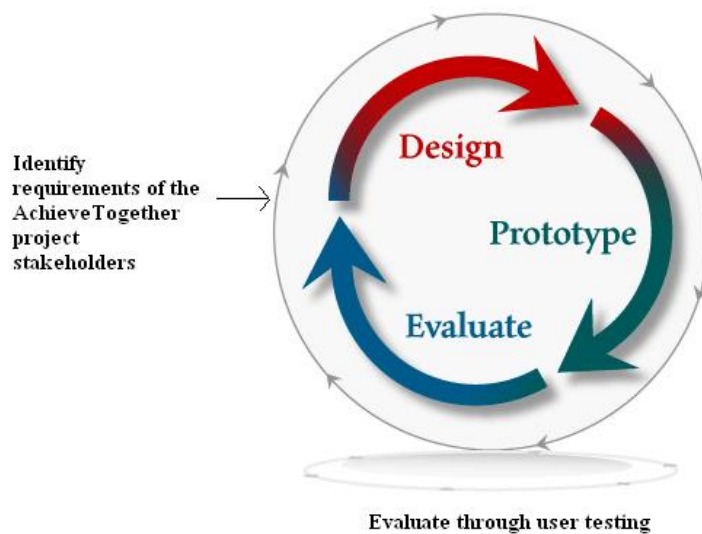
Fig 1-4: Research Approach

The 2 primary phases of the research are described below:

1. Feature Specification & Prototype development:

    The first part of this phase involved creating a functional specification document that clearly
    identified the set of requirements and the features of the website that the group at HMS
    wanted. The second part of this phase involved the development of the website
    "AchieveTogether.com" (http://achievetogether.ist.psu.edu/drupal) using the Drupal content
    management system as a platform. The prototype supports the following major functions:

    a.   Receive and store demographic and habit usage data from users.

    b.   Provide recommendations to users based on the provided information.

    c.   Allow users to maintain a diary of strategies to follow.

    d.   Provide feedback on their progress.

    e.   Provide a method for users to contact other users.

    f.   Provide video and text content to users showing success stories of other people similar to them.

    g.   Store all the data of users' interaction with the website and their progress securely in the database for medical researchers to identify success patterns and evaluate impact of the website.

2. Prototype evaluation: This phase involved testing of the prototype by users.

    a.   Observing the users use the system in a controlled environment

    b.   Interviewing the users to get input for effective evaluation of the system

    c.   Analyze the gathered data for accurate assessment of the goals of the research

Since the goal was to develop a completely automated system for recommendation, information sharing, collaboration enabling and data gathering, the implementation has a number of potential applications outside the weight loss domain.

Thesis Overview

The remainder of the thesis details the approach taken to design the online system and to identify the features that users found necessary for continued usage of an online weight loss program.

- Chapter 2 gives background information on the existing websites for weight loss that are most accessed by users and identifies their common features and functionality approaches while making an effort to understand the missing pieces. It also presents some of the solutions for which Drupal is employed as an open source Web 2.0 platform and the successful community behind it.

- Chapter 3 is organized into 2 main sections, the conceptual design and the actual implementation. In the first section, I analyze the set of requirements for the website: technical, functional and from a social context, and then outline the assumptions I made for the problems that were not fully defined. In the second section, I describe the actual building of the interface and the back-end architecture including the database tables and relationships and the reasons for making those implementation decisions.

- Chapter 4, section one outlines the data collection approaches used for the research that includes interviews, observations and user click through logs. Section two elaborates data analysis and presents the results that answer the research questions.

- Chapter 5 provides the challenges faced and the lessons learned during the research and provides suggestions for future development and research. Chapter 6 provides concluding remarks and acknowledgements.

Chapter 2

Background

Nearly two-thirds of the U.S. population is overweight or obese [3], making the discovery of successful weight loss interventions an important public health issue. Excess weight is associated with increased incidence of a variety of life-threatening diseases, including diabetes and hypertension. In addition to the health implications, the economic repercussions are also great. The United States spends between 92.6 and 117 billion dollars annually on overweight- and obesity-related healthcare [11, 12].
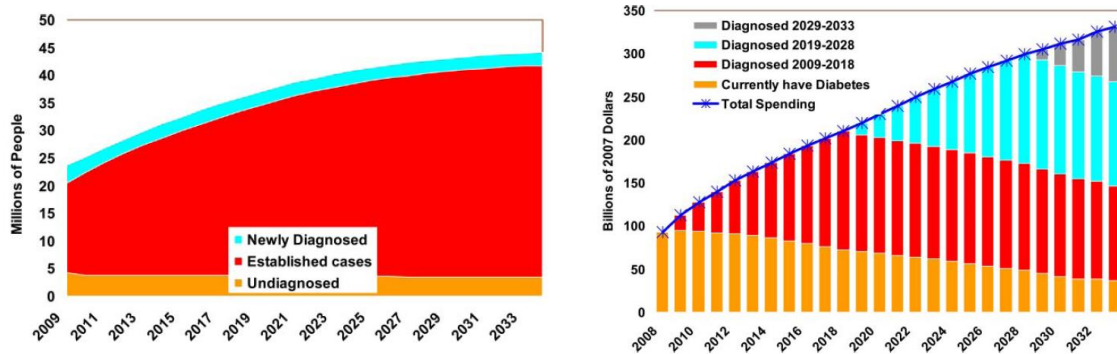
Fig 2-1 Projected cases, direct spending on Diabetes and its complications

A number of researchers have examined how the internet can be used for weight loss intervention programs [13-22]. A survey by market researcher iCrossing found that 59% of U.S. adults search online for health information and almost 50% of the searches were associated with weight loss, diet and exercise. More surprisingly, the study showed that 34% of the searchers visited emerging social media such as patient blogs, message boards, and forums, a trend often referred to as Health 2.0 [5].

Current Web technologies referred to as "Web 2.0" have provided users with unprecedented power for participation, conversation, collaboration, and ultimately, impact their community and the society. The "2.0" designation in Web 2.0 refers to the second generation of Web-information where users present their own ideas and information, comment on others' ideas and information, or in some cases (like wikis) may even change others' ideas and information. According to Forrester Research Inc., enterprise spending on Web 2.0 technologies will surge over the next few years, growing 43 percent each year to reach $4.6 billion globally by 2013.

Researchers are examining how Web 2.0 technologies can be applied to improving healthcare [23]. However there have been very few instances of applying these technologies to helping people find solutions for weight loss and asthma. With weight loss as one of the top health concerns of adults, many companies and individuals have created a presence online offering solutions ranging from diet and nutrition advice, workout recommendations, surgery options and diet pills. However, very few of these websites have taken advantage of the rich set features that Web 2.0 offers.

This chapter is intended to give the reader background information on the existing solutions that are available for weight loss online, their common functionality and features. I will highlight the missing features that I believe are essential for successful online weight loss programs. In the second part of the chapter, I focus on the features of Web 2.0 that are relevant to our current functional design. I also highlight how Drupal, the content management system used in this project, is able to successfully package all these features. I will also examine applications where Drupal's Web 2.0 features have been successfully incorporated to create great websites and online solutions.

Existing Weight Loss Websites

A few years ago, when "Cyber-dieting" emerged as a potential market, many weight loss companies started delivering their products and services through the Web. It also led to the growth of several diet, exercise and healthcare websites, specializing in weight loss or nutritional counseling. Most of these websites offer weight loss clinics, online consultations with hospitals, physicians, dietitians, and some were just Internet drugstores selling prescription weight loss medications. There are also many free or low-cost websites that provide information for weight loss, tips and personal advice on diet including custom meal planning, and chat rooms for discussions with other users.

There is little doubt that the weight loss industry's involvement with Internet-based services has really grown during the past few years. Google is the most widely used search engine in the world and the data gathered by Google provides accurate information as to which websites for weight loss are most accessed by American users. An analysis of the list reveals that a vast majority of the websites fall into one of the 5 categories based on the primary features that they offer. (Table 2-1)

Table 2-1: Existing weight loss websites

	Primary Features	Websites
1.	**BMI calculators**: Use height and weight (English or metric) to help determine amount of body fat and the body mass index (BMI). This is an important feature because it helps users to find out if they are over weight, and is the most used online health tool by Americans.	www.nih.com www.webmd.com
2.	**Calorie counters and food databases**: There has recently been an explosion of websites offering a searchable directory of nutrition facts and printable food labels. Most of these websites include a daily calorie requirement tool to determine daily calorie needs, and online diet diaries to enter the users' daily food intake and exercise. It is an essential feature for successful weight loss as it helps the users to maintain a journal of calorie intake and expenditure. Tracking of the user's progress has been found to be one of the most successful tools for weight loss. Some of the Web's latest technologies such as AJAX and JavaScript are employed heavily for these sites to give instant numbers and graphs that help the users to be proactive. Most websites claim to cover every possible food item in the American user's diet.	www.calorie-count.com www.calorieking.com www.2000cal.com www.Nutridiary.com www.itrainharder.com
3.	**Exercises**: These websites provide tools to that encourage physical fitness and promote regular exercise. They help the users to create a customized workout or exercise programs based on the user's weight and goals. They also help the users to track their exercise routine. Some sites offer workout and training videos as well. These websites help address the need for a focused exercise routine that is customized to each user. By offering online diaries, they also help the users to monitor their routine which as mentioned before, is a key to successful weight loss.	www.Nutridiary.com www.exercise.about.com
4.	**Diet plans**: These websites offer tools and resources such as online menu planners, recipes and custom meal plans tailored to eating habits. They provide guides to eating out and tips as to which foods are best for you. Most of the established commercial sites like Diet.com offer paid meal plans that deliver food to the subscribers. This is the largest market for sites that directly depend on user subscription and hence they offer other features such as opportunities to meet with other like minded users, counseling backed by physicians, dieticians and psychologists, and the option to buy "starter packages", recipe books, motivational tapes, supplements and other related merchandise.	www.Weightwatchers.com www.JennyCraig.com www.DietTips.com www.Dieting-review.com

5.	**Article/Text based websites**: The bulk of online weight loss solutions fall under this category. The websites provide links to information about diets, emotional eating, fitness, nutrition, cooking and more, as well as periodic feature expert-reviewed articles that offer tips and guidance on effective weight loss planning, therapies, prevention and healthy living. The biggest challenge for these websites in creation of new content and the absence of any user interaction. These websites are supported by advertisements and offer good economic returns to the website owners if they have a high volume of users visiting the sites.	www.About.com BBC Health www.Lifeclinic.com www.Weightlossforall.com Harvard School of Public Health

Although the top online weight loss websites offer some useful features, they are missing certain other features and functionality that could help users to be more successful. Researchers have found that the keys to any successful weight loss program are a combination of attitude, diet and exercise routine [4, 8, 9, 10]. Most of these websites design features that focus on diet or exercise or both, features that may help shape the users' attitude have not been addressed.

Peer and community support was found to be critical for creating a positive attitude that has helped people lose weight in some of the most successful offline weight loss programs. Therefore, in order to sustain and motivate online users trying to lose weight, it is important for them to develop a community relationship with other users through forums, interact by sharing tips and stories through chat, email or other online messaging , and get involved with community based incentives. Users are likely to relate more to people like them who have been successful at losing weight. Unfortunately, very few online weight loss programs offer communities, forums and ways to let people contact each other online due to the technical obstacles that existed to create the framework of collaboration.

Of the hundreds of websites offering help online for losing weight, only a fraction actually offer the users a controlled program with feedback. A study of internet-based

intervention programs [31] reported that only 26% of participants logged on to the websites more than once, and a later publication[32], reported that only 46% accessed the website a minimum of once. A more detailed analysis of the programs highlighted the difficulties associated with user engagement and retention in internet-based interventions; which can result in high drop-out rates and reduced intervention exposure. Unfortunately, none of the commercially available sites take any steps to counter this.

Some of the best websites for online weight loss have monthly or yearly paid subscription plans [36]. However, this discourages most people from joining these programs because users can get similar services from websites which do not charge any fees and earn income through online advertising. However, commercialization has created several usability issues. It has become extremely hard for the users to separate content from advertisements. With the article/text based websites, very little attention is paid to site navigability and user interaction and more resources have been directed towards banner and targeted product ads. Even if there is a lot of useful information available, it is not presented in a way that would really motivate users to follow the suggestions. Also there is an absence of personalization and customization in article based websites and an inability to sustain users' attention.

To summarize, exiting websites provide some valuable features such as diet and exercise plans, tools to track progress and access to information on weight loss. However, they lack the framework to help users contact each other, do not create a personal relationship with the user to combat dropout, and pay little attention to keep the users involved and making the interaction and interface an enjoyable experience. Most websites also struggle with making a profit while balancing production and running costs with income from advertisements or paid subscriptions. Web 2.0 offers solutions for all the above problems by providing the technical platform for

creating collaboration systems and a framework for rich internet experiences for the user while optimizing the websites for maximum online exposure for increased income.

Web 2.0 and Drupal

Web 2.0 has been compares to a way of thinking, a new outlook on the entire business of software, from concept to delivery to support. Web 2.0 thrives on network effects: databases that get larger with more relevant content the more people interact with them, applications that are smarter the more people use them, marketing that is driven by user stories and experiences, and applications that interact with each other to form a broader computing platform.[43]

These days, there are many users participating in rich media social networking websites such as Facebook, MySpace, YouTube and Flickr. Users create (e.g. upload photos on Facebook or Flickr), and consume media (e.g. listen to music on MySpace, Pandora and watch videos on YouTube). These Web 2.0 sites provide a framework for communication between the users – such as comments by users on videos and content posted by others. People return to content previously visited to post more comments in response to the activity, rather than to see the video again.

Web 2.0 offers some fascinating features and utilities that helps address the missing features of current websites for weight loss. Web 2.0 features that are useful for healthcare and weight loss websites are described below:

1. Algorithmic applications of software to create automatic recommendation systems based on user data. There is a potential for applications to become more intelligent as more users use them through learning algorithms and an expanding database for information retrieval.

Amazon's recommender system works by suggesting products to the user based on his past history of purchases or by the history of purchases made by other users in the same demographic group. For weight loss websites, the system should be able to recommend diet, exercise plans and an overall set of strategies to the user.

2. User comments, user blogs and user articles as a novel way of obtaining user input. Users do not need special software knowledge to create their own content online. User no longer considers his personal entries private anymore, but makes them available to friends, a certain community, and ultimately the general public, and where this often leads to an improvement of the underlying platform. People buy products on Amazon based on reviews created by other users. Ability of users to offer peer support through comments and creation of blogs and other content to share success stories offers great potential for weight loss websites. Users answer questions posted by other users thereby providing an alternative method for obtaining information on the Web: rather than browsing results of search engines.

3. HTML and AJAX are used as fundamental development paradigms upon which present-day Web applications can be built using programming languages such as PHP, C# and JavaScript. This framework (Fig 2-1) where it is possible to create dynamic applications and content delivery with low delay, continuously update software without the need for upgrades and downtimes have revolutionized the market and created new opportunities for better services and experiments. Using open source software enables reduction in production costs and support from a huge community of developers for troubleshooting technical problems.
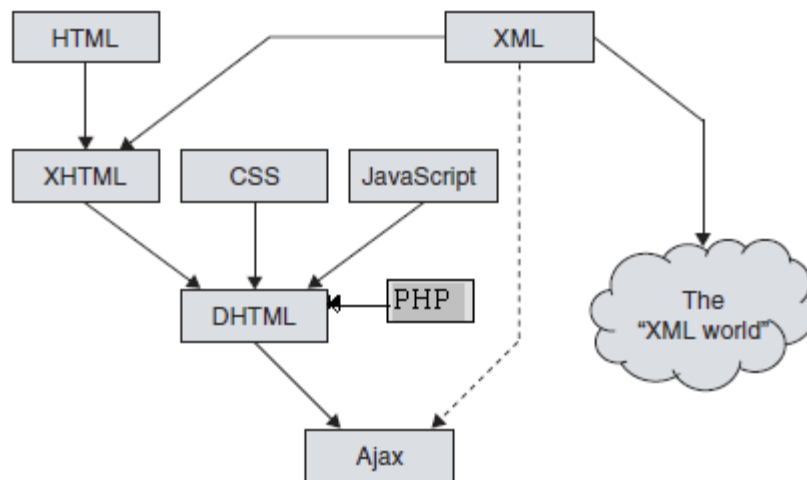
Fig 2-2: Programming framework of Web 2.0

4. The use of REST and SOAP Web-services and portable data formats of XML and JSON to deliver content to any end user device – stationary or mobile. This means data is accessible to everyone at all times. With the proliferation of smart mobile phones, the ability to go online at anytime from anywhere is no longer restricted to enterprise users alone leading to increased accessibility and participation from everyday users.

5. The ability to share photos and videos instantaneously over a variety of devices. Usage of tagging to identify and create online social connections based on real world events. Users can share success stories, upload pictures of them after losing weight to motivate themselves and access workout & diet videos. With proliferation of this media, there is a great opportunity to truly engage the users, which was difficult to do with text articles.

6. The ability to communicate real time with the Web application as a medium with no requirements for installing additional software on the user's device. This allows creation of online communities and social networks as places where users create and share collective intelligence and knowledge and share experiences. It also allows users to communicate with exercise specialists, physicians, dieticians and counselors as and when they are online.

7. Content syndication and automatic feed of most viewed articles, videos and photos and ability to setup scripts to contact inactive users. This helps to automatically keep track of users and contact them in case they are dropping out of the program. The ability to let users know of new content as it is created automatically is a great way to make users return regularly to the site and use its features.

8. Modular and scalable software design allowing for future development and feature expansion. There is open access to most used functions through Application Programming Interfaces of popular software packages, allowing for replication and customization of code for performing essential functions allowing for huge saving in development time and costs.

9. The creation of Rich Internet Applications through software that can enrich user experiences on the website by providing the user an interactive Web front-end with the same feel as that of a desktop application front-end. This is critical for any weight loss website as a great experience for the user means returning visits and word of mouth recommendations of the websites to other people wanting to lose weight.

The open source movement has gained considerable strength over the past few years and many developers have formed communities that worked on creating out of box Web 2.0 solutions. The most popular of these are Drupal, Joomla and Wordpress, which are Content Management Systems (CMS) because they provide ready to use tools for an individual or a community of users to easily publish, manage and organize a wide variety of content on a website. Of these, Drupal has been described as the "poster child for Web 2.0 community driven Web Applications" [37] due to its strong framework, performance and the wide variety of feature-rich modules that it offered for creating Web 2.0 solutions. Drupal also has a very strong and active developer community, usable documentation and over 18 books published offering valuable support for new developers wanting to create a high impact website. Drupal was my

choice to implement the Web 2.0 features that were crucially missing in the available weight loss websites.

Drupal:

Drupal is a free and open source modular framework and Content Management System. Tens of thousands of people and organizations are currently using Drupal to power scores of different Web sites, including

- Community Web portals
- Discussion sites
- Corporate Web sites
- Intranet applications
- Personal Web sites or blogs
- Aficionado sites
- E-commerce applications
- Resource directories
- Social Networking sites

Drupal's architecture contains a core that contains basic features such as the ability to register and maintain individual user accounts, administration menus, RSS-feeds, customizable layout, flexible account privileges, logging, a blogging system, an Internet forum, and options to create a classic website or an interactive community website. It also allows third party user contributed modules to perform tasks and include features that may be unique to each website. Drupal's strength lies in these user contributed modules of which more than 2000 exist offering a huge library of customizable features. Drupal's flexible Web application framework has made it possible to keep evolving quickly to support each new Web 2.0 functional trend.

Drupal powered sites:

In the Drupal conference 2008 held at Boston, a Drupal site showcase was created and case studies were done on the top ranked sites. Some of the most popular ones were the websites of The Young Writers Project, The Vineyard Voice, The Whole Grains council, Go Sleep Go, The Open Architecture Network, Red Room, Mozilla Foundation and Ubuntu Linux distribution.

The most important and common feature among these sites was the creation of a strong and vibrant community of users, ranging from kids to adventure seeking travel lovers to architects to software developers. Drupal was able to successfully provide a medium for people to come together, share their ideas, provide useful comments and collaborate on common goals. The creation of such a community is vital for any successful online weight loss website.

The ability of Drupal to place content at the forefront and create different levels of user roles were also very useful. Drupal focuses on the easy creation of content and then allows the users to tag and classify the content making it easily accessible through simple search or navigation options. Also the ability to create different levels of permissions for different groups of users allows a high degree of privacy control. All the websites used a number of contributed modules as well as some custom modules written by the Web developers. This highly customizable feature of Drupal is crucial for developing a weight loss website with an algorithmic recommender and feedback system that depends on user data.

Because of Drupal's excellent performance in handling high volumes of users and data, its modular design allowing for feature expansion without downtimes and strong privacy and security features, Drupal was chosen as the platform for building AchieveTogether.com.

Chapter 3

Prototype Design

I designed AchieveTogether.com to support the requirements of the research team at Penn State Hershey College of Medicine. My aim was to create a Web intervention tool that would assist people to lose weight and keep it off for a long period of time by helping them make changes to their lifestyle. The design was intended to involve the user through the interactive Web 2.0 features, support the creation of an active community and gather valuable research data to measure the effectiveness of the intervention. In this chapter, I will first identify the primary requirements of the website and then go through the rationale of the design decisions I made while developing the website.

Conceptual Design

Design Requirements

AchieveTogether was envisioned with its users' long terms objectives in mind. The site was to be a crucial tool in changing their everyday habits and connecting with other users to achieve long term weight loss. **Fig 3-1** highlights the conceptual framework of the user activities and the benefits of using the website.

The researchers at Penn State Hershey had completed in-depth interviews with 50 individuals who have been successful at losing weight and keeping it off. These successful individuals were referred to as "**Role Models**". From these interviews they were able to identify
1) What habits are being used to maintain weight loss,
2) How these habits are implemented and
3) How barriers to these habits are overcome.

Overall a list of **36 common and effective habits** was identified. AchieveTogether.com was to be designed as a storehouse for this information and an online portal to allow users to access it. The information was in the form of text, pictures, external links and videos and the site had to effectively display the content in the most accessible way.

```
                    ┌─────────────────────┐
                    │  Utilize the website │
                    └─────────────────────┘
                         │            │
                         │            ▼
                         │       ┌──────────┐
                         │       │  Connect │
                         │       └──────────┘
                         │            │
                         ▼            ▼
                    ┌─────────────────────┐
        ┌───────────│       Learn         │───────────┐
        │           └─────────────────────┘           │
        ▼                    ▼                         ▼
  ┌──────────────┐   ┌─────────────────┐        ┌──────────┐
  │  Be inspired │   │ Put in practice │        │  Share   │
  └──────────────┘   └─────────────────┘        └──────────┘
                             │
                             ▼
                       ┌──────────┐
                       │  Succeed │
                       └──────────┘
```
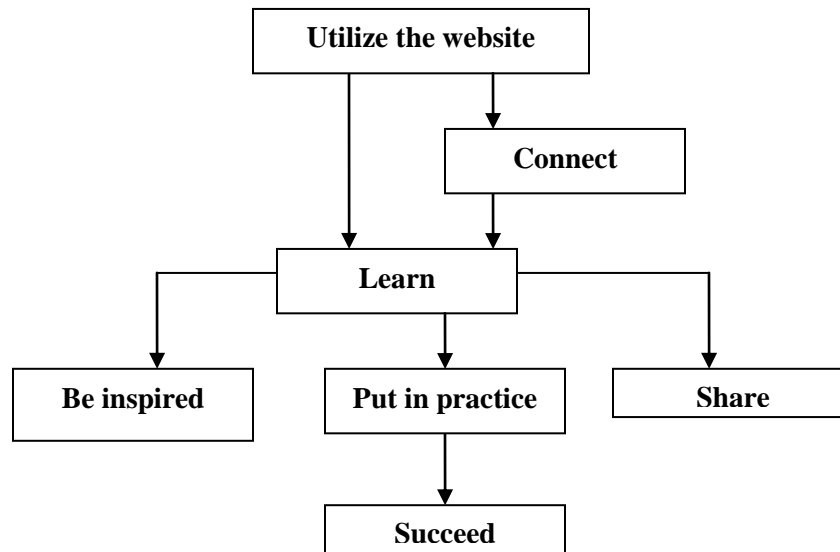
Fig 3-1: Conceptual framework of user activities and benefits.

As fig 3-1 indicates, the users are expected to learn from the different forms of information that is provided on the website and use what they learn to make changes to their lifestyle and help them to lose weight. Also they should be able to connect to people like them through the website and share some of their success stories and spread the change.

Apart from being a simple information providing website, AchieveTogether.com also had to be a successful recommendation and feedback system. The primary recommendation system worked in the following way: Data was to be gathered through initial surveys of the users, the algorithms would match the users with the role models and suggest habits that might work for

them. There would also have to be a second recommendation system that would monitor the progress of the users, specifically their weight and recommend if the habits in their plan were working or not. There would have to be visual indicator of their progress, for e.g., a weight chart. The final feedback system involved allowing the users to set achievable goals for each week and through data gathered from a returning user survey after one week; tell them if they had been disciplined in the past week. Personalization was the most crucial requirement of the website and it can be seen in the snapshot of the Recommendation & Progress page in Fig 3-2.

Fig 3-2: Snapshot of the Recommendations & Progress page

Overall these recommender systems were designed so that with an increasing number of users, the database would have more details and the recommendations would get better.

The other primary requirement of the website was to serve as a platform and access point for similar users to find and contact each other. Several collaboration tools were identified such as simple messaging through the website, e-mail, instant messaging through a chat server, groups, forums and bulletin boards. The website would have to support any or all of these features.

AchieveTogether.com also had to gather all the data about every user of the website for studying the effectiveness of the study. Some sample variables that were required by the researchers were:

1. Percent of people who log-in at least each week, and at least each month, by month of study.

2. Number of page-views per login, per week and per month.

3. Number of behaviors added, per month of study.

4. Number of behaviors used, per month of study.

5. Number of behaviors used often, per month of study.

6. Percentage of peers that a peer contacts each week.

7. Percentage of users completing weekly treatment.

Others potential variables of interest included:

1. Whether or not users lost weight or kept from gaining weight.

2. Demographics associated with those who lost x amount of weight over time.

3. Habits associated with those who lost x amount of weight over time.

4. Habits that had the highest fidelity (easiest to adhere to).

5. Survey responses pre/post intervention.

6. The addition/deletion of habits correlated with weight (i.e. do they delete a habit because they did not lose weight using it?)

7. Current weight versus target weight.

Most important of all, the site needed a fresh, light and modern look and feel to it to make it a memorable experience for the users. Users must be able to access all features regardless of the browser or operating system that they use. However access to the data was to be limited to registered users to encourage users to register with the site and thereby make the results of the study more accurate. Finally, the website had to be scalable to allow for a large number of users to access the site while isolating points of failure, and modular so that new features could be added at any point of time without affecting existing functionality and well documented to allow future developers to take over the website.

Design Assumptions

The following assumptions were made prior to the design of AchieveTogether.com:

    1. Providing success stories of common everyday people who successfully lost weight would motivate users to follow their example and achieve long term weight loss.

    2. Allowing users to pick and modify their own list of habits and giving them the freedom of choice while providing recommendations would be more effective than auto populating their plans.

    3. Providing ways for peers to contact each other, post content and get involved with the site would encourage them to put in more effort and aid them in achieving their weight loss goals.

4. Most users would return to the website at least once a week. Some users may not be

regular with accessing the website and there needs to be a mechanism to contact users

automatically to reduce the drop-out rate.

5. New features were constantly going to be added throughout the lifetime of the website

and that should not interrupt the working of the live website.

Assumptions such as using the online program will help a user to lose weight are based

on the long term results of the intervention that is currently being carried out by the researchers at

the Penn State Hershey in the controlled clinical trial.

Website Workflow

A great deal of importance was placed on the design of the website that would enable the

users to flow intuitively from one activity to another. Some of these activities such as the surveys

and goal settings are expected to be compulsorily completed by the user for maximum

effectiveness and accurate feedback. The majority of the users are categorized into new and

returning users. The paths that they are expected to follow through the website is shown in fig 3-

3.

New users   **Returning users**

```
┌─────────────────────┐        ┌─────────────────────┐
│      Register       │        │       Login         │
└─────────────────────┘        └─────────────────────┘
          │                              │
          ▼                              ▼
┌─────────────────────┐        ┌─────────────────────┐
│    Demographic      │        │   Returning user    │
│      survey         │        │      survey         │
└─────────────────────┘        └─────────────────────┘
          │                              │
          ▼                              ▼
┌─────────────────────┐        ┌─────────────────────┐
│    Initial user     │        │  Progress indicator,│
│      survey         │        │ summary of useful/not│
└─────────────────────┘        │   useful habits and │
          │                    │ recommended habits (with│
          ▼                    │  option to add and delete│
┌─────────────────────┐        │      habits)        │
│ Summary of suggested│        └─────────────────────┘
│ habits (with option to add│            │
│    and delete)      │                  ▼
└─────────────────────┘        ┌─────────────────────┐
          │                    │  Goal setting page  │
          ▼                    └─────────────────────┘
┌─────────────────────┐                  │
│  Goal setting page  │                  ▼
└─────────────────────┘        ┌─────────────────────┐
          │                    │ Personal Plan (with option│
          ▼                    │ to print the plan displayed│
┌─────────────────────┐        │  prominently. Plan gets│
│ Personal Plan (with option│   │  emailed automatically.)│
│ to print the plan displayed│  └─────────────────────┘
│  prominently. Plan gets│
│  emailed automatically.)│
└─────────────────────┘
```
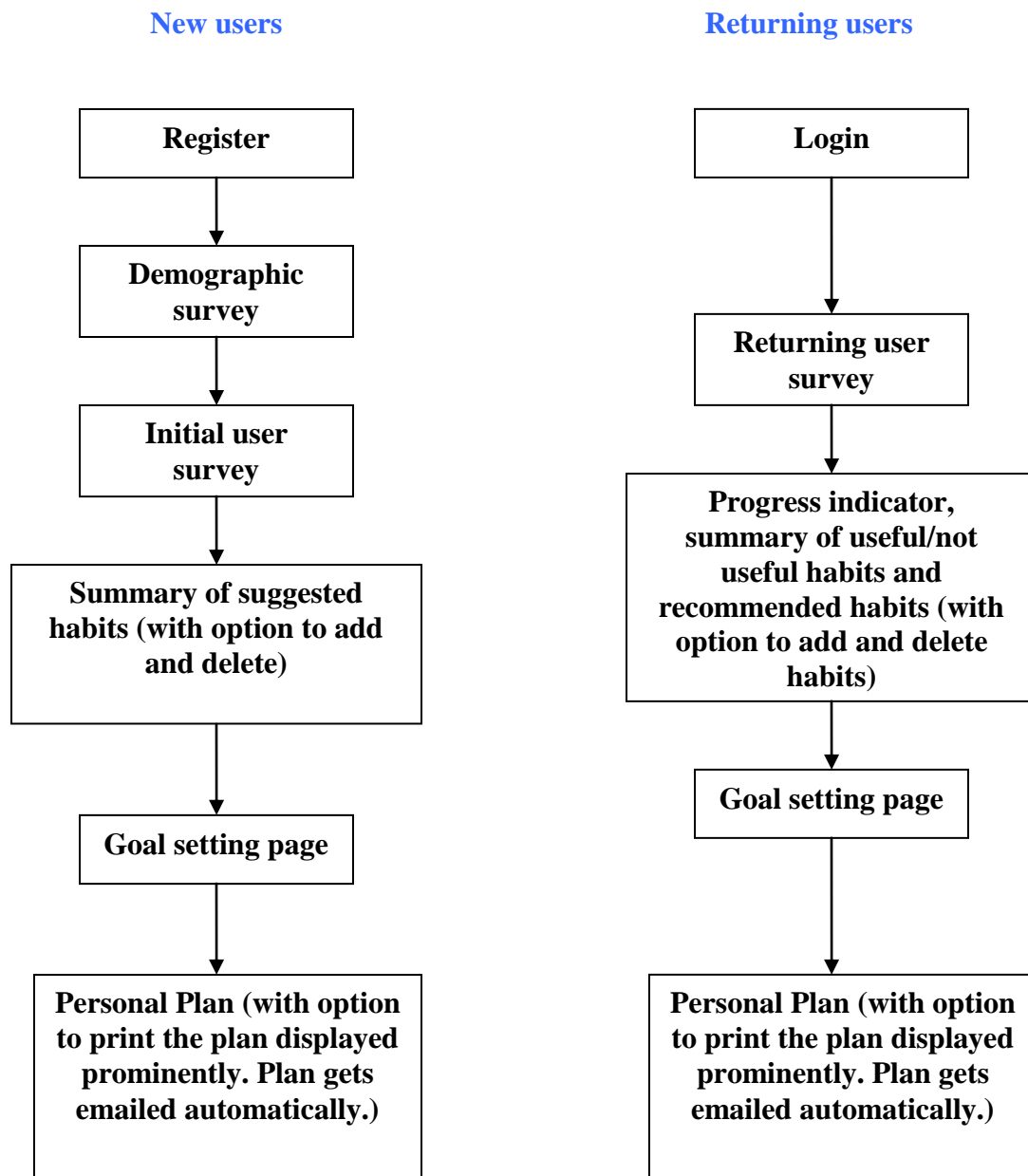
Fig 3-3: Website Workflow

A **new user** is someone who is visiting the site for the very first time. The new user is expected to complete the registration which involves submitting demographic information. After completing the registration the user takes an initial survey. This survey asks the user how often she was using each of the 36 useful habits in the past 7 days. The user is then provided with a

recommended list of habits and can make modifications to her plan by either adding or deleting habits using the appropriate forms. Once that is complete the user should set goals for how often she plans to use the habits during the week.

A **returning user** is a user who already has an account with the website and has a small set of habits in her plan. The returning user takes a survey that asks her how effectively she has stuck to her habits over the past one week. Once that is complete, the site provides recommendations and shows her progress over the course of using the site. After making the modifications to her plan, the user can set goals for the next week.

At any point of time after reaching the recommendations and progress page, the users can branch out in different directions, such as finding out more about the habits and role models, contacting other users, contributing their own experiences or reading about the experiences of others. But the website always makes it easy for the user to return to the original predefined path set by the researchers.

Physical Design

The website http://achievetogether.ist.psu.edu (IP address: 130.203.135.204) required installation of the Drupal Open Source content management system which can be downloaded from www.drupal.org. Version 5.12 of Drupal was installed on the IST server of Penn State University, University Park. The pre-requisites for the Drupal installation were:

1. Linux Red Hat (Server Operating System)
2. Apache/2.2.3 Red Hat (Web Server)
3. PHP Version 5.1.6 (Scripting language libraries)
4. MySQL version 5.0.45 (Database System)

Drupal provides options to theme the website with a uniform style. From the several hundred themes that were available, the Marinelli theme was chosen because it offered clear navigation links and the ability to customize the font, images, colors, blocks and menus in the website.

Normally, every time a user visit a Drupal page, Drupal makes dozens of queries to the database to pull out the data needed to generate the HTML that the Web-browser renders. However when caching is enabled, Drupal stores the HTML for any page visited by a user into the database. When there is another request for the same page, Drupal gets this page out of the database with a single query rather than re-generating it from scratch with multiple queries – this greatly improves system performance and reduces the time for the page to load. Bandwidth optimization can also be done with Drupal compressing the CSS style sheet used to theme the page and reduce the number of requests to the Web server. Overall this can reduce the server load, the bandwidth used, and the average page loading time for the users.

The software view of the website constitutes of two main components:

1. Interface
2. Backend

Interface

Content accessibility is the ability of the website to deliver well-organized information. It requires a clear identification of a few core contents that synthetically convey the information of the entire application, and then the repeated use of few, well-designed access patterns so as to give the users the impression of mastering the process of retrieval and navigation.

Data Design:

        For this website, the core concepts are the *Habits* and the *Role models*. Both these core concepts are modeled as entities with a collection of attributes. Links are created bi-directionally between Habits and Role models. These are used to present all role models who used a habit and all habits used by a given role model.

        Habit as a core concept is organized by habits based on diet, exercise or other behavioral characteristics. Similarly role models are categorized based on the age group they fall under. Users looking for the most similar role models narrowed down their search first by their age and then by the amount of weight lost. The designs were chosen in a way that the user can easily make decisions while navigating without any cognitive overhead.

        Each of the habit pages and role model pages were created as a custom content type using the Drupal Content Construction Kit (CCK) which allows the developer to define fields or attributes for the content.

        For the habits, there were 4 questions associated with each habit which the role models answered:

1. Why did you start to use this habit?
2. What gets in the way with using this habit?
3. How to overcome those barriers to using this habit?
4. What advice would you give for using this habit?

Each question had its answers in text. There was also a video of one of the role models answering each question that was embedded in the page.

For the role model pages there were 2 primary attributes:

1. Top 3 habits of each role model

2. A profile of the role model detailing their motivation and implementation of their overall weight loss program.

All of the habit and role model pages were displayed in the same format, with the fields appearing in the above given order, so that users could become familiar with the pattern and understand where they would find the information they were looking for. For example, if users were looking to overcome barriers, they knew that it would be the third field for all of the habits. With the use of Drupal taxonomy module, it was possible to tag these pages with the attributes mentioned above. Combining it with the CleanURL module, it was then possible to assign unique URLs to all the habits in the format "habit/#habit number" where #habit number could range from 1 to 36. Role models were assigned "luckyloser/#id" where #id referred to a unique identifier associated with each role model ranging from AT103 to AT 281. This helped in efficient hyper-linking and interconnection throughout the website allowing for ease of navigation for the users.

Presentation Design:

I focused a great deal on the presentation of the website, the images, font, color combinations and background. As mentioned earlier, Drupal allows custom themes to improve the look and feel of the website. Using a combination of theme override codes and Cascading Style Sheet modifications, it was possible to obtain a very custom modern to the website while conveying the message of the importance and benefits of a healthy lifestyle.

The first decision was to use 75% of the screen real estate, to bring focus to the content. As a general rule, each page was divided into three: header, content and footer areas. The header area

was divided into 2 areas. The top part was allotted for the primary navigational links or "landmarks". These represented the most used and accessed features and pages of the website. Links were provided to the Welcome page, Recommendations page, Personal Plan page and the list of Habits and Role Models. A large section of the header was allotted to the banner of the website which was specially designed by a graphic designer to convey a visual message of the intent of the website (Fig 3-4).
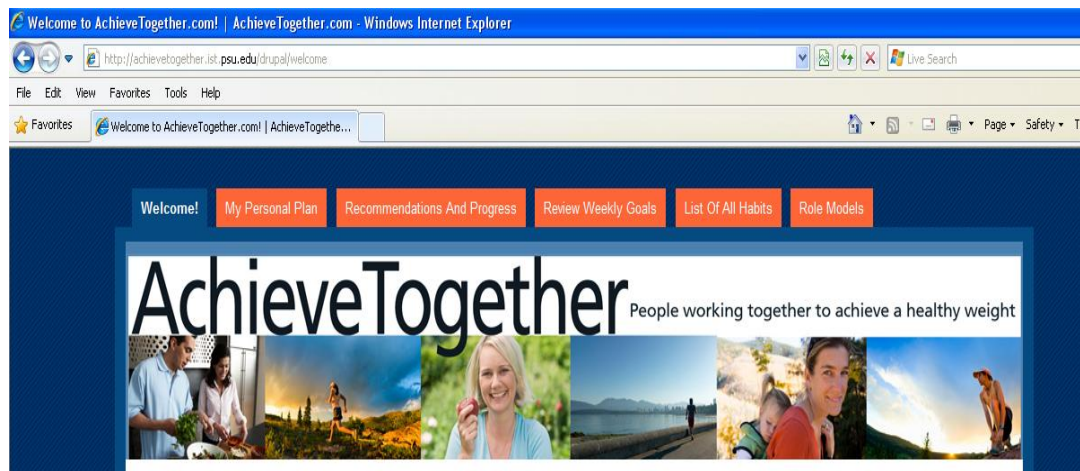

Fig 3-4: Top links and banner

I decided to go with a 2 column layout for the website: displaying the content on the left column and allowing for a sidebar on the right for placing less frequently used functions. This was chosen in response to eye-tracking studies [42] which showed that users tend to follow an F-pattern while scanning the contents of the website: two horizontal stripes followed by a vertical stripe.

- Users first read in a **horizontal movement**, usually across the upper part of the content area. This initial element forms the F's top bar.

- Next, users move down the page a bit and then read across in a **second horizontal movement** that typically covers a shorter area than the previous movement. This additional element forms the F's lower bar.

- Finally, users scan the content's left side in a **vertical movement**. This last element forms the F's stem.

Relevant images were also added in the content area to bring focus to the content as users tend to switch off if they only see text. Also through a mix of color, bold text and contrast, attention was drawn to the key points and headings in the pages.

Videos in the website were encoded using the Windows Media Player format to allow for maximum accessibility. Each of the habit pages has 4 videos per page, showing the testimonials of the role models for the 4 questions that were asked about each habit.

Custom user profile pages were created by modifying the user_profile.tpl.php file in the themes folder. This led to fine-grained control over which data of the users would be accessible to other viewers. I was able to customize the order and style of the field information displayed for each user (Fig 3-5).

You are viewing the Dashboard of

Dheepak Ramaswamy

Male

Age: 35

Member since: 12/02/2008 - 6:48am

Last accessed: 07/30/2009 - 11:19am

Current Weight: 175

Target Weight: 140

What habits is Dheepak using consistently?

Remind yourself why you need to control your weight.

Limit the amount of sugar you eat or drink, such as cookies, desserts, sweets or in soda.

Follow a consistent exercise routine.

Eat plenty of fruits or vegetables.

Fig 3-5: User profile page

Useful Features in the website:

       All users of the website are initially directed to the Welcome page (Fig 3-6). It contains

details about the site and options to login, new account creation and for users who forgot their

password to get a new one. Also, an introductory video that clearly explained how the website

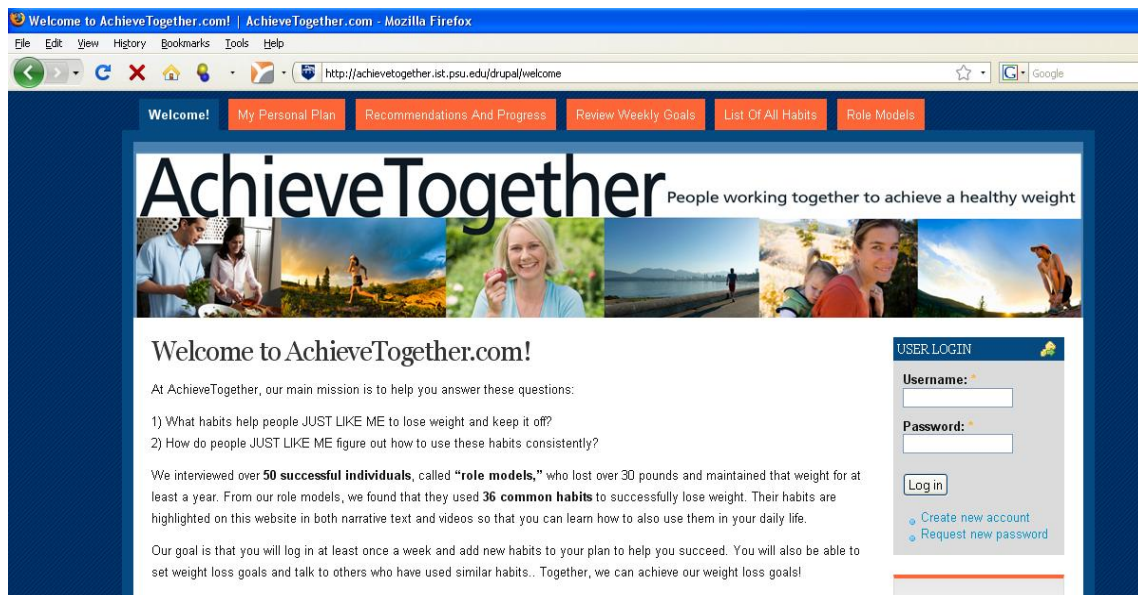works, its features and its potential benefits was added.

Fig 3-6: Welcome page

    Demographic variables are collected from the users using the Profile module when they

register for a new account with the website. Some of these variables are first & last name, date of

birth, gender, weight one month ago, current weight, target weight, current height and education

level. This data is accessible throughout the website through the special $user variable.

    The user registration page displays the minimum set of Terms and Conditions which the user

had to accept. The page does not allow anyone younger than 18 years of age to register as the

website is only meant for adults (age 18 or older). The user registration page also asks the users if

they would like to allow other users to contact them. This would ensure privacy in the usage of the website. By adding a registration code field, the website prevents the people in the control group from having access to the intervention. If they do, it will bias the results of the intervention to the null.

The initial user survey, returning user survey, logout survey and forms for goal setting, addition & deletion of habits were created using the Webform module. This module provides several additional features such as user access control, ability to add more form components on the fly, automated mailing of the user submissions to the administrators and options to customize the display of the form. There is also a very efficient integration mechanism with the backend database with the Webform module allowing for faster response times.

Fig 3-7: Returning user survey

An algorithm was created to rank and display the top five users of each of the 36 habits from the complete list of the website users. The current user can pick anyone from the list to learn more about them. The profile of the peer who was picked is shown when the user clicks on their name. On the profile page, a link is available to the private message module (fig 3-9) which allows the users to contact each other with the website as the medium.

These are the users who have successfully used this habit. You can view their personal plan and contact them for support!

dxr265
Heather
rpogash
Joanne Longenecker
kkreider
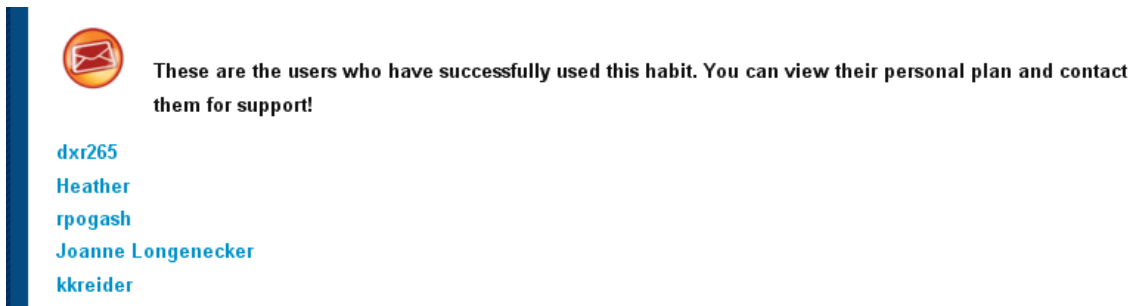
Fig 3-8: Top users of a particular habit

Private messages

List   Compose   Contacts

To: Dheepak
Separate multiple names with commas.

Subject: Test Message

Message:
Hi Dheepak!

How is the development of the website coming?

Thanks!

- Web page addresses and e-mail addresses turn into links automatically.
- Allowed HTML tags: <a> <em> <strong> <cite> <code>   <dl> <dt> <dd><font>
- Lines and paragraphs break automatically.

More information about formatting options

Preview   Send private message   Cancel

Fig 3-9: Private Message module

While answering the initial, returning user survey and while setting goals for the week, a uniform set of options are provided to the users. These will either answer the question "How regularly did they use a particular habit in the past week or how often they plan to use a particular habit in the coming week?" The options are coded in with an equivalent numeric value for data analysis purposes:

- Always or almost always (5)
- Much of the time (4)
- About half of the time (3)
- Some of the time (2)
- Hardly ever (1)
- Not at all (0)

A clear line graph showing the weight progress of the users over time is prominently displayed on the Progress page. This was the most important requirement as a visual progress indicator. The chart has a weekly interval for every entry of weight recorded during the returning user survey.

The researchers also had a statistical algorithm to calculate and organize existing habits for each user into

1) Useful habits: Are helping the user to lose weight.

2) Habits that are not helping the user lose weight.

3) Habits that need to be used more often in order to decide if they are useful or not useful.

If there were no habits falling in any particular category, then the corresponding category heading is not displayed. The algorithm to determine the category in which the habits in the plan will fall into is described in Table 3-1. For example, if a user has lost weight (Weight status = 3) and he

has been using a habit always or almost always (Habit use = 5), then that habit is labeled as one

that is helping them lose weight (Recommendation = 2).

Table 3-1: Recommendation Algorithm for determining if habits are/are not useful.

Algorithm to Determine Use More/May Be Helping/Not Helping

WEIGHT STATUS	HABIT USE	RECOMMENDATION
3 = lost weight	5 = Always or almost always	2 = May be helping
2 = maintained weight	4 = Much of the time	1 = Use more
1 = gained weight	3 = About half of the time	0 = Not helping
	2 = Some of the time	
	1 = Hardly ever	
	0 = Not at all	

3	5	May be helping
	4	May be helping
	3	Use more
	2	Use more
	1	Use more
	0	Use more
2	5	May be helping
	4	May be helping
	3	Use more
	2	Use more
	1	Use more
	0	Use more
1	5	May not be helping
	4	May not be helping
	3	Use more
	2	Use more
	1	Use more
	0	Use more

Goal Feedback

If the users did not meet their goal for using a habit, the feedback will include a thumbs-

down graphic and if they met their goal (or are using it more than planned) they will receive the

thumbs-up graphic. This was to be calculated by comparing the goals the user sets during week

number (n) and the returning user survey answers while the user logs in during week (n+1).

Recommendations:

The most important feature of the website is its recommendation system. The age,

current weight, target weight, gender and education level of the user are obtained from the $user

objects of the Profile module. These values are compared with the demographic data of the

successful role models. The conditions are as follows:

a) If gender ($user) == gender (role model)

b) If (Target weight ($user) ± 25 == current weight (role model))

c) If (age ($user) ± 5 == age (role model))

The algorithm retrieves the top 5 role models who match these conditions the closest. The

top 3 habits of these role models have been recorded in the database. Duplicates are accounted for

by storing the habits in array and making array elements unique. A final recommendation is then

displayed to the user.

The website has an automated email reminder module that alerts administrators and the

user if the user has not logged in for more than 7 days. There is a "Report abuse" link that would

enable the users to directly email the administrator to report any misuse of the website. For

session management, the website automatically logs the user out if there has been no activity for

half an hour using the Auto-Logout module. Also, it protects the data from simultaneous logins

on the same account by automatically logging out an older session through the Session-Limit

module. Before logging out, the website helps the user verify if he has completed all the

necessary tasks of the workflow.

Backend Architecture

The backend of Drupal is simple, with logically organized links to create new content, edit existing content, manage user accounts and permissions, ability to theme, add modules, perform upgrades and backups and control settings of all modules. The code generated by Drupal is a bit more complex than most other CMSs, but still relatively easy to understand. All modules in Drupal are written in PHP using the hook system [38], a hook is a simple PHP function to access and share the core functions of the Drupal framework. This system enables easy customization of modules to suit our purpose. In that way, Drupal is being used as an effective blog platform, has great support for media built-in and has great plug-ins for enabling functions for image and video hosting and seamlessly integrates the recommendation systems and forms. Drupal is very manageable because it is possible to uninstall themes and modules that are not required without affecting the overall working of the system.
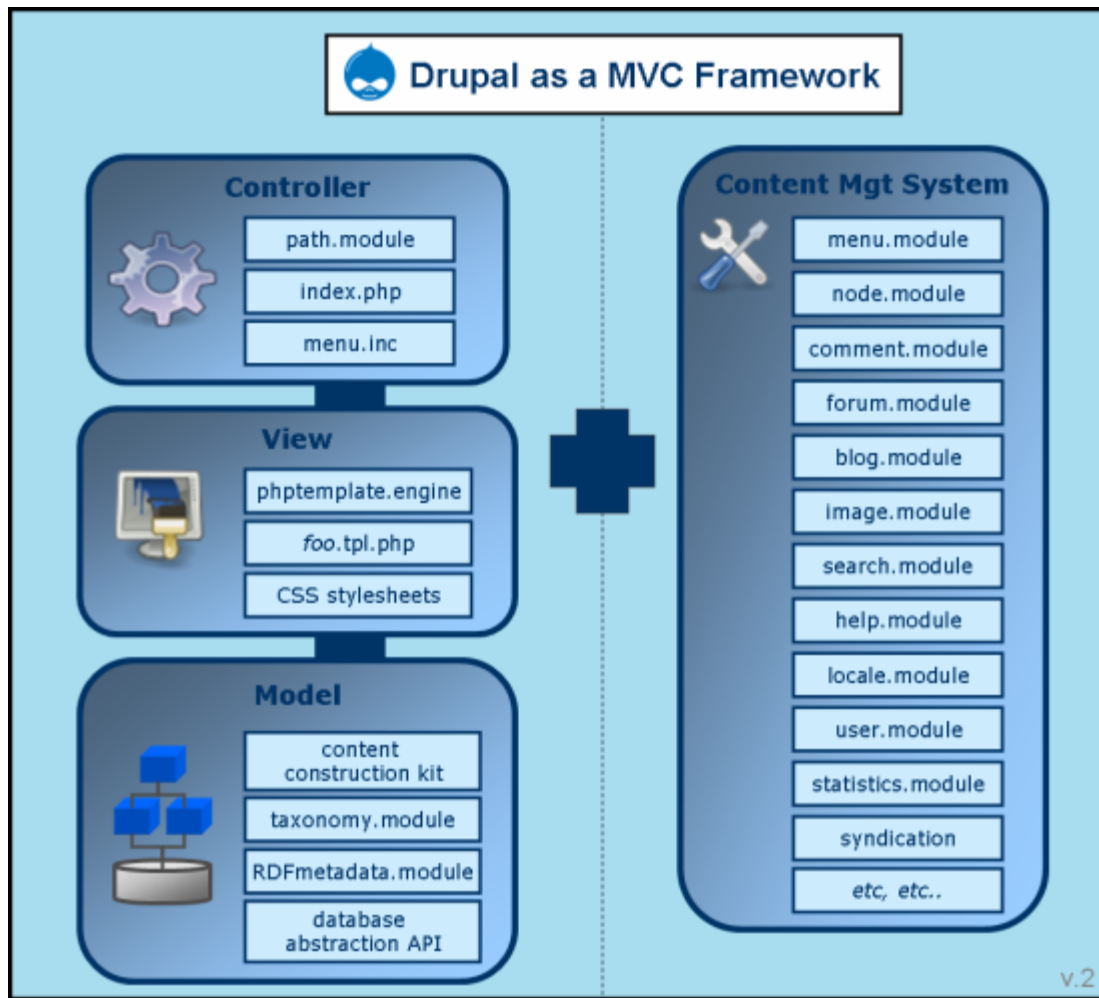
Fig 3-10: Drupal Framework

MVC stands for "Model-View-Controller", a software engineering architecture pattern. When applied to the Drupal framework, the *controller* refers to the forms and surveys that collects user input, the *model* refers to background code written using PHP by the developer and by third party modules which manipulates application data, and the *view* which is the user interface that can be designed using the style sheets and presents the results to the user. In our case, views and controllers come in pairs, each corresponding to a small part of the user interface; the website has been built with many such pairs.

Research Tables:

Drupal creates a set of 100 tables for performing the core functions on a MySQL database system. Apart from this, each additional module and theme creates its own table automatically during installation. Access to the database was done through a browser based interface called "PHPMyAdmin". PHPMyAdmin allows creation, deletion and editing of databases, tables and records. It allows creation of table structures, schema and different data types such as numeric int, float, string and character. Fig 3-10 shows the structure of one such table with its data.

For gathering data for the researchers at Hershey Medical School, I created a set of 6 new tables. These tables store details of the current habits of the users, the date and time during which they were added or removed from their plan, their weights during the additions, their goals for the week and their scores on the surveys. These tables were linked to the webform module tables using a simple relational database model. Fig 3-11 shows a partial list of the tables created for the website.

			id	uid	habitid	habit	score	timestamp	weight	time	sid	goal_value
☐	✎	✗	919	70	30	Avoid going too long without eating, such as by sk...	2	1241033242	148	Wed, 29 Apr 2009 15:27:22 -0400	465	3
☐	✎	✗	918	70	3	Look for information about weight loss, nutrition ...	5	1241033242	148	Wed, 29 Apr 2009 15:27:22 -0400	465	3
☐	✎	✗	916	73	36	Think about your goal for a healthy weight.	5	1240931717	150	Tue, 28 Apr 2009 11:15:17 -0400	0	0
☐	✎	✗	917	70	2	Follow a consistent exercise routine.	2	1241033242	148	Wed, 29 Apr 2009 15:27:22 -0400	465	1
☐	✎	✗	915	73	30	Avoid going too long without eating, such as by sk...	5	1240931717	150	Tue, 28 Apr 2009 11:15:17 -0400	0	0
☐	✎	✗	913	73	18	Write down how much you exercise.	5	1240931717	150	Tue, 28 Apr 2009 11:15:17 -0400	0	0
☐	✎	✗	914	73	24	Look at older pictures of yourself to motivate you...	5	1240931717	150	Tue, 28 Apr 2009 11:15:17 -0400	0	0
☐	✎	✗	912	73	12	Limit the amount of unhealthy food in your home.	5	1240931717	150	Tue, 28 Apr 2009 11:15:17 -0400	0	0

Fig 3-11: Structure and data of members_habits_score table

Fig 3-12: Database tables

I also created a set of pages on the AchieveTogether.com website for the direct dump of all the data gathered in the relevant tables in the database. This protects the database from repeated calls for data export that may pose a threat to the privacy of the users and the security of the website. Several additional modules such as User Profile Export module also help create organized data dumps of user information.

In this chapter, I have tried to capture the most important design elements that went into building the website. A more detailed explanation is provided in the Appendix with regard to the specific modules and functions used. In the next chapter, I describe the user testing that I conducted and present the results obtained from analysis of the initial observations.

Chapter 4

Evaluation

Overview

The evaluation of AchieveTogether.com was done to gain better insight into the usability of a Web 2.0 tool for long term weight loss.

Usability is defined in the International Standard of Usability as follows:

"*Usability: the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.*"[39]

Consequently,

The goals of this evaluation were:

1. Evaluate the overall effectiveness, navigability and impressions of the website design.

2. Identify areas of the website that needed improvement.

3. Examine how users used the features such as private messaging and blogging.

4. Analyze the users' success in efficiently completing the tasks given and overall satisfaction with the website.

5. Identify features for the next version of AchieveTogether.com.

I used two evaluation techniques: observation and interviews to gain insight into the user's thought process, opinions, and the website's strengths and weakness. Before the evaluation, a set of use cases for the most commonly performed tasks on the website were developed for the evaluation.

Usability Evaluation Setup

Participants

The evaluation was performed with 29 participants. Figures 4.1 and 4.2 present the demographic profile of the participants. The participants included university students and a few of their parents.

The reason for choosing these participants was to ensure my test subjects were a representative sample of the eventual users of the website. Out of the 29 users, 19 were comfortable navigating websites and 10 were not so comfortable. Out of the 19 Web savvy users, 8 were extremely active Web users, going online for over 10 hours a day. Also among the 29 users, 11 were seriously interested in finding online solutions to their weight loss problems, while the rest were open to the idea and wanted to get a glimpse of the website before deciding whether to use it or not.

The participants were asked to perform a set of tasks designed to test the various features of the system. The evaluation of the website took each participant about 30 to 45 minutes. The participants used the Windows XP or Vista operating system with Internet Explorer, Mozilla Firefox or Google Chrome browsers.

Age group	No. of subjects
15-19	2
20-23	10
24-28	7
45-50	4
50-60	6

Fig 4.1 Age distribution of participants
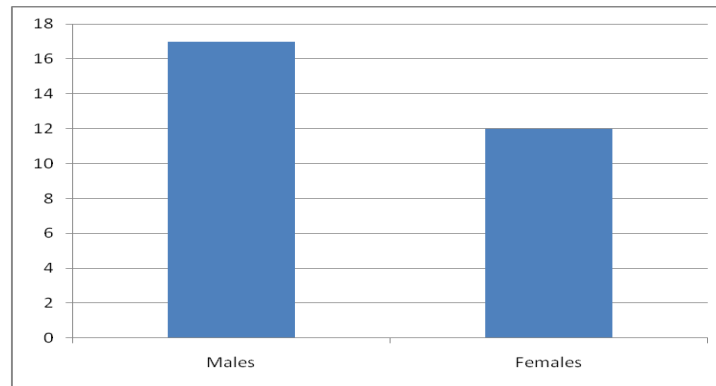
Fig 4.2 Gender distribution of participants

Usage Scenario.

The participants were given 2 scenarios:

1) As a new user of the website, they were to log in and explore the features of the website and complete a set of tasks.

2) They were to assume that a week has passed, log in to the website and complete another set of tasks.

Although no time limit was given, most participants spent between 15 to 20 minutes to achieve the goals for each scenario. During the scenario, participants were asked to follow the think aloud protocol [40] in which they described their thoughts about what tasks they found were easy to accomplish, how they would go about accomplishing the tasks, issues they had with navigation, things they would change about website and things they found that were interesting, useful and had not come across in any website before AchieveTogether.com.

The comments of the participants was recorded by hand and later transferred to an Access database. Their movement on the screen including the areas that they most concentrated on, links they used most frequently, functionality that they used and the ones they did not realize was available was also observed and recorded by note taking. Their use of the system was further

analyzed using the access logs that Drupal provides to identify specific patterns of navigation.

Tasks were designed with the goal of the eventual user of the website, which is to identify a set of

habits to help lose weight and keep from gaining weight and the goals of the study. Below are the

tasks that were given to the participants as part of each scenario.

Scenario 1: New user tasks

1) From the home page, create a new user account.

2) Check if your user name is available.

3) Complete your demographic information.

4) Complete the initial user survey with answers that match your habits the best. Indicate to the
   tester if you find any questions or options are difficult to answer.

5) Identify the habits that have been recommended to you by the system.

6) Go through the habits and add 5 of the suggested habits to your plan

7) Now delete two habits from your plan that you think are the most difficult for you to
   implement.

8) Set your goals for the week.

9) Print your goals for the week.

10) Logout of AchieveTogether.com

**Scenario 2: Returning user tasks: (It was indicated to the participant that they have to
assume that they are returning to the site after one week).**

1) Imagine you are logging back after a week. In the login screen, login using the username and
   password you created in the previous task.

2) If you have forgotten the user name and password, follow the steps to retrieve your password.

3) Complete the returning user survey.

4) Indicate to the tester the strategies that the website says are either working or not working and which strategies need to be used more often.

5) In the strategies that need to be used more often, identify at least 2 role models who used it successfully to the tester.

6) In the strategies that need to be used more often, identify current users of the website who are successfully using it. If no one is using that habit, please indicate it to the tester.

7) Send a private message to the current users who you have just identified.

8) Find 3 strategies that the role models "Marcus" and "Marcella" used successfully.

9) Create a blog about a topic of your choice.

10) Comment on the blog of user "test".

11) Change your account picture and your education level.

12) Understand the overall "Terms of Use" and "Privacy Policy".

13) Logout

Data Collection

Observations

The participants were either asked to come to the lab or were given access to a computer in a controlled environment. I facilitated each session. Each session was conducted according to a script to maintain consistency in the findings. The participants were urged to provide both positive and negative feedback. The participants were initially given a brief introduction to the website and its overall objective. The purpose of the current usability study was also explained to them. I sat alongside the participant, taking notes while the participant talked about their actions and opinions of the website while simultaneously completing the tasks. Assistance was provided with task instructions but not with the actual execution of the tasks. I also recorded the progress of their ability to learn and navigate through the system, taking notes of the links and functions that they missed.

Interviews

The users were interviewed right after using AchieveTogether.com while things were still fresh in their minds. The interview included structured, semi-structured and unstructured questions. Some questions required yes/no answers, a few required choosing from a set of answers, and others required users' opinions. The interviews with each of the teams took about 10 to 15 minutes. The interviews were recorded for future analysis. Below are the interviews questions used in the study.

Interview Questions:

1. Have you used a weight loss website before?

   a. Yes

   b. No

   If 'Yes' name the website: _____

2. Did you have problems using the system? If yes, can you describe some of them?

3. Is the website clear for you to identify what to do next and where to search for things?

4. What do you think of the overall look and feel of the website: the colors, font, images, and videos used?

5. Do you think the content is well organized? If not, what are your recommendations for easy and efficient content access?

6. Is there a good balance between text and graphics on the website?

7. Is the content provided on the website match its purpose?

8. Did the system help resolve errors by proving feedback of necessary steps to be taken?

9. If you made an error, were you able to go back and correct it?

10. Was the interface intuitive to navigate and accomplish the tasks given?

11. Did you feel any of the links, forms, options and buttons used in the website out of place? (Testing Mapping)

12. Did you need extra information and guidance to use the website?

13. Suggest improvements to the surveys and functions.

14. Was the website easy to learn? (Testing Learnability)

15. Do you think you would be able to use the website next time without any guidance? (Testing Memorability)

16. Suggest what other features you would want the website to support.

17. On a scale of 1-5, how would you rate the navigational ease of the website?

18. On a scale of 1-5, how would you rate the look and feel of the website?

19. On a scale of 1-5, how likely is it that you would recommend someone looking to lose weight to use this website?

I used the interview questions to better understand the participants' views about AchieveTogether.com and their experiences with using the system. The questions also provided a way to confirm the observations I made and get a detailed input from the users.

Access Logs

Every page and action completed by the user was recorded in Drupal's access logs for further analysis. I used two tables of logged data from each of session of use of the website:

1. Access log table: This was used to identify the users' flow through the website, the order in which they viewed the pages and the time spent for performing the critical tasks of the website. Comparing these to the use cases that I had prepared for each of the scenarios helped me understand the amount of deviation that users were generally ending with from the ideal workflow. It also helped me understand which of the methods was preferred for performing tasks that had more than one way of doing it such as adding habits to their plan.

2. Watchdog table logs: This table contains any error messages that arose due to the users' actions and helped me understand how the users recovered from those errors.

Results of Usability Test

Large amounts of qualitative data were collected through the evaluations:

1. Notes taken during observations and interviews that were entered into a database

2. Log files

Data recorded from the notes and interviews were compared to the access logs to ensure the authenticity of the results and ensure that user actions matched their answers in the interviews.

Once that was complete, the data was coded using classification schemes commonly used for user testing such as user behaviors while handling a task (both verbal and physical), level of completion of tasks, nature of tasks and their difficulty level. This helped me identify interesting issues for further analysis and identify different patterns in the data. The data was then grouped into categories such as navigability issues, content issues, look and feel issues, errors, requests for new features and so on.

My goal through this evaluation was to identify what features an online Web application for long term weight loss must have that would encourage its users to continue to keep using the site over a long period of time and possibly benefit from it. To do this I focus on the benefits and challenges that users of the study faced while they used the website. In the following sections, I present the results obtained from analysis of the initial observations. The results indicate a clear set of themes that the users think would help them better use the site.

Positive feedback from users

The themes in this section describe usability features in the website that users were happy with and found them motivating enough to continue using the website.

Good first time experience and right amount of information

11 of the 29 users involved in the study were seriously looking for a way to achieve long term weight loss online. Of these 11 users, 9 thought this website offered a refreshing change from the cluttered websites of the major online weight loss solutions.

> "*AchieveTogether.com is an ideal point to start my online weight loss program since it gives me a plan based on a generic behavior pattern I need to follow to succeed. Once I have that, I can then focus on whether I want to go the diet or exercise way for my goals and AchieveTogether.com gives me the links to those specialized websites. There was just the right amount of information on the homepage and the pages inside and having the videos explaining the objectives really helped me from having to go through blocks of text.*"

The fact that users got a plan from the website in minutes instead of having to go through mountains of data and innumerable clicks was a point of high satisfaction with 90% of users saying it made it a ***great first experience***. They felt that this website was an ideal starting point before moving on to more focused programs. It shows that users are looking for instant takeaways for them to get started on a weight loss program. Also an information overload tends to switch users off. Each weight loss website should be focused on its unique theme and way in which it can help its users.

Expert recommendation and approval of content

13 of the 17 users (76%) in the age group of 24 and above said they were looking not just for people like them, but also for experts to provide a stamp of approval on the site's content and recommendation. Watching the introductory video gave the users a great deal of confidence to actually start using the site with an expectation that it would help them. However, when one user saw that the terms of service mentioned that the data was not reviewed by physicians and doctors, she completely lost trust in the website. I had to then clarify the statement saying only the messages posted by current users have not been reviewed. Thus branding and trust in content is key to success of any online weight loss website.

Respect of Privacy and Advantage of Anonymity

The first set of users (15 out of 29, 51%) who went through the testing scenarios were not asked to enter their real names. This condition of anonymity led to the scenario where none of the users hesitated to enter their actual weight. The fact that they did not have to face their fear of judgment by others really helped these users to come to terms with their weight loss issue and look for solutions.

In fact one user in this batch suggested the following:"*I would like to have my own online diary and journal to be included in the website if other users don't really know who I am! I will be completely honest about my struggle with my weight and would like others to learn from my mistakes.*"

However, for the second set of users who were asked to enter their real name, the fact that their profile page displayed all their information made them uncomfortable. Hence a decision was made to make that data inaccessible to all other users of the website. Privacy and anonymity are therefore basic requirements that users have now come to expect from websites that ask them for their data. Uses do not like to compromise on data integrity and security.

Accessibility and Availability

According to the users' answers from the interview questions, some of the best characteristics of the website were the fact that the program was free; it was available to them at any time of the day and from anywhere as long as they had access to the Web. Users liked the fact the website was offering quality content for free. 5 users expressed the fact that they had seen websites which might potentially offer good programs but then they would have to pay for it which led them to look elsewhere. 1 user said she had paid a subscription but then found that she did not like the program and decided to drop out, also losing her subscription.

The users believed that having continuous access to the website would lead them to be aware of their weight loss program and not lose track of their goals at any point. One user mentioned how when she used to attend weekly weight loss meetings but would lose touch with her group as the week went by. Having the website easily available at all times meant she could send a message to someone or read about a role model to keep herself focused on her goals.

When they were shown the feature of how an email gets sent to them automatically after setting their goals, 22 of the 29 users felt it was a great feature. This meant that they always had the plan from the website at their call. The feature of the website automatically sending them a reminder email after a week had passed since their login was also well appreciated by the majority of the users. They felt that this kept them in touch with the website throughout the duration of their weight loss program. Some users also suggested that the website send them daily digests with interesting articles on weight loss to their emails and every time new content got posted on the site.

One user said: "*I would like to know how well other people using the website are doing, if they lose weight, post content or try something new and works for them, I would like to try that too. Even if it is not going to be an email, I would like to see updates at some place on the website, which would have new content every day.*"

However a small number of users felt too many emails from the website would be a problem and they were comfortable with just the goal and reminder emails. This was because they felt their inbox would be cluttered with unnecessary emails. If the website was going to publish daily content, they felt they should get an option to be able to read daily or weekly digests on the site itself.

It can be seen that for the website to have an impact, the users need to be constantly reminded of their plans, goals and maintain a continuing relationship with the website.

Personalization

25 of the 29 users felt that the concept of getting a customized set of recommendations and having a choice to setup a plan and goals was really good.

One user commented: "*This level of personalization helped me feel that I get individual, focused attention. In all the other weight loss websites, I just have access to a vast amount of*

generic data and to get any personalized plans, I have to end up paying a fee. Having my own personal behavior coach really does motivate me to lose weight!"

However, this level of personalization did lead to a few concerns such as privacy issues and initial user workflows which the users were concerned about as we can see in the following paragraphs.

Challenges & requests for new features and improvements

The themes in this section describe the recommendations and suggestions offered by the users, pointing to missing features and improvements on existing features.

Unique Selling Point

20 out of the 29 users, mostly in the younger age category were looking for a clear indication on the front-page on how the website would help them to reach their goals. In other words, users wanted to know what the website offers its users that other websites do not offer.

As one user put it, *"The first thing I look for in the site's front-page is a message. By looking at the website's message, I will instantly make the decision on whether I will find it useful or not, whether this is the program I am looking for. "*

In the case of AchieveTogether, it was the two questions that the website helps answer:

1) What habits help people JUST LIKE YOU to lose weight and keep it off?

2) How do people JUST LIKE YOU figure out how to use these habits consistently?

These two messages clearly convey the fact the website intends to help people identify and change a few vital behaviors that will help them to lose weight. Users suggested having this central message on the front page to be displayed more prominently in order to strike a personal note with them and also to make sure that users knew exactly what they should expect from the website.

Confirmation that the website does help

23 of 29 users suggested including images and quotes from the role models who had succeeded after using the methods suggested on the website. This included all of the 11 users looking for weight loss solutions. It showed that users were sub-consciously looking for a confirmation that the methods suggested on the site had actually helped real people and it gave them a reason and hope that it would help them as well.

One user said, "*Seeing before and after pictures of people who have lost weight on other sites makes me feel happy for them and gives me the confidence and motivation to try what they did, knowing that it helped them.*"

Branding and Trust

19 of the 29 users, mostly in the younger age demographic felt that the website lacked an identity.

This was the comment of one user: "*The site can really gain a lot of character if it used a custom logo and custom font to display the name **AchieveTogether.** That would bring in some of the cool factor to weight loss.*"

All 29 users liked the name of the website and said they found it very motivating. They also felt that a more prominent display of the Penn State logo and the Hershey Medical School connection would hugely improve their trust in the website. When users found out that the site was also supported by the Lance Armstrong foundation and the Highmark Blue Shield insurance program, they wondered if those logos could be displayed on the front page as well.

This feature request indicates that online users need to identify with entities they are comfortable with before submitting details about themselves or trying out the recommendations.

Collaboration and online groups

The key for successful weight loss is support. AchieveTogether.com provides ways for users to contact each other through private messaging with the website as a medium. However only 14 out of the 29 users said they found it useful. The rest of the users said they were looking for a lot more collaborative features.

One user who is an experienced Web user said: "*I am looking for existing communities or groups of people with similar interests. I like forums where I can post general questions and get answers from other users, or submit some answers of my own. I would really like a central forum where my questions or comments would get full visibility. Right now the only way I see that happening is through the blog feature.*"

Among the users who were genuinely interested in losing weight, a majority was interested in spreading the word about the website and wanted a feature where they could send invitations to people through email from the website. It was indicative of the fact that they wanted more people who they knew to use the website so that they could relate to and communicate with other people about the website. It also shows that even though people like the fact that they meet new people online who can give them the encouragement that they need, they still need family and friends to be involved in their weight loss program.

Navigation and content accessibility

A majority of the participants found the site easy to use, with 18 out of 29 participants rating the site highly easy to use (4 or above on a scale of 1 to 5). They also liked the look and feel of the website, most users particularly happy with the efficient use of space, the use of the banner image, top tab for most used links and the overall two column layout.

"*I like the fact the site uses light colors, is well spaced and easy to read*", said one user. Users felt that the site was well planned out on an overall basis but gave suggestions to improve speed of locating content through navigation.

To improve navigation over 50% of the users suggested the addition of "Back" buttons to all the pages so that they are able to go back to the page they came from. They presence of the top navigational links which allowed jumping between pages without having to return to the main recommendations page was found to be very useful and was used extensively by all users as evident from the access log data.

Content Organization

For the habits many users recommended organizing them by what their core idea was, if the habit was based on a change to diet, exercise routine or overall behavior. Other suggestions were organizing them alphabetically or by most popular habits in use.

For the role models page, the original listing page contained all of the role models in alphabetical order. One user commented: "*I want to first look at the role models who are most similar to me and a full listing makes it difficult to find out more about the relevant role models.*"

Other suggestions were to organize role models in descending order of weight lost from most successful to moderately successful or by gender.

Content retrieval through Search

90% of users tested felt that the website needed an effective "Search" function. One user mentioned: "*I viewed a habit during the first session and could not locate it during the second session. I do not want to scan the entire list of 36 habits to find the one habit I want to look at. I also want to search for other health related data without actually leaving the site, maybe you can add a Google search bar somewhere in here.*"

This highlights the ubiquity of search in everyday online experiences of users, it is a feature that people have become the most familiar with and every effort must be made to include an accurate search feature in any weight loss website.

The data on navigation and content retrieval points to how important it is for the site to make its top content easily accessible to the users. Multiple methods must be provided so that the users can always access the core data: habits and role model interviews, which are the unique selling point of the website.

Website experience

The users' experience with the website played an important part in deciding whether they were satisfied with it. Simple issues like time taken for pages, images and videos to load affected the users' experience and created a negative image. Some users expressed dissatisfaction with the speed of loading of the top banner image and the videos. Inserting a lighter image and sourcing videos from a video hosting service are solutions for this problem.

This data indicates that users are generally impatient when it comes to media on the website and the more attention being paid to this means the more satisfied they will be with the overall experience.

Younger participants felt the site was too static and needed some kind of movement to keep the user's attention on the page and not think about leaving the site.

One user came up with the following recommendation: "*Add rolling facts, images of successful users, links and cover images for books on weight loss & healthy living and quotes from successful users. Make it look like the Amazon website, engaging and professional but without having too much of an information overload. Add advertisements for the physician recommended products for weight loss.*"

Overall experience was also dependent on the site being pleasing to the eye with regard to color schemes, color gradients, backgrounds and fonts. Special attention needs to be paid to make the site professional in order to give users the confidence that they are using a site that is well designed in layout and content.

Engaging the user and new content

This is the single most important feature that tends to get overlooked by all weight loss websites who simply try to push information to the user. A majority of active Web users wanted the site to be a platform where they could share interesting content they found online, such as stories, articles, blogs, website links, images and videos with other users of the website. Some of them also recommended integration with their Facebook and Twitter profile so that the friends they make on the website stay updated with each others' activities. This is an interesting insight into how the ubiquity of social networks means that users would like to share information with as many people as possible. Enabling support for these features means the user will spend more time on the website, creating more content and causes other users to spend more time on the website as well. As long as new content gets created, users are not going to stop visiting the website. This chain effect can lead to overall website use increasing. The longer a user uses the website, the more likely it is that the user will be able to lose weight and maintain it over a long period of time.

Summary of Observations

The following are the reasons why users liked the website:

1. Website was an ideal place to start and did not overload them with information.

2. Website was designed by Penn State Hershey College of Medicine and content had been approved by the registered physicians.

3. Website was free to access and there was no restriction on when, or how many times content could be viewed.

4. Website did not reveal personal data to any other user.

5. Website created plans and goals that were custom built for each user.

6. Website sent reminder emails which encouraged them to stick to their plans and visit the website more often.

Users felt that the website needed to be improved in the following areas:

1. Website needs to display prominently what was unique about it compared to other websites that will help the user lose weight and keep it off.

2. Website needs images and testimonials from people who had succeeded by using the methods suggested on the website.

3. Display Penn State Hershey Medical Center logo, Lance Armstrong foundation logo and Highmark Blue Shield logo on the front-page.

4. Website should have online groups, forums where people could collaborate and communicate with other users and work as a team in encouraging each other to lose weight and share tips.

5. Addition of Back buttons, more visual indicators as to where users might find more content, shortcuts to their favorite content and most widely accessed content.

6. Ability to create custom views of the content for each user to make navigation easier.

7. An excellent search functionality that will retrieve data both from the website and from other recommended sources based on keywords.

8. Website needs to be more professionally designed and engaging, with interactive features, polls, games and so on.

9. Website can be integrated with social networks such as Facebook, MySpace, YouTube and addition of new content should be supported through content creation processes, content syndication from other sources and allowing users to generate content.

Summary

In this chapter, I have identified the goals of the user study and described the methodology of the study. Data was gathered from observations, interviews and access logs. From the data and user responses, several unique themes were identified. These themes help answer the question of understanding what features of the website, both existing and recommended are highly motivating for the users to continue using the website and achieve their goal of long term weight loss.

Chapter 5

Discussion

The evaluation of the usability study showed me the how usable AchieveTogether.com was. More importantly, it revealed the different themes that users thought were vital for a website that aimed to help its users achieve long term weight loss. In this chapter, I connect the findings to existing market research and identify the future directions for the success of AchieveTogether.com and for weight loss websites using Web 2.0 principles in general. I also identify the challenges and limitations I faced during the design and a few lessons I learned about user interaction design with Drupal.

Experience with Drupal

Technical Challenges

Drupal in spite of being an open source project with hundreds of contributors was surprisingly robust and stable. In the initial stages of the project however, issues with memory unavailability, the so called "white screen of death", and confusion about input formats existed, as the project became more mature, the system became very predictable and stable.

An important note for all developers is to only install modules that have been approved for production. Although there are some very exciting modules in Drupal, most of them were still in beta testing and the developer definitely risks the website if he installs such a version. The Drupal.org site clearly shows which modules are stable though.

Another lesson was the use of input formats during content development. Drupal has certain formats which strip normal HTML tags from the code, thereby rendering content in an unexpected fashion. It is extremely important to set a clear set of formats to work with before content creation as it might lead to future conflicts in display that may cause the theming engine to crash.

During my development period, the use of JavaScript, AJAX and JavaScript libraries was still largely unexplored. I believe this is one area in which AchieveTogether.com can use a lot of new development in since it can produce some great user experiences. For example, an AJAX process to execute the surveys and habit functions seamlessly without a page reload will really enhance the user experience.

I do believe that the Drupal learning curve is steep. When you are using Drupal for a project, it is extremely important to use Drupal's inbuilt APIs for calls to the database and for creating Forms. Websites using the Drupal API have been found to perform a great deal faster and scale better compared to websites using direct database calls and form creation through PHP and HTML. The challenge however is the time taken to understand the nuances of the system, which can be quite complicated at the beginning. Going through the code examples of experienced Drupal coders is the fastest way to learn the API and the hook system. Also developing custom modules as an exercise also helps to understand the system better and create more efficient code.

Equally important as module development and coding is an understanding of Drupal's theming engine and content display mechanism. Theme development can also be time consuming to learn but once mastered, it gives the developer the power to create some visually stunning websites which will definitely increase the user satisfaction with the website.

Specific challenges

One of the biggest challenges I faced was that the primary content of the website was fixed. Although this was necessary to protect the identity of the role models, having the data locked up in a database meant the power of Drupal's content management could not be applied.

For example, if the content types of habits and role models had been created and manually filled in, we would have been able to tag the content, use taxonomies and vocabularies to link the content and create teaser views for users to get a glimpse of the data. However the

most important feature that could not be put to use due to this design decision was **Search**. Since the data was directly pulled from the database at run-time it could not be indexed by the search module making content discovery extremely hard for users. Usage of modules which could analyze the data and create RSS feeds was also not possible because of run-time data retrieval. The presence of the RSS module would have enabled content similar to the core content of the website to be syndicated from other websites to AchieveTogether.com, thereby creating new content everyday without the need of the webmaster having to edit new data.

Drupal now has more than 5000 modules. However, many of them are version specific. This was particularly frustrating as many modules whose functionality was required in our website were not built for the version we were using, leading to custom module development. It is extremely important before the start of development to exhaustively identify all the requirements and decide the module version based on the requirements. In our case I chose version 5 because it had the majority of working modules approved for development when we started.

Benefits of using Drupal

One of the benefits of using Drupal is that it continues to grow and mature into a great Content Management System, packing in more powerful Web 2.0 features with each new version. Since upgrades are easy in Drupal, once a framework has been built as it has in our case, the modular essence of the Drupal system allows the website to grow in a very organic manner. For example, social networking features in the new versions are comparable to that of Facebook and MySpace, with out of the box features available to engage the users and build a vibrant community around a central idea.

The availability of the Forms API, Database API, hook system and theming engine with access to the source code allows customization that can never be achieved with a closed enterprise built system.

The biggest benefit of using Drupal was the Drupal community which has a huge army of developers willing to help every other developer with any issue. There have been so many instances where I have had issues which were solved immediately either by looking at existing examples or posting it to the forum and getting it answered. One such example was with the Google Charts API module used to plot the users' weight against time. Over 15 fellow developers helped troubleshoot the issue and finally came u with the fix. The community is extremely encouraging and urges you to give back as well; there have been many instances where I have helped other developers with their issues.

A tribute to Drupal and its community stems from the fact that on every one of the occasions that the researchers from Penn State Hershey have asked me the question, "Can this feature be implemented in Drupal?", I have always been able to reply "Yes it can be done."

Future Directions for AchieveTogether.com

Content Creation and Management Process

Earlier, I mentioned the content creation process in the Technical Challenges section. I had talked about the core content made available to the Drupal modules to harness the power of Search, Taxonomy and Syndication modules.

Taking a step back, I would like to discuss the issue of content ownership. All the role models videos in the current website are stored on the Penn State servers because of ownership and privacy issues. If these issues were not present, it would have been possible for users to view these videos, share it with their friends and community outside of the website and possibly led to creation of very similar videos on sites such as YouTube. It would have also been possible to track the views of a video, rank them in terms of popularity and time, allowing dynamic views to be created for the users.

The nature of content in Web 2.0 has always been that of openness. Content owners have realized that the value of the data is much greater if it is distributed outside their environment than if it is kept locked up inside a single environment. In essence, Web 2.0 is all about providing a platform and a framework to support the changing nature of data and encourage its consumption and transformation by several people which leads to its continuous improvement. This can happen in many ways,

Having open and searchable content leads to more sharing and a larger audience for the information, more serendipitous discoveries being made by the users and more interaction within the community.   We can ask users to create and take polls, blog about their related experiences, comment on others' blogs, add new videos and photos, play some simple games that send the message of the website, allow users to share content possibly to their Facebook, MySpace, Twitter feeds, or email the article to their friends, publish it to their external blog, add it to their "Favorites" list, give the content a thumbs up and so on.

This leads to another important aspect of user satisfaction which is a reward program. An important part of the user interaction process is to provide some kind of reward to the most active users, by having an effective points system which can track the users' action and allowing them to redeem their points later.

If content is going to be open, attention needs to be paid to the content creation process.
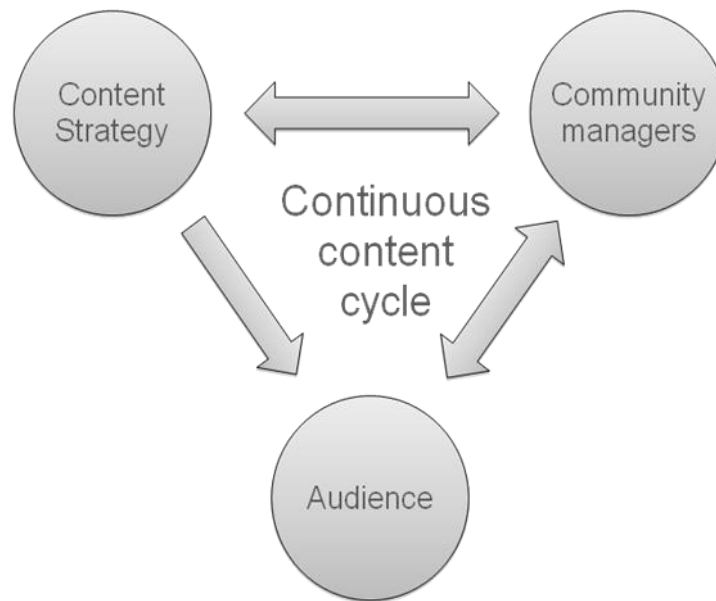
Fig 5-1 Content creation and management

Content from the outset needs to be designed so that it is useful, usable and enjoyable. Content for Web 2.0 application have a unique way of growing. In many Web 2.0 applications, once the core content is planted, the architect should step back and let the application and content grow on its own with minimal intervention (as in the case of Craigslist.com and Facebook). However, there are automated tools available in Content Management Systems such as Drupal that are able to root out the so called bad content and the rogue users in the community. Eventually AchieveTogether.com needs to take this approach towards content management.

Collaborative development

A common feature of Web 2.0 application development has been community support. In several cases, developers from different backgrounds and companies collaborate on ideas for features and even implementations, to create a product that belongs to many companies and entities. AchieveTogether can also grow in a similar manner, collaborating with researchers and developers from other universities and companies, thereby sharing both technical expertise and feature design.

Community and Social Networks

Research proves that a strong community, peer and family support result in successful weight loss in offline programs. Luckily Web 2.0 technologies are inherently built to enable growth of communities and networks around a common cause. A survey of internet users by the USC Annenburg School suggests that a growing number of online users feel very strong about their online community (Fig 5-2)[44].
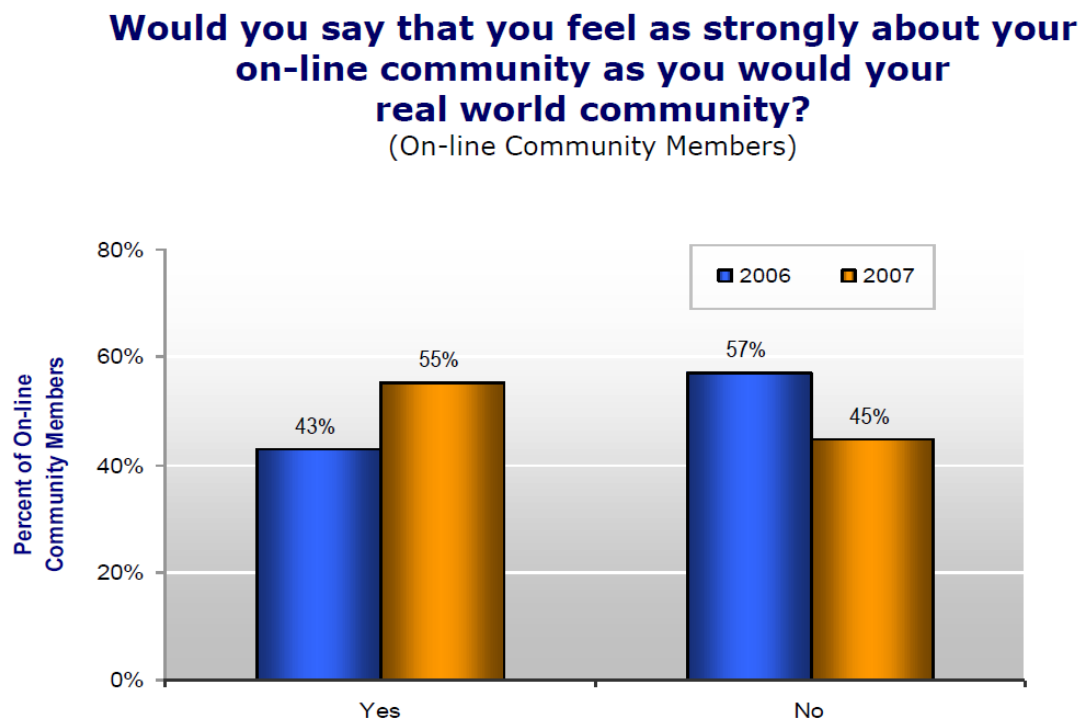

Fig 5-2 Online Community Importance

We can infer from this result that online weight loss communities can be just as effective for long term weight loss.

In some previous health websites, users actually started using the forums more than the actual "official" content posted on the website. Discussion boards that were setup for informal information sharing and socializing have turned into a vital community. The official structure and information serves as a useful anchor point and a framework for the community but the conversations eventually take precedence over the content.

The key for achieving long term goals is to set up a great framework and from there on motivate users to create conversations and be active while at the same time, monitoring and moderating the community to shape the activity towards the eventual goal of the website. A lot of thought needs to go into the initial design of the platform itself, to put in the necessary checks for the system to do bulk of the work automatically and identify unsuitable content and stray users. Also with this issue comes the issue of openness of content. When people start sharing, a whole new set of opportunities to interact grow around that conversation, while sometimes causing issues of privacy. A well documented set of rules and regulations needs to be put in place before users start posting.

Social Networks should leverage user generated data that fuels the context of the conversation. Self-help networks such as ones that may be created for AchieveTogether.com have been identified as one of the few industries that can support scalable social networks, since it has the right amount of data, users, content and purpose.

AchieveTogether should also focus on its growth to spread its message to as many users as possible. In earlier social networks, it was achieved through word of mouth of current users. However it is now possible to provide multiple tools to users that are intuitive to help bring in new users through interactions with website content. It also needs to leverage effective social media advertising in a non-intrusive way.

Rich User Interface

In its current form, AchieveTogether.com still does not have many of the rich user interactions that are possible through AJAX and JavaScript libraries. With the new versions of Drupal, JavaScript integration has become more robust and documentation has also grown. It is a great opportunity to implement some of the "cool" features, such as integration with Open APIs to reflect real time data, multiple user interactions, screen effects such as appearing and fading,

better screen elements such as rounded table edges, dynamic calendars and forms, icons with a short fly out explanation and non intrusive widgets to enable user actions.

User-centric Design

The World Internet Project, [44] provided an insight into the online and related offline activities of 2 age groups: 12 – 24 year olds and 24 - 54 year olds. One of the most prominent discoveries is their take on privacy is completely different. For the younger age group, privacy online was hardly an issue. However, a vast majority of the higher age group had issues with posting their personal information and intimacies online. Another big difference was that the lower age group trusted their peers more than experts whereas for the higher age group, the source of information and advice was extremely important. However both age groups agreed on the fact that advice had to be impartial & independent and the reasoning behind the advice had to be explained. These are two areas where AchieveTogether.com may have a conflict in design in the future. A great deal of care has to be paid so that both groups are able to enjoy their experience with the website and its community.

Web 2.0 as a disruptive Technology

AchieveTogether and other similar projects are products of a health care institution with deep set values. However, Web 2.0 challenges almost all of those values. Table 5-1 describes the differences.

Table 5-1 Health care and Web 2.0 values

Health care values	Web 2.0 values
Risk averse	Risk taking
Information comes from authoritative sources	Information judged based on social networking
Privacy and Security are regulated	Very little regulation
Long lead times for deployment, focus on quality	Quick deployment with iterative development, focus on flexibility
Data is controlled	Information is contributed by and distributed to all

In order for AchieveTogether.com to truly become a successful Web 2.0 application for long term weight loss, it needs to embrace the best values from both sides. With the current available technology and framework, there is an opportunity for AchieveTogether to become the hub of activity where people looking to lose weight first land. Through integration with other services, its large online community and continuous development, it can provide the launch pad for users to move on to related tools, interact with a vast community, become motivated and successfully achieve long term weight loss.

Chapter 6

Conclusion

Through this research, my aim was to achieve the following goals:

1. Identify the set of requirements, features and functionality for the website based on the requirements of the AchieveTogether project stakeholders.

2. Design and develop the front-end user interface and the back-end architecture including databases and recommendation algorithms.

3. Evaluate the usability of the website through a user study involving user interviews and observations and offer recommendations for future development.

I was able to successfully achieve all of my goals at the end of my research process, and also identified some clear strategies for future Web applications to combat obesity. During my research process, I ran into some technical difficulties with Drupal and the MySQL database which I was able to solve with the help of the Open Source community. I also had to deal with design issues that may have impacted the end application. These challenges however gave me a great understanding of the importance of having a complete design document to address every possible issue before actually starting to build a framework as it was the case with AchieveTogether. For example, not having to pull content from the database at run-time would have opened up several features of content management and retrieval such as search and taxonomies.

By analyzing the results of the user study, I was able to identify common themes which explained what users were looking for in a website to help them lose weight and keep it off over a long period of time. This included quality and variety in content, branding and trust, respect of privacy, a strong community, personalization, accessibility, availability, ease of website use, excellent navigability, ability to find content, share content with the social Web, ability to reach

out to other users, and a great user experience. While it is up to the creators of content and the managers of the application to ensure the first four requirements, Web 2.0 offers the technology to build a framework to support the remaining requirements. This merging of traditional health care and the latest technologies can be tricky and requires accommodation and flexibility in the core values of both sides.

The latest 20th annual survey of America's healthiest states released on Nov 17th, 2009 by nonprofit group America's Health Rankings [45] states that obesity is America's greatest health threat overtaking other threats like smoking. If the current trends continue, then 43% of adult Americans will be obese in just 8 years (103 million).

At the same time one in every three Americans has a profile on a social media site [39]. With the top three social media sites in 2008 having over 300 million unique visitors worldwide, people are spending a lot of their time in online communities which they consider to be just as important as their offline communities.

This offers a unique opportunity to combat obesity using online platforms and communities as a way to reach out and offer assistance. However, online activities vary greatly by age and future research can focus on creating an experience customized by age which will definitely lead to great results for the users in terms of a healthy life.

Given more time, I would have liked to create better user experiences with technologies such as AJAX and JavaScript, explored the huge functionality of Drupal and done more iterations of the Design -> Prototype -> Evaluate cycle to come as close to the user expected end application as possible. I have firmly come to believe at the end of this research that usability and creating a great user experience are the most important reasons for a Web application to succeed provided a minimum level of content quality is maintained. In projects like this, it would be ideal for collaboration to happen between the medical schools and Web 2.0 companies as their synergy can make a huge difference to ensuring a healthy life for people looking to change themselves for the better.

Bibliography

1. Gunther, Medicine 2.0: Social Networking, Collaboration, Participation, Apomediation, and Openness, *J Med Internet Res*, Vol. 10, No. 3. (2008), e-22.

2. Drupal Open Source Content Management System http://www.drupal.org

3. Flegal KM, Carroll MD, Ogden CL, Johnson CL. Prevalence and trends in obesity among US adults, 1999–2000.*JAMA*. 2002;288:1723–7.

4. National Heart, Lung, and Blood Institute and North American Association for the Study of Obesity. Practical Guide to the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults. Bethesda, MD: National Institutes of Health; 2000.

5. "How America searches: Health and Wellness" iCrossing, Jan 2008

6. Google Insights, http://www.google.com/insights/search/#q=weightloss&cmpt=q

7. Jesse James Garrett, Customer Loyalty and the Elements of User Experience, Design Management Review, Winter 2006

8. Wadden TA, Butryn ML. Behavioral treatment of obesity. *Endocrinol Metab Clin North Am*. 2003;32:981–1003.

9. Wing RR. Behavioral treatment of obesity. In: Wadden TA, Stunkard AJ, eds. *Handbook of Obesity Treatment.* New York: Guilford; 2002, pp. 301–16.

10. Womble LG, Clark VA, Wadden TA. Diet and physical activity for obesity: how effective are they? *J Endocrinol Invest*. 2002;25:922–4.

11. Finkelstein EA, Fiebelkorn IC, Wang G. National medical spending attributable to overweight and obesity: how much, and who's paying? *Health Aff (Millwood)* 2003;(Suppl Web Exclusives):W3-219 –26.

12. Wolf AM. Economic outcomes of the obese patient. *Obes Res.* 2002;10(Suppl 1):58S– 62S.

13. Harvey-Berino J, Pintauro S, Buzzell P et al. Does using the Internet facilitate the maintenance of weight loss? Int J Obes Relat Metab Disord 2002; 26: 1254–60.

14. Harvey-Berino, Pintauro SJ, Gold EC. The feasibility of using Internet support for the maintenance of weight loss. *Behav Modif*. 2002;26:103–16.

15. Fox S, Rainie L, Horrigan J et al. The Online Health Care Revolution: How the Web Helps Americans Take Better Care of Themselves. Washington, DC: The Pew Research Center, 2000.

16. Tsai AG, Wadden TA. Systematic review: an evaluation of the major commercial weight loss programs in the United States. *Ann Intern Med.* 2005;142:56–66.

17. Wantland DJ, Portillo CJ, Holzemer WL et al. The effectiveness of Web-based vs. non-Web-based interventions: a meta-analysis of behavioral change outcomes. J Med Internet Res 2004; 6: e40.

18. Tate DF, Wing RR, Winett RA. Using Internet technology to deliver a behavioral weight loss program. J Am Med Assoc 2001; 285: 1172–7.

19. Tate DF, Jackvony EH, Wing RR. Effects of Internet behavioral counseling on weight loss in adults at risk for type 2 diabetes: a randomized trial. J Am Med Assoc 2003; 289:1833–6.

20. Harvey-Berino J, Pintauro S, Buzzell P et al. Effect of internet support on the long-term maintenance of weight loss. Obes Res 2004; 12: 320–9.

21. Napolitano MA, Fotheringham M, Tate D et al. Evaluation of an internet-based physical activity intervention: a preliminary investigation. Ann Behav Med 2003; 25: 92–9.

22. Brug J, Campbell M, van Assema P. The application and impact of computer-generated personalized nutrition education: a review of the literature. Patient Educ Couns 1999; 36:145–56.

23. Virtual Community Health Promotion, Richard Crespo, Preventing Chronic Disease, Vol 4, No 3, Jul 2007

24. Volkmar FR, Stunkard AJ, Woolston J, Bailey RA. High attrition rates in commercial weight reduction programs. Arch Intern Med. 1981;141:426-8.[PMID: 7212881]

25. Locke EA, Latham GP. Building a practically useful theory of goal setting and task motivation. A 35-year odyssey. Am Psychol 2002; 57: 705–17.

26. Ammerman AS, Lindquist CH, Lohr KN et al. The efficacy of behavioral interventions to modify dietary fat and fruit and vegetable intake: a review of the evidence. Prev Med 2002; 35: 25–41.

27. Annesi JJ. Goal-setting protocol in adherence to exercise by Italian adults. Percept Mot Skills 2002; 94: 453–8.

28. Alexy B. Goal setting and health risk reduction. Nurs Res 1985; 34: 283–8.

29. Duncan KA, Pozehl B. Staying on course: the effects of an adherence facilitation intervention on home exercise participation. Prog Cardiovasc Nurs 2002; 17: 59–65, 71.

30. Estabrooks PA, Nelson CC, Xu S et al. The frequency and behavioral outcomes of goal choices in the self-management of diabetes. Diabetes Educ 2005; 31: 391–400.

31. Marshall AL, Leslie ER, Bauman AE et al. Print versus website physical activity programs: a randomized trial. Am J Prev Med 2003; 25: 88–94.

32. Leslie E, Marshall AL, Owen N, Bauman A: Engagement and retention of participants in a physical activity website. Prev Med 2005, 40(1):54-59

33. Kalten MR, Ardito DA, Cimino C et al. A Web-accessible core weight management program. Diabetes Educ 2000; 26: 929–36.

34. Womble LG, Wadden TA, McGuckin BG et al. A randomized controlled trial of a commercial internet weight loss program. Obes Res 2004; 12: 1011–8.

35. Polzien KM, Jakicic JM, Tate DF et al. The efficacy of a technology-based system in a short-term behavioral weight loss intervention. Obesity (Silver Spring) 2007; 15: 825–30.

36. Wang SS, Wadden TA, Womble LG, et al. What consumers want to know about commercial weight loss programs: a pilot investigation. *Obes Res*. 2003;40:131–5.

37. Travis Wissink, CM Pros Summit, Nov 2007

38. Drupal Hooks, http://api.drupal.org/api/group/hooks/5

39. International Standard of Usability, ISO 9241-11: Guidance on Usability, retrieved online from http://www.usabilitynet.org/tools/r_international.htm#9241-11

40. Ericsson and Simon 1993; Willis 2005, Think-aloud protocol

41. Weight Loss on the Web: A Pilot Study Comparing a Structured Behavioral Intervention to a Commercial Program - Beth Casey Gold, Susan Burke, Stephen Pintauro, Paul Buzzell and Jean Harvey-Berino

42. Jakob Nielsen's Alertbox, F-Shaped Pattern For Reading Web Content http://www.useit.com/alertbox/reading_pattern.html

43. Definition of Web 2.0: O'Reilly media

44. Center for Digital Future Report, 2007 - USC Annenberg School for Communication http://www.digitalcenter.org/pdf/2007-Digital-Future-Report-Press-Release-112906.pdf

45. America's Health Rankings™, A Call to Action for People and Their Communities: 2009 Edition http://www.americashealthrankings.org/glance.aspx#