



National College of Ireland  
MSc Web Technologies  
2010/2012



Conor Lawlor  
X93001354

Conor.lawlor2@student.ncirl.ie  
conor.lawlor@gmail.com

# Golf Advisor - Location Aware Rating Engine for Golf Courses

Dissertation

January 2012

Supervisor: Paul Stynes



National  
College of  
Ireland

*The college for a  
learning society*

I hereby certify that this material, which I now submit for assessment of the programme of study leading to the award of Master of Science in Web Technologies is entirely my own work and has not been taken from the work of others save and to the extent that such work has been cited and acknowledged within the text of my work.

Signed: .....

Date:

Student Number: x93001354

## **ACKNOWLEDGEMENTS**

This dissertation would not have been possible without the support of many people. I would like to acknowledge these people and thank them for their help and support.

Firstly I would like to thank my supervisor Paul Stynes who helped guide me on the right road particularly with the research aspect of this project. His knowledge, patience and encouragement are very much appreciated as were his insightful comments on the documentation.

Secondly, I'd like to thank my employer Phoneware Ltd. for supporting this undertaking. The flexibility shown with regard working hours to attend lectures and exams is very much appreciated.

I'd also like to thank the various colleagues and friends for their helpful suggestions and recommendations for the Golf Advisor application, particularly those that took part in its evaluation and review.

Last but not least, I'd like to thank my loving wife Maria and children Katie and Ciara. Without Maria's support and encouragement this would have been a much more difficult task. The sacrifices they had to make to support this endeavour have not gone unnoticed.

## **Abstract**

In recent years there has been an explosion in the number of internet sites dedicated to the rating of products or services, with many of these sites becoming extremely influential in their field. Regardless of domain all sites of this nature face the same primary challenge, namely user contribution.

The primary motivation for this research is to determine if geo-location data can be used as a catalyst to contribution for community based rating sites. Although the rating of recreational activities poses no less of a challenge than any other domain, the fact that most activities are location based provides the opportunity to use this data to promote user participation. The thesis describes the requirements both functional and technical of a location aware rating system for recreational activities. The state of the art review describes the key attributes of rating sites, their influence in user's decision making process, the importance of trust in such sites and the attributes required to establish this. Presented in this work is design and implementation of the Golf Advisor application, a location aware community based rating site for golf courses.

To evaluate and validate the research carried out, detailed analysis of the effectiveness of different elements of the application is presented. The analysis confidently demonstrates that user's geo-location data can be leveraged to incentivize contribution to community based rating sites for recreational activities. This is the primary contribution to the State of the Art made by the dissertation. This approach to rating sites using fixed line internet connections has only been made possible since the advent of HTML 5, and it is this innovative approach that significantly differentiates the application from current offerings in the field.

## Table of Contents

ACKNOWLEDGEMENTS .....	3
Abstract.....	4
Table of Contents.....	5
Table of Figures .....	8
ABBREVIATIONS .....	9
1. Introduction.....	10
1.1. Motivation .....	12
1.2. Research Question .....	13
1.3. Research Objectives.....	13
1.4. Area of Proposed Contribution.....	14
1.5. Research Approach .....	15
2. HTML5 & Location Awareness .....	17
2.1. HTML 5.....	17
2.2. Geo-location .....	18
2.3. Summary .....	19
3. State of the Art of Community Rating Sites on the WWW .....	20
3.1. Community Social Networks .....	21
3.2. Community Ratings/Reviews .....	22
3.3. Decision Making .....	24
3.4. Trust and the Collaborative Web .....	26
4. Design .....	29
4.1. Influences from the State of the Art .....	29
4.1.1. Sentimental Influences on Golf Advisor Design.....	30

4.1.2.	Review Framing Influences on Golf Advisor Design .....	30
4.1.3.	Trust Influences on Golf Advisor Design .....	30
4.2.	Requirements Elicitation .....	31
4.3.	High Level Design.....	31
4.3.1.	Functional Requirements.....	32
4.3.2.	Non-Functional Requirements .....	34
4.4.	High Level Architecture of Golf Advisor .....	35
4.5.	Summary .....	39
5.	Implementation.....	40
5.1.	Golf Advisor Web Application .....	40
5.2.	Components of Golf Advisor .....	41
5.2.1.	Google Maps .....	41
5.2.2.	jQuery.....	42
5.2.3.	jQuery UI .....	42
5.2.4.	MySQL.....	43
5.3.	Methodologies .....	44
5.4.	Development Environment & Technologies .....	44
5.4.1.	Ruby On Rails .....	44
5.4.2.	Ruby Gems.....	44
5.4.2.1.	Devise .....	45
5.4.2.2.	Kaminari .....	45
5.4.2.3.	Paperclip .....	45
5.4.2.4.	MySQL 2 .....	46
5.5.	User Interface Design .....	46

5.6. Testing .....	50
5.6.1. Introduction .....	50
5.6.2. Unit Testing .....	50
5.6.3. Functional Testing .....	52
5.6.4. Usability Testing .....	52
5.6.4.1. Usability Test Methodology .....	53
5.6.4.2. Usability Test Results .....	55
5.7. Summary .....	59
6. Evaluation of Golf Advisor .....	60
6.1. Experiment Objectives .....	60
6.2. Metrics Applied .....	60
6.3. Methodology .....	62
6.4. Results .....	63
6.5. Observations .....	69
6.6. Summary .....	70
7. Future Perspectives .....	72
Appendices .....	74
Appendix A - Golf Advisor Questionnaire .....	74
Appendix B: Golf Advisor Screen Shots .....	80
Appendix C: Use Cases .....	83
Appendix D: Database Structure .....	87
References .....	88

# Table of Figures

- Figure 4-1 MVC Architectural Pattern ..... 35
- Figure 4-2 Golf Advisor Technical Architecture ..... 37
- Figure 5-1 Golf Courses displayed using Google Maps API ..... 42
- Figure 5-2 Golf Advisor - Course Ratings ..... 48
- Figure 5-3 Golf Advisor - Forum Listings ..... 49
- Figure 5-4 Golf Advisor Forum Posts ..... 49
- Figure 5-5 Sample Unit Tests ..... 51
- Figure 5-6 Unit Test Results ..... 51
- Figure 5-7 Sample Functional Test ..... 52
- Figure 5-8 Golf Advisor Login Screen ..... 55
- Figure 5-9 Local Search & Driving Directions ..... 56
- Figure 5-10 Usability Testing - Questionnaire Results ..... 58
- Figure 6-1 Age Profile of Test Sample ..... 63
- Figure 6-2 Membership of Golf Club or Society ..... 64
- Figure 6-3 Usage of online social networks ..... 64
- Figure 6-4 Previously reviewed/rated a product or service online ..... 64
- Figure 6-5 Reviewed Course ..... 65
- Figure 6-6 Reviewed Home Course ..... 65
- Figure. 6-7 Local data incentivized contribution ..... 65
- Figure 6-8 Found location data engaging ..... 65
- Figure 6-9 Map of the Local Area ..... 66
- Figure 6-10 - Seeing courses the use has played ..... 66
- Figure 6-11 Simple Rating System ..... 66
- Figure 6-12 Desire to Help Others ..... 67
- Figure 6-13 Desire to Promote Club/Area ..... 67
- Figure 6-14 Like/Dislike Option ..... 67
- Figure 6-15 Review/Rated Golf Course with location awareness On/Off ..... 68
- Appendix B-1 Golf Advisor - Course Listings ..... 80
- Appendix B-2 Golf Advisors - Course Details ..... 81



**ABBREVIATIONS**

AJAX	Asynchronous Javascript and XML
API	Application Programming Interface
DOM	Document Object Model
eWOM	Electronic Word Of Mouth
HTML	Hypertext Markup Language
HTTP	Hypertext Transfer Protocol
JSON	Java Script Object Notation
MVC	Model View Controller
RoR	Ruby On Rails
SDK	Software Development Kit
XHTML	eXtensible HyperText Markup Language
XML	Extensible Markup Language
WHATWG	Web Hypertext Application Technology Working Group
WWW	World Wide Web
W3C	World Wide Web Consortium

## 1. Introduction

The rating of a recreational activity facility in community based social networks to influence a person's purchasing decision presents a major challenge for the recreational tourism sector. Traditionally word of mouth has been the main form of advice on facilities/services etc. While this may work at a local level it fails from a tourism perspective, i.e. there should be a source of independent advice for people without knowledge of the facilities they're considering using. The traditional model needs to be replicated online so that people can share their opinions/experiences with a broader community.

Rating sites are online communities established to foster relationships between members based upon a common interest. Providing a definitive definition of what "online communities" are is certainly a challenge as experts put forward different definitions depending on their field of expertise. The following definitions clearly define the term as relevant to this paper:

- "Online community is a social network that uses computer support as the basis of communication among members instead of face-to-face interaction. These virtual social networks may be used for empathetic support, but are more often used for common interest information sharing and problem solving." Dorine C. Andrews [68], Barry Wellman [69]
- "A virtual community can be seen as a group in which individuals come together around a shared purpose, interest, or goal." Koh et al [70], Rothaermal et al [71]
- "For the purpose of this study, we define an online community as a group of people with a common interest or shared purpose whose interactions are governed by policies in the form of tacit assumptions, rituals, protocols, rules and laws and who use computer systems to support and mediate social interaction and facilitate a sense of togetherness." – Preece et al [72]

For the purposes of this paper ratings sites can be deemed community social networks established to encourage user contribution to create collective intelligence in the given domain. These online communities form part of what is known as the Collaborative Web.

The collaborative web can be defined as participatory information sharing or user created content or as West et al.[46] states, the principal objective for a collaborative web application is to provide a common platform for users to share and manipulate content. Wikis, forums, blogs and open source software are all examples of collaborative web applications.

Fundamentally all rating sites operate around the same principles, with the domain in which they operate being the main differentiator. Their primary objective is to assist in the decision making process of its users. The site must provide the user with ratings/opinions from other users that have experience of the desired object in a format that can be consumed quickly.

The rapid growth of online social networking in recent years has resulted in a transfer of power towards the consumer in the market place as they are more informed and have greater choice than ever before. This online collaboration now means that other consumers are now more influential on the decision making process when it comes to the purchase of products or services. While the adoption of community based social networks for travel and accommodation is widespread, its application in the recreational tourism subsector has been relatively limited.

Reaching critical mass in communications is a prerequisite for success on interactive platforms [20]. It is therefore essential that there are low barriers to entry for an individual to join a collective and contribute. Ultimately in a collaborative system it is the users that add value to the system.

While there is lots of data on the influence on how online reviews can impact product sales, data relating to what motivates people to write online reviews is much more limited. As collaborative websites require user generated content it's

essential we examine the factors that get people to contribute and identify perceived barriers to user contribution.

### **1.1. Motivation**

The motivation for this research originates from the fact the majority of people that use ratings sites do so to consume the data rather than contribute it [19]. As most effective rating sites provide independent ratings/reviews, they are fundamentally collaborative; user contribution is therefore a significant challenge for these sites regardless of domain. This research proposes to ascertain if features of modern web technologies such as geo-location can be used to reduce the barriers to user contribution.

Another motivating factor is the challenge of developing a rating engine for recreational activities that communicates its content in an efficient manner. While the tourism industry has undergone some radical changes in recent years due to the phenomenal success of travel review sites, these sites predominantly cater for the hotel/restaurant sector, with the recreational tourism sector being left largely untapped. Sites such as tripadvisor.com and virtualtourist.com have become enormously successful and extremely influential. Their success is primarily based upon the fact that they provide independent reviews/ratings. The rating model used for the travel industry, coupled with some innovative techniques such as location awareness (to develop a sentimental attachment with the user) could be deployed to rate recreational activity facilities with great success.

Finally a common criticism of rating sites is that they are subject to the expression of extreme views, often expressed by people with limited exposure to the product or service they are reviewing. Research has shown that self expression is a prime motivator [51] for writing online reviews and as such many online reviews tend to be written by people that have had an extremely good or extremely bad experience. This project proposes an alternative approach to harvesting reviews by targeting the people with the greatest exposure to the product/service or in the case of this research, an amenity.

## **1.2. Research Question**

This project proposes to explore if location awareness can be used to incentivise contribution to community rating social networks in the recreational activity sector.

The hypothesis is that users are more likely to rate/review facilities in their locality when afforded the opportunity. Location data can therefore be used to invite user contribution rather than relying on user initiative. This research suggests that a user's location information can be used to effectively create a sense of community spirit, in the traditional sense, in an online environment. It proposes that the use of location data to serve users with familiar imagery (maps of the local area and pictures of local recreational facilities) will help create an emotive bond and thus increase the likelihood of their contribution. It will examine the influence, if any; serving users with data from their locale has on their decision to contribute.

## **1.3. Research Objectives**

The objectives of this research are:

- I. Design, prototype and evaluate a location aware rating application for recreational activities.
- II. Use the prototype developed to evaluate if geo-location technology can be used to achieve greater user contribution on community rating sites for location based products or services.

Fundamentally, this study hopes to ascertain if websites for rating location based products or services can achieve increased user participation through serving data tailored to the user's location.

#### **1.4. Area of Proposed Contribution**

This research aspires to contribute to the state of the art of technology enhanced rating sites. The research proposes to investigate an original approach to the online rating of location based activities, by using location data to target the people most familiar with the amenities for their opinion.

A common problem with rating sites is that the opinions expressed tend to be from the extreme ends of the scale, as users are only motivated to contribute by an exceptionally positive or exceptionally negative experience they want to share. This research proposes to harvest user contribution via an alternative approach, namely sentimental attachment.

A distinguishing feature of certain recreational activities is that although they are primarily utilized by the local community they may also be a tourist attraction for that area. Activities such as golf, sailing, skiing, hill walking are all examples of this. Participation in many of these activities is done through clubs and it is proposed that this sense of attachment or local pride can be leveraged for contribution through location awareness techniques.

This thesis proposes to contribute an innovative application of geo-location technology. Geo-location enables a web application to obtain a users geographical position by using a number of different sources, called location providers. Location providers can be one or a combination of the following: GSM Cell ID, IP Address, Wi-Fi and Bluetooth MAC address, radio-frequency identification (RFID), Wi-Fi connection location, or device Global Positioning System (GPS). This information can then be used to tailor the content served to the user based upon their location. The application developed as part of the research objectives for thesis will geo-code<sup>1</sup> the addresses of all the golf courses in the application database. This will enable the development of a "location enhanced" rating site to be used in determining if location awareness can be used to achieve greater levels of user contribution.

---

<sup>1</sup> Geo-coding is the process of finding the geographical coordinates of a location, expressed in latitude and longitude from its geographical address.

### **1.5. Research Approach**

To attain the research goals and objectives outlined above, it was necessary to provide an overview of the existing research in the area of online review/ratings sites. Chapter 2 provides a brief description of HTML5, how the current revision differs from its predecessors etc. before detailing how the new geo-location feature is implemented as it is a critical component in the application developed to test the research hypothesis. Chapter 3 is a state of the art review for collaborative websites in the tourism and recreational areas with a focus on rating/review sites. It starts by giving a brief overview of community social networks with a discussion on how user generated content on social networks has revolutionized the way we now read, share, produce and redistribute information. The key characteristics of online community social networks and rating sites are discussed with an emphasis on their impact on user's decision making and the importance of trust in this arena. The motivators for both consuming and contributing rating data are also examined. The information gathered during this research was formative in the design of the application developed to test the hypothesis of this thesis.

The design requirements of the application to be developed as part of this research are outlined in chapter 4. This chapter describes the influences from the state of the art review and how they were incorporated into the applications design along with the applications requirement elicitation process. It then outlines the high level design for the project, documenting both functional and non functional requirements. The chapter concludes with a description of the high level architecture used for the application, detailing the various components of its composition.

Chapter 5 details the implementation of the Golf Advisor web application. It provides a detailed description of the various open source components and APIs used within the application. It outlines the methodology used for its development before providing a detailed description of the development environment and technologies used to create the application. Finally this chapter concludes with a

detailed description of how the application was tested from both a functional and usability perspective. The findings of the usability tests are also provided in this chapter.

Chapter 6 describes how the Golf Advisor application was evaluated in terms of the research question of this thesis. It outlines the objective of the experiment performed to test the hypothesis along with the metrics applied to qualify the results. A detailed description is given of the methodology used to perform the experiment and this is followed by its findings. This chapter concludes with articulations of observations made during the research.

Finally this thesis concludes with a discussion of the possible future perspectives research in this area could take.



## 2. HTML5 & Location Awareness

The development of a location aware rating system is an abstraction of the new geo-location feature in HTML 5. This chapter will give a brief description of HTML5 and how it continues to evolve before describing the geo-location feature and how it can be incorporated into web applications such as the one developed as part of this research. As location awareness is fundamental to the hypothesis of this thesis and the technology to implement it has only become commonly available for non mobile devices since the introduction of HTML 5, it is deemed important enough to warrant its own chapter.

### 2.1. HTML 5

HTML 5 is the fifth revision of the hypertext markup language (HTML). HTML is the language used for structuring and presenting content for the World Wide Web (WWW) or internet as it's more commonly referred to. Although HTML was first created in 1990, it was not until 1997 that the first set of standards for how the markup should be constructed appeared, this became known as HTML4. The World Wide Web Consortium (W3C) was established as a governing body to develop and publish open standards for the web. As these standards were adopted by the major browser providers, it helped reduce the headache for web developers as their applications would be rendered in a relatively consistent manner across different browsers.

HTML 5 is an evolving standard and is currently a work in progress although most modern browsers have some HTML5 support. HTML5 will be the new standard for HTML, XHTML and the HTML DOM. The standard has been defined through cooperation between two groups, the W3C and the Web Hypertext Application Technology Working Group (WHATWG). Its standardization is based around six key principles [74]:

- New features should be based on HTML, CSS, DOM, and JavaScript
- Reduce the need for external plugins (like Flash)
- Better error handling
- More markup to replace scripting
- HTML5 should be device independent
- The development process should be visible to the public

HTML5 includes support for a host of new features, such as embedded media elements (audio & video), offline storage and new controls for calendars, email, search etc. [75]. HTML5 also includes new elements such as section, article and header; these are included to provide the semantic content of documents on the web. However one of the most interesting developments in the HTML5 standard is the addition of geo-location support.

## **2.2. *Geo-location***

With HTML5 users can choose to share their location information with web applications that request it. These applications can then use this information to tailor the content on display specifically for that user. What was once the preserve of mobile devices is now available on non-mobile devices. For the purposes of this research, a non mobile device is any device that receives internet content from a fixed source, such as laptop and desktop computers.

A user's location data is retrieved using the geo-location API [73] which is available through the browsers navigator object. If a user agrees to share their location when prompted, their browser gathers the information about nearby wireless access points and the computers IP address and submits this data to the geo-location service provider for processing. The service provider then returns an estimate of the user's physical location by latitude and longitude. Currently Google Location Services is the default geo-location service provider on most browsers.

The API can also be used to send a notification when the user's location changes, this means that users of location aware websites on mobile devices can have location specific content updated as they move. This technology was previously only available on mobile devices through platform specific software development kits (SDK). Potentially, this could result in a shift away from platform specific apps for mobile devices towards mobile web applications.

The API works the same regardless of device type; however the level of accuracy on mobile devices is significantly better as GPS or the cell tower they are connected are used as the primary location providers.

Location aware browsing can also be thought of as "location enhanced" browsing, as the use of location data to serve the user location specific data can greatly enhance their browsing experience. The Golf Advisor web application developed as part of the research for this thesis will be a "location enhanced" rating website.

### **2.3. Summary**

In this chapter we described HTML 5, its origin and some of the new features it implements. This was followed by a more indebt look at the new geo-location feature in HTML 5. Geo-location will form an integral part of the architecture for the application developed as part of this research.

### **3. State of the Art of Community Rating Sites on the WWW**

This state of the art review focuses on the use of collaborative social networking and the various guises through which it is implemented. It provides a synthesis of the research literature in the collaborative web and social networking fields. It gives examples how these two elements of Web 2.0 are being jointly implemented in commercial websites.

Collaborative social networking is the merging of the collaborative web with the modern phenomenon of online social networking. This is part of what is commonly referred to as Web 2.0, which is a term coined by Tim O'Reilly of O'Reilly Media in 2005.

"Web 2.0 basically refers to the transition from static HTML Web pages to a more dynamic Web that is more organized and is based on serving web applications to users. Other improved functionality of Web 2.0 includes open communication with an emphasis on Web-based communities of users, and more open sharing of information." (Source: Webopedia)

Community based web sites have a social nature by enabling users to communicate with each other either by providing content or directly through a forum.

According to Sigala [38], user generated content and online social networking have revolutionized the way users read, share, produce and redistribute information. Consequently this is having a major influence on consumer's decision making process, as they seek affirmation from the advice of their online peers. As such an online social network will form part of the architecture for this research.

### **3.1. Community Social Networks**

Social networking is a concept that has been around long before the internet. Weaver and Morrison [45] state that the wide scale adoption of social networking on the internet is causing a shift in the internet's function from an information repository to a communication utility. It is their belief that:

"The mass adoption of social networking websites of all shapes and sizes points to a larger movement, an evolution in human social interaction".

Social networks generally focus on a specific domain, for example, Wikipedia is a collaborative encyclopedia, Youtube focuses on video sharing amongst its members and Facebook offers peer to peer social interaction. This research will concentrate on the social aspect of advisory sites operating in the travel and recreation area.

Sparks and Browning [41] believe that more research is required in the area of "electronic word of mouth" due to the increasing reliance of advisory websites in the tourism area. They explore the role of four key factors "that influence perceptions of trust and consumer choice":

- The target of the review (core or interpersonal)
- Overall valence of a set of reviews (positive or negative)
- Framing of reviews (what comes first: negative or positive information)
- Whether or not a consumer generated numerical rating is provided together with the written text.

They found that consumers were more influenced by "early negative information" and that positively framed information coupled with numeric indicators increased both booking intentions and trust. On the whole they found that users are looking for information that is easy to process when evaluating reviews. To encourage the decision making process of the user in relation to making a booking the technical architecture in this research will include numeric/visual indicators.

It is generally accepted that the manner in which the review data is displayed can be more influential than the review itself, as users will initially scan websites looking for visual indicators of the products/service/entities rating. This will determine if they will discount it from their research or explore it further. This should have major implications for website design in this area as it has a direct bearing on their effectiveness. Therefore the application developed will use visual indicators to display rating information wherever possible.

### **3.2. Community Ratings/Reviews**

In recent years there has been a dramatic increase in the use of social networking by organisations. Businesses want to leverage the power of social networks to inform people of their products and services. This is primarily down to the power online forums and rating sites etc. have over consumer choice. As De Hertogh et al. [20] point out reaching critical mass in communications is a prerequisite for success on interactive platforms. It is therefore essential that there are low barriers to entry for an individual to join a collective and contribute. Ultimately in a collaborative system it is the users that add value to the system.

While there is lots of data on the influence on how online reviews can impact product sales, data relating to what motivates people to write online reviews is much more limited. As collaborative websites require user generated content it's essential we examine the factors that get people to contribute and identify perceived barriers to user involvement.

One of the first studies in this field was carried out by Hennig-Thurau et al. [18]. They used a traditional survey in which participants were asked to explain their motivation for reviewing products or services online. The survey identified the following as the primary motivating factors:

- desire for social interaction
- desire for economic incentives

- concern for other consumers
- potential to enhance their own self-worth

Another study [51] on what motivates consumers to review products online found that people are more likely to review something they found to be exceptionally good or exceptionally bad and there is also a greater propensity to review something that is extensively marketed. Their findings also led them to reject Henning-Thurau et al. finding that concern for others was a motivating factor, but rather self expression/self confirmation was the principal motivator.

Research shows that over 30% of internet users have rated products online (Pew Internet & American Life Project, 2006). An interesting aspect of their research was that it showed only small differences for gender and age when it comes to posting an online review. The Pew Research Centre also found that among internet users, 78% conduct product research and 32% have posted product comments online. (Web: <http://www.pewinternet.org/Reports/2010/Online-Product-Research/Findings/58-percent-of-Americans-have-researched-a-product-or-service-online.aspx>; Sept 2011).

When analysing collaborative social networking we also need to understand what motivates people to read reviews/opinions on line. Hennig-Thurau & Walsh [19] in their study "Motives for and Consequences of Reading Customer Articulations on the Internet" devised eight theoretical motives for reading online reviews. Their research enabled them to refine this down to five factors:

- Obtaining buying related information
- Social orientation through information
- Community membership
- Remuneration
- To learn to consume a product

The results of the study enabled them to show that the two main motivating factors are to save decision making time and to make better buying decisions.

Therefore the architecture implemented should prioritise the rating valance to expedite the user's decision making.

### **3.3. Decision Making**

The primary function of a community based social networking site, regardless its domain, is to help members make informed decisions through the provision of independent unbiased reviews. Rahayu et al. [35] state that online reviews and opinions are now a "de facto basis and contributing factor for a range of daily activities such as buying products, choosing restaurants, booking hotels and planning holidays". They also state that there is an increasing reliance on online opinions for product/service selection. Thus the efficiency with which this information is conveyed to the user the more effective the implementation.

Sites such as [tripadvisor.com](http://tripadvisor.com), [virtualtourist.com](http://virtualtourist.com), [lonelyplanet.com](http://lonelyplanet.com) and [travel.yahoo.com](http://travel.yahoo.com) are the market leaders in the tourism social networking domain, with one each generating millions of dollars in annual revenue through advertising revenue and affiliate programs. All these sites have the same core functionality. They use social media techniques to provide travel tips and reviews and allow members to interact through forums. It is the use of these techniques that helps foster a sense of community for the members. This research will assimilate the best features/characteristics of each of these sites from a usability perspective and this will be formative in the design of the website element of this project.

One of the major problems of collaborative web sites is that it can be hard to quantify the level of influence they have on the decision making process of other members. According to Ye et al., [49] Web 2.0 has led to a dramatic increase in the number of online review sites. While prior studies have been able to quantify the influence of these sites on the sales of CDs, books and films etc., it is their belief that the influence of user generated reviews in the tourism industry is still largely unknown to both tourism researchers and practitioners. They conducted



an empirical study to analyse the direct impact reviews had on business performance using data from an online travel agency in China. They found that traveler reviews had a significant impact on online sales; in fact they found that 10% increase in traveler review ratings boosted sales by 5%.

Vermeulen and Seegers [43] on the other hand applied set theory to model the impact of online reviews on consumer choice with regard to the hotel industry. Their study included review valence (positive vs. negative), hotel familiarity (well known hotels against less well known) and reviewer expertise. They found that online reviews whether positive or negative increases consumer awareness and therefore ensures the hotels consideration. They also found that the effects of positive reviews are much stronger for lesser known hotels. It was also their conclusion that reviewer expertise has little or no bearing on the impact of the review. Based upon this information a review site for the providers of recreational activities would greatly benefit the lesser known operators in the market.

Palakvangsa-Na-Ayudhya et al. [34] have shown that the sentiment of a review is deemed more influential than the review itself as often users are just looking for affirmation before making their decision. Sentimental analysis is the process of categorising reviews as positive or negative, and this opinion mining can provide an objective summary from large groups of differing opinions on a product/entity/service. The summary data can usually be displayed graphically so it can be quickly absorbed by a visitor to a site. Therefore the presentation of data will be a key usability factor.

With collaborative social networking becoming a major influence on a business's online sales, Ye et al. [48] conducted a study to measure the value of managerial response to online reviews. They researched two online travel agencies, both of which allowed their customers to post hotel reviews, but only one of which gave the management of the hotel the right to reply. Their results were staggering as they found that hotels that responded to online reviews received 60% more online bookings, than equivalent hotels that didn't respond. This could be seen

as an extension of the empathy users' desire from their online experience and should be factored into the design of sites that allow users to post reviews.

As Chen's [5] study of the different business models on the web noted that the viability of the "community model" is based on user loyalty. User retention is therefore essential if advertising, infomediary or affiliate opportunities are to be taken advantage of. It is therefore crucial that a community based site not only provides a great user experience but also entices the user to return. Chen also states how Web 2.0 is being used to "Power Verticals", in that user's seem to prefer sites that do one thing extremely well as opposed to being mediocre at many things. This is why there appears to have been a shift away from the portal style websites in recent years.

Another key element of the so called Web 2.0 revolution is the provision of a richer user experience. With the use of technologies such as Ajax and rich internet controls users have come to expect a more interactive experience, i.e. the web application should "react immediately" to user events. The architecture implemented as part of this research will enable the user to initiate a purchase if they desire, thus allowing us to ascertain the influence of community ratings with regard to impulse decision making.

### **3.4. *Trust and the Collaborative Web***

The definition of trust in regard to online activity varies considerably depending on the literature you are reviewing. A.G. West et al. [46] propose redefining trust specifically for collaborative content as they believe there are deficiencies in existing definitions. They define trust in collaborative content as "the degree to which content quality meets the community's requirements. Thus, trust must be measured through the subjective lens of the community consensus on which it resides."

Trust plays an enormous part in the collaborative web and it is deemed a key element in the success of a site and there has been much research carried out in

this area [9][12][13][23][26][30][39]. According to these authors trust is required where there is uncertainty that leads to a perception of risk. This is why trust is such a big issue in the online environment as the product or service users are purchasing is not immediately tangible. This is also why peer reviews are given more credence than testimonials. In online communities there is the expectation that members intend to help and support other members [37]. Without this benevolence online communities wouldn't work. There must also be a belief in the competence of the reviewer and this is why many sites now also rate reviews as it helps garner trust. As such the ability to rate a review must be considered when architecting a model in this domain.

It is reported that the internet is used for some aspect of travel plans in 75% of cases [52]. This is why online communities are being used to provide unbiased information to help make informed decisions. This has in effect caused a major shift in the travel industry as tourists now regard peer reviews as the best source of information when booking a trip. The number of people actively taking part in these online communities continues to grow with sites such as tripadvisor.com having more than 10 million registered members and 25 million unique visitors each month.

Fazli & Sam [11] examined six website quality traits as antecedents of online purchase intentions for air tickets. The six factors examined were usability, website design, information quality, trust, perceived risk and empathy. They found that empathy and trust are the two most influential factors. In terms of websites empathy can be regarded as "personalization" which includes understanding the specific needs of customers and providing service related convenience [31]. It is therefore essential that a website provides an empathetic service to increase user trust if they want to increase their conversion rates. Personal recommendations, suggestions etc. based upon what the user has previously expressed an interest in could be added to sites to help provide a more empathetic user experience. Part of this research will review how effective recommendations are in the recreational domain.

Ironically perhaps the biggest indicator of trust in a website is "community endorsement". This in effect provides a catch 22 situation for new websites, i.e. how do you establish trust on a new website with little or no initial activity? As such the percentage of users that leave a review during usability testing will be a metric used in this research. The application will also implement a user forum to enable users to request information regarding facilities with no current reviews.

## **4. Design**

As discussed in the previous chapters, several issues need to be considered when designing an online community based rating application. These issues relate to how the information is consumed by its users for decision making purposes, achieving critical mass by retaining user and establishing trust within the application. However, the fundamental requirement is user contribution as this a prerequisite for any collaborative application. This chapter aims to identify the fundamental requirements of a rating application for recreational activities.

The design of the Golf Advisor application is focused on fulfilling the research objectives of this thesis, so it must incorporate all the aforementioned attributes as well as location awareness. This chapter will begin by outlining the influence the state of the art review had on the application design, followed by the requirements elicitation process. Next, the application requirements for Golf Advisor, both functional and not functional are presented. Finally we take a high level look at the applications architecture, describing the architectural design pattern used and the core components the application is comprised of.

### ***4.1. Influences from the State of the Art***

The research carried out in chapters two and three influenced several design decisions in architecting the Golf Advisor application. The aim of this section is to describe their influence and how they manifest themselves in the finished application.

Although the main focus of this research is user contribution, the primary function of online rating sites is as a decision making tool for its users. As the majority of the potential audience for a site such as Golf Advisor will solely want to consume the review data [19], it's essential that it is conveyed in an efficient manner.

#### ***4.1.1. Sentimental Influences on Golf Advisor Design***

The research showed that the sentiment of a review is more influential than the review itself [34]. This had a major influence on a number of design decisions. It was the inspiration for the Like/Dislike option available for each golf course on the site. This option serves two purposes, it allows user to quickly see the valence of the reviews for the course and it also allows users to express an opinion about a course in a non-taxing manor.

The importance of the sentiment of a review also influenced the decision to make written reviews optional. Although this decision was initially mooted as an incentive to contribution, it does serve a dual purpose. The simple attribute rating system allows users to express their opinion about key aspects of a golf course in an extremely efficient manner.

#### ***4.1.2. Review Framing Influences on Golf Advisor Design***

The state of the art review also revealed that the way in which a review is framed can also be influential on a user's decision making process. Therefore a summary of aggregate course ratings should be displayed unless the user wants to explore more detailed reviews. Detailed reviews will only be available on the details page for the golf course within the application. This serves two purposes, ratings are displayed in a uniform manner for all golf courses and they are displayed in a graphical manner that can be interpreted quickly by the user.

As the application aspires to advise users what golf course to play, courses ratings should be easily available for comparison. This should be done in a graphical manner to reduce cognitive load on the user. Summary data for each rating criteria should be available for comparison, this allows the user to prioritize the attributes most important to them and should expedite their decision making.

#### ***4.1.3. Trust Influences on Golf Advisor Design***

The research also highlighted the importance of trust in the collaborative web [9][12][13][23][26][30][39]. The perception of trust is a key determinant in the

success of a website in this field. A common criticism of online rating sites is that they are susceptible to bogus reviews by unscrupulous self promoters, therefore moderation is required. To garner trust within the application registration/login will be required before a golf course can be rated. Users should also be restricted from reviewing a course more than once.

A user forum will also form part of the application design as it has been shown that forums within a web application increases the perception of trust.

The Devise [54] framework used for user authentication also stores the IP address from which the user logs in, in a real world environment this could be monitored for suspect activity. The moderator could then remove questionable reviews/ratings which could lead to mistrust.

The user registration process was designed to be as simple as possible, with new users only required to provide a username, email address and password. Detailed and complex registration processes are deemed a disincentive to user contribution.

## ***4.2. Requirements Elicitation***

As well as the state of the art review requirements elicitation was also carried out through researching comparable websites and informal interviews with colleagues and friends that have a keen interest in the subject matter. The concept for the application along with its scope was explained to the interviewees and discussions took place regarding functionality and participation. Due to the nature of the application the core functionality is non-negotiable but the main recommendation to arise from the interviews was that compulsory written reviews only acts as a deterrent to contribution.

## ***4.3. High Level Design***

Golf Advisor is a simple community based rating site for golf courses. It aims to use the geo-location API available in HTML5 to provide users with location based

data that will encourage contribution. To achieve its objectives the application must implement the following core functionality:

#### 4.3.1. Functional Requirements

Requirement	Description & Rationale
<b>Add/Edit/Delete Golf Courses</b>	<p>The administrator must be able to add edit and delete Golf Courses on the system.</p> <p>When adding a golf course to the system, the administrator will also be able to add details regarding course information and green fees etc.</p> <p>As green fee data may change on an annual basis this information must be easily updatable.</p> <p>The application must also geo-code the courses location upon creation. This is essential for the location based features in the application.</p> <p>Role based administration should therefore be incorporated into the application.</p>
<b>Geolocation</b>	<p>The users physical location should be attainable, if not a default should be set.</p>
<b>Review/Rating creation and editing</b>	<p>The primary function of the application is to enable users to rate and review golf courses they have played.</p> <p>A simple rating system is to be implemented to encourage participation. Textual reviews to be optional and making them compulsory could discourage participation.</p>
<b>User Forum</b>	<p>A forum is to be provided to facilitate communication between members of the sites.</p> <p>This is an essential feature of participatory online</p>



	<p>communities. It will allow members to ask questions and get opinions from each other. May also be used for non golf related topics such as advice on accommodation etc.</p> <p>Users will be able to ask questions and post comments on the various "boards" defined in the application.</p>
<b>Map Based Search</b>	<p>Golf Courses to be plotted on a map.</p> <p>Users can navigate the map to find courses in the desired area.</p> <p>This provides a quick and intuitive way to retrieve course information. It also provides proximity information for both towns and other courses.</p>
<b>Location Based Search</b>	<p>Users to be able to search for courses by distance from their current location.</p> <p>Same functionality also used to display the initial course listing on the index page.</p> <p>Enhances the user experience especially when being accessed from a mobile device.</p>
<b>Rating/Review Search</b>	<p>Users to be able to search courses based upon the ratings submitted.</p> <p>This will allow users to drill down through the ratings to find the best courses in the area as rated by the users.</p>
<b>Secure Login with Password Recovery</b>	<p>Users will be required to register to rate or review golf courses.</p> <p>As users are unlikely to use a site such as this every day, a password recover option should be available for when users return, as people frequently forget what passwords they used for which site.</p>

<b>Like/Dislike</b>	<p>A simple Like/Dislike rating option for each golf course.</p> <p>The primary function of this is to encourage participation, as it's an effortless contribution for the user. Also research has shown that the sentiment of a review is what's most important to other users.</p>
<b>Driving Directions</b>	<p>Driving directions for each golf course.</p> <p>Once a user decides to play a course they should be able to get directions easily from wherever they are.</p>
<b>Local Search</b>	<p>This feature allows the user to search for other amenities in the area, such as accommodation and restaurants.</p>

#### 4.3.2. Non-Functional Requirements

Requirement	Description & Rationale
<b>Integrity</b>	<p>Data should be securely stored with user passwords being encrypted etc.</p> <p>Users should only be able to rate/review a course once.</p> <p>Confirmation email for account creation etc. will help prevent bogus ratings/reviews.</p>
<b>Scalability</b>	<p>As the system grows performance should not degrade.</p>
<b>Usability</b>	<p>The application must be intuitive; it should be immediately obvious what each function is for etc.</p> <p>As the intended audience for Golf Advisor is anyone that plays golf, varying degrees of computer literacy can be expected, due to the broad age profile.</p>
<b>Robustness</b>	<p>The application should perform consistently with any errors being handled gracefully.</p>

#### 4.4. High Level Architecture of Golf Advisor

Based upon the design requirements outlined in the previous section, the following architecture was created for Golf Advisor. It was designed around a rating engine which will be used to collate the ratings submitted and process them into meaningful data and thereby creating the decision making platform illustrated in Figure 4-2.

Golf Advisor implements the Model View Controller (MVC) architectural design pattern (Figure 4-1). This approach separates the domain logic (business logic layer, data access layer etc.) from the user interface or view as it's referred to in MVC terminology. In object oriented database driven MVC web applications the Model generally consists of classes representing the tables in the applications database. The View is the display logic, i.e. how the data from the controller classes gets displayed to the user. Finally, the Controller is the layer that communicates between the view and the model, i.e. it responds to user interaction by invoking the application logic.

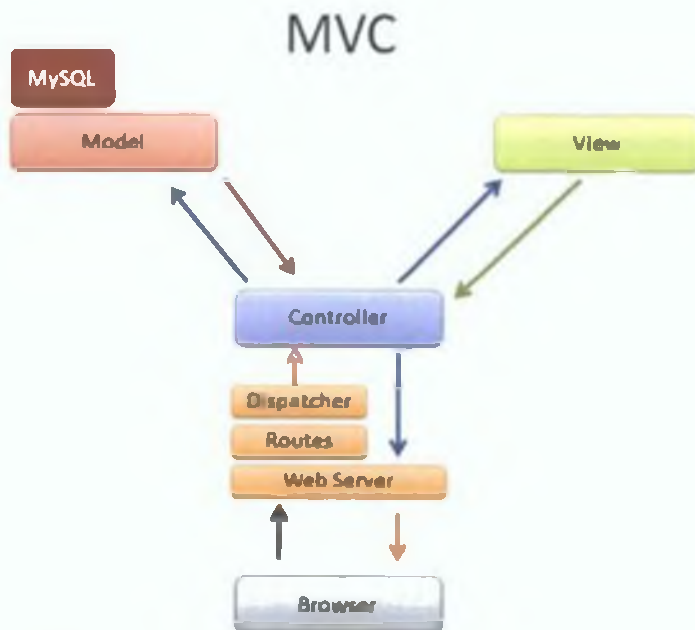


Figure 4-1 MVC Architectural Pattern

As location awareness is a key attribute of the application, the user's physical location will be retrieved upon start up. This location information is then stored in a session variable so that it can be used throughout the application. The location information is then used to initialize the map control on the index page to the user's current location. Golf courses are then plotted on the map via an Ajax request to the server. A carousel of images from golf courses in the area with links to their information page is also populated upon startup. The application was designed to initialize with content specific to the users current location for two reasons:

1. Users that reside in the area will be greeted with familiar imagery, i.e. a map of their area and images from local courses they may have played. It is hoped that the familiar images will help form an emotive bond with the user and there by encourage contribution.
2. Users accessing the site from mobile devices will have an immediate list of courses in the area and a means of comparing them.

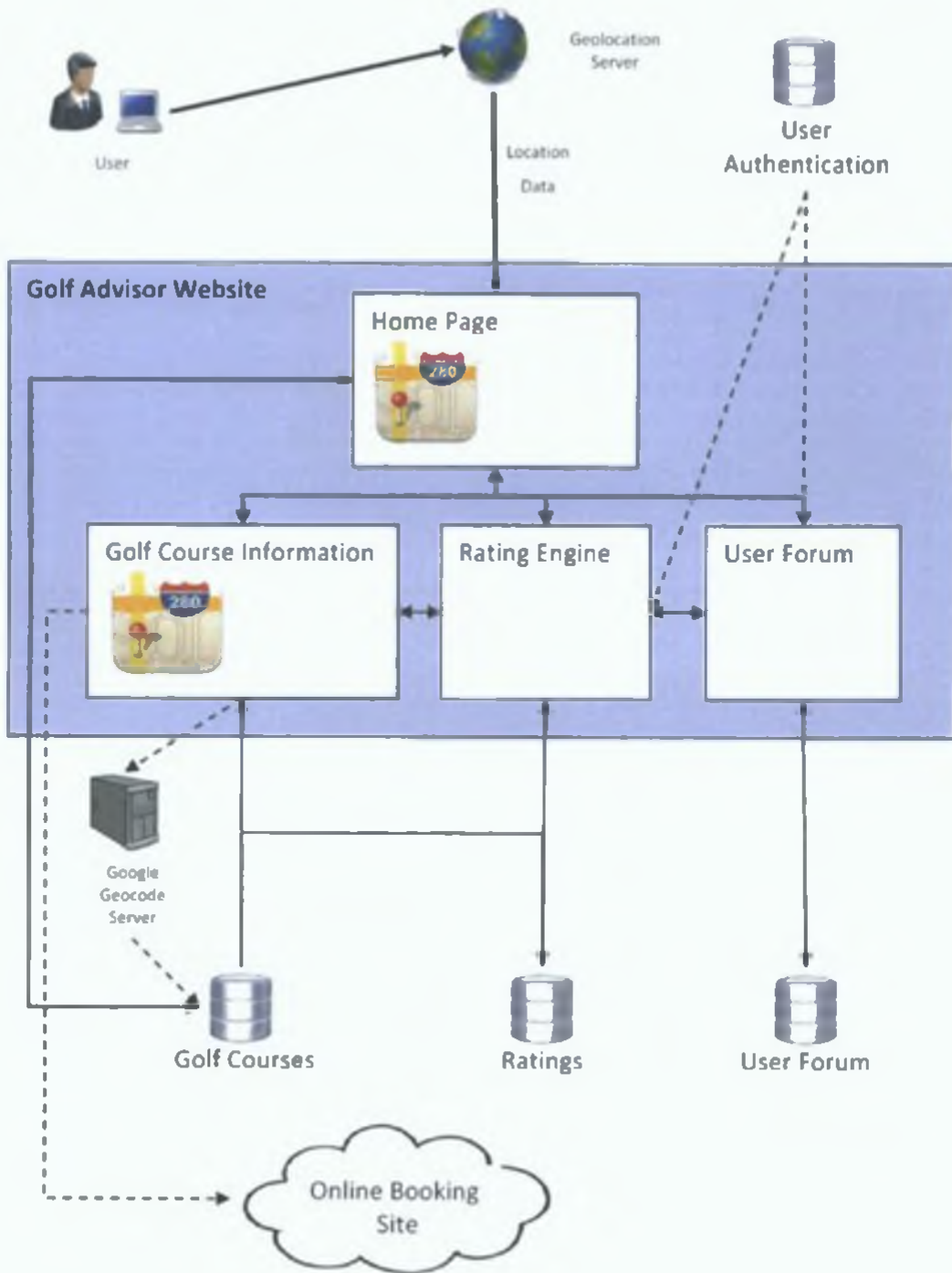


Figure 4-2 Golf Advisor Technical Architecture

The application is designed around three core components:

- Golf Course Information
- Golf Course Ratings
- Members Forum

The golf course section of the application provides users with information relating to the selected golf course such as course information, green fees, driving directions and links to book tee times on line where available.

The rating engine will provide the business logic of the application. Users can submit ratings by simply rating various predefined attributes applicable to golf courses. The ratings engine will aggregate the ratings to provide meaningful summary information to express the overall sentiment of the ratings. The aggregated ratings will facilitate course comparisons and this can be filtered down by geographic area. Summary data for each attribute will also be available.

Two forms of rating will be available to the users, simple and detailed. The simple rating procedure will allow the user to simply "Like" or "Dislike" a course. The implementation of this feature would immediately differentiate the application from any other ratings site in this domain. Users will not be required to register to express a Like/Dislike. However restrictions will be incorporated into the application so that users can only like/dislike a course once for integrity reasons.

The detailed rating option will provide for more in depth analysis, i.e. rating predefined aspects of the course as well as a textual analysis if they so wish. A standard rating matrix will also facilitate comparisons with other courses in the area and this will help users in their decision making process. User registration will be required before a rating can be submitted and the system is designed so the user can only rate a course once. When a user tries to rate a course they have already rated they will be allowed to edit their initial submission.

A forum will also be available for members, so they can actively look for recommendations/advice from other members. This will also benefit the site

initially prior to courses receiving sufficient ratings to be deemed influential. Registration will be required before a user can join the forum.

As the application developed for the purposes of this project will essentially be proof of concept, its geographical impact will be limited to Ireland; however it will be designed to facilitate expansion into other territories.

The system will be designed so that anybody will be able to read the reviews, book golf etc. through the site. As previously stated to rate a course, write a review or take part in the forum however membership will be required. This will enable the authentication of reviews to a user and also build a useful database of user information which could be used for mail shots etc. All rating sites run the risk of bogus reviews etc. but golf courses by their very nature should be relatively self regulating, i.e. the variance between reviews should be relatively modest.

#### **4.5. Summary**

This chapter reviewed the design of the Golf Advisor application. It described how the state of the art review influenced the design of the application, detailing specific examples and describing their proposed implementation. A high level design overview of the application was also provided with a breakdown of both functional and non-functional requirements. The chapter concluded with a look at the high level architecture for the application, outlining the architectural design pattern and listing the core functional components of the application.

## **5. Implementation**

Chapter 4 of this thesis described the design of a location aware community based rating application for recreational activities. This design is based upon a set of requirements, both *functional* and *non-functional* that was formulated from the state of the art review and other requirement elicitation. This chapter will describe the steps involved implementing the aforementioned design to create a web application for use in testing the research objectives of this thesis.

### **5.1. Golf Advisor Web Application**

The development of a community based rating application that enables users to both consume and contribute ratings in an efficient manner would be of great benefit to the users. The Golf Advisor application described in chapter 4 is designed to provide such functionality. A number of core technical requirements were defined which Golf Advisor must implement to achieve the objectives set out in this thesis. These requirements are:

- I. Golf course locations to be mapped in the application.
- II. Use geo-location technology to initialize the map to the user's location.
- III. Graphical display of rating information.
- IV. User authentication prior to contribution.
- V. Administrators should be able to add/edit/delete golf courses on the system.
- VI. Golf Advisor should allow location based searches by users.
- VII. Ratings and reviews to be searchable.

All of these requirements have been implemented in the Golf Advisor application developed for this thesis.



## **5.2. Components of Golf Advisor**

The following open source components were used in the implementation of Golf Advisor:

### **5.2.1. Google Maps**

The mapping features of the application is implemented using the Google Maps Javascript API V3 [55]. The maps are dynamically generated using AJAX [56] and centered on application defined coordinates. If the user permits the application will initialize the map on the index page from the user's current location. Markers are plotted on the map to identify the golf courses.

Markers will be clustered depending on the zoom level. The clustering is performed using the markerclusterer [76] JavaScript library, which is part of the Google maps utility library; it creates and manages "per zoom" level clusters for large amounts of markers. The clustering of markers enhances the user experience as it eliminates the problem of markers "stacked" on top of each other depending on the zoom level.

A click event has also been added to the markers to create a popup "info window" containing summary information regarding the golf course. The info window contains links to both the course information page and a link to rate or review the course. There is also a visual indicator as to its average rating using a JQueryUI progress bar for effect (see Figure 5-1).

Data transfer of the course information to be plotted on the maps is done through JSON [57] for efficiency reasons.

When adding new courses to the system their address will be geo-coded using the Google Geocoding API [58].

## Courses near you...

Why not help the community by rating the courses you've played.



Figure 5-1 Golf Courses displayed using Google Maps API

### 5.2.2. jQuery

jQuery [59] is a “fast and concise JavaScript Library that simplifies HTML document traversing, event handling, animating, and Ajax interactions for rapid web development”. It is a free, open source library that offers cross browser compatibility.

jQuery is used extensively throughout the application to access and update page elements using the Document Object Model (DOM). A good example of its use is the updating of the Like and Dislike counter information, an Ajax request is used to call the function that updates the database and if it is successful the like/dislike counter on the page is incremented. As only a single element on the page is being updated this appears seamless to the user.

### 5.2.3. jQuery UI

jQuery [64] UI is a library of interface elements or “widgets” and animations built on top of the jQuery library. It is a free, open source library that can be used to provide richer user experience.

jQueryUI widgets and plugins used in Golf Advisor include:

Name	Description
<b>Stars v3.0.1</b>	<p>This widget is used for the "Star" effects on the rating system. It uses either html radio buttons or input lists as its source control and replaces them with a richer more interactive interface.</p> <p>It is customizable and this was used in the application to disable the controls when being used for display purposes only and also to use different images for different star sizes.</p>
<b>Carousel</b>	<p>The Carousel widget is used for the "cover flow" of golf course images on the index page. Clicking any of the images will display the full sized image in a light box.</p>
<b>Fancybox v1.3.4</b>	<p>The fancy box widget is used to display images in a "lightbox" that floats on top of the current page. It provides a number of visual effects such as animated opening and closing and layered captions for the images. The mouse can also be used to scroll through the images in the collection.</p>
<b>Progress Bar v1.8</b>	<p>The progress bar widget is designed to show progress information, such as the percentage complete of a process. In Golf Advisor an alternative use was found for this control and it is used to display a courses average rating.</p>

#### 5.2.4. MySQL

The application data is stored using a MySQL [65] on port 3306. MySQL is an open source, multi platform relational database. It was chosen for this application for its platform independence, performance and scalability.

Interaction with the database is handled by the Active Record framework in Rails. Active Record implements object relational mapping between business object in the application and database tables.

### **5.3. Methodologies**

Golf Advisor was developed using an agile approach to software development. This methodology promotes iterative and incremental development and facilitates change during the development phase. A good example of this was the decision to replace AuthLogic [60] as the user authentication framework with the Devise[54] framework between increments. This decision was made as Devise offers a significant number of enhancements over AuthLogic such as password recovery, optional email validation and tracking information (sign in count, timestamps and IP address).

### **5.4. Development Environment & Technologies**

#### **5.4.1. Ruby On Rails**

Golf Advisor was developed using Ruby on Rails [53]. Ruby on Rails (RoR or Rails for short) is an open source web application framework for the ruby programming language. Ruby on Rails promotes the rapid development of data driven web applications.

Rails applications implement the Model View Controller (MVC) architectural pattern as described in the Chapter 4, section 4.5.

The application was developed using version 3.0.3 of rails with ruby version 1.9.2. It is hosted on port 3000 by default, but this can change depending on the host.

#### **5.4.2. Ruby Gems**

Ruby Gems are third party libraries (packaged ruby modules) that provide additional functionality in an application.

The following Gems were used in Golf Advisor:

- Devise
- Kaminari
- Paperclip
- MySQL 2

#### **5.4.2.1. Devise**

Devise [54] provides a flexible user authentication solution for rails. It provides secure password authentication that can also be integrated with other systems such as OAuth using token authentication. It can also be configured to send registration confirmation emails etc. and can track user sign in and IP addresses, in a production environment this could be used to help prevent bogus reviews. Another nice feature of Devise is the password recoverable option, which resets the users password and then sends reset instructions to the user. All these options have been implemented in the Golf Advisor application. The Devise framework was developed specifically for Rails 3 applications.

#### **5.4.2.2. Kaminari**

Kaminari [61] is a “scope and engine” based paginator for Rails 3. It is used throughout the application to divide large amounts of information into discrete pages. It helps improve user experience, as only a subset of the results are required, thus reducing processing time and improving performance. The pagination was generally used in conjunction with AJAX to improve performance as only a portion of the screen was being updated when the user changes page.

#### **5.4.2.3. Paperclip**

Paperclip [62] is used to manage file uploads to websites. It is used in the application to allow users to upload photos. Users can upload photos to accompany their course review and the administrator can also include photos when adding a new course.

Paperclip enables the formatting of images to standard sizes when they are being saved. Golf Advisor creates medium sized (300\*300) and thumbnail sized

(100\*100) copies of all images being uploaded. These are then used in other various controls in the application such as the carousel and the info window popup on the map. ImageMagick [63] must be installed on the host computer for this feature. ImageMagick is a free, open source, platform independent image editing application.

#### **5.4.2.4. MySQL 2**

The MySQL Gem provides an API for connecting to and querying a MySQL database. Information regarding the database will be discussed later in this chapter.

### **5.5. User Interface Design**

The user interface was designed keeping in mind the 6 rich internet applications design principles [66]:

- Make it Direct
- Keep It Lightweight
- Stay on the Page
- Provide an Invitation
- Use Transitions
- React Immediately

The application was designed to provide the user with a simple user interface that is easily navigable with all views being accessible from the current page. To implement this, a simple navigation menu is included on each page. The title bar will also indicate the user's current status, i.e. if they are logged in or not, along with links to sign in/sign out or sign up.

The website uses a white background with light dark fonts as the contrast is visually more appealing for users. Borders and tabs have a chrome effect again for visual appeal.

All function buttons and action links have intuitive labels clearly indicating their purpose; this facilitates navigating the site and aids usability and memory recall.

Many rich user controls are used in the application to provide a more pleasing user experience. The applications home page displays the main image for courses nearby the user in a carousel that transition's automatically. The images

in the carousel also have an identifier label that links to their details page. Clicking on an image in the carousel opens up the full sized image in a light box. This feature alone implements almost all 6 principles of good interface design.

The map control is undoubtedly the focal point of the main page. This enable the user to browse the current course listing by geographic location, although it defaults to the current location users can easily zoom and pan to whatever location they like. A marker is added for each golf course using java script and there is a hover invitation to view the course. The golf course marker tool tip also includes an image of the course which is a link to its details page and there is also a link to rate it. In an application such as this images are the most important asset as they can tell the user more about the course than any textual description.

The course listing page displays the courses in a tabular format that includes the main image of the course. Pagination is used on the list and this is implemented through Ajax this ensures the user "stays on the same page" and also limits their cognitive load. Smaller lists also lead to improved "scannability" and the page loads quicker. Users can also filter the list of course by a number of criteria such as name, address, green fee, distance etc., again the search is performed using a Ajax request.

Using Ajax to update elements on the page means the URL remains unchanged and this is one of the key ingredients of a Rich Internet Application. It also improves the user experience as the page is only being partially updated and the other elements on the page remain available to the user during the update.

The course details screen displays information about the golf course in a clear and concise manner. The image gallery for the course can be viewed in a lightbox control, which is visually more appealing. Reviews for the course are listed in a paginated partial ordered by timestamp, with the most recent ones being displayed first. There are links to its online booking facility if available along with links to rate/review it. An interactive map of the local area is also provided; this map incorporates a local search facility. This can be used to find

hotels and restaurants etc. in the area. There is also an option to get driving directions to the golf course; the directions are outputted in a printable format below the map. These features are implemented through the Google maps API.

The reviews details screen is used to compare and contrast courses by their individual attribute ratings. The user can filter the results by various different options and the data is displayed in a tabular format so the user can sort the results by attribute in ascending or descending order. Again, this is all implemented through Ajax. The individual ratings are "starified" for visual effect as it makes the comparison between courses easier.

The screenshot shows a 'Reviews' section on the Golf Advisor website. It features a table of course ratings with the following columns: Course Name, Green, Fairway, Bunkers, Tee Boxes, Difficulty, Equipment, Value, Avg. Rating, and # Reviews. The ratings are represented by star icons. Below the table, there are navigation links for '12 Next' and 'Last'.

Course Name	Green	Fairway	Bunkers	Tee Boxes	Difficulty	Equipment	Value	Avg. Rating	# Reviews
Castillo	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	5.0	1
Monte Alito	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★	4.71	1
Canaan	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★	4.71	1
Performance	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★	★★★★	4.52	1
Walden	★★★★★	★★★★★	★★★★	★★★★	★★★★★	★★★★★	★★★★	4.29	2
Tapscott	★★★★	★★★★	★★★★	★★★★	★★★★★	★★★★★	★★★★	4.19	3
Academy	★★★★	★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★	4.14	1
Odessa	★★★★	★★★★	★★★★	★★★★	★★★★★	★★★★★	★★★★★	4.0	1
Our Lady	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★★	★★★★	3.96	4
Hyland	★★★★	★★★★	★★★	★★★★	★★★★★	★★★★★	★★★★	3.86	1

Figure 5-2 Golf Advisor - Course Ratings

The member's forum is organized by topic (see Figure 5-3); users can create new topics or post new messages on existing topics. When a user responds to a posting it effectively takes the form of a conversation. For convenience the number of replies and the date of the last post are listed on the main page of each topic (see Figure 5-4).



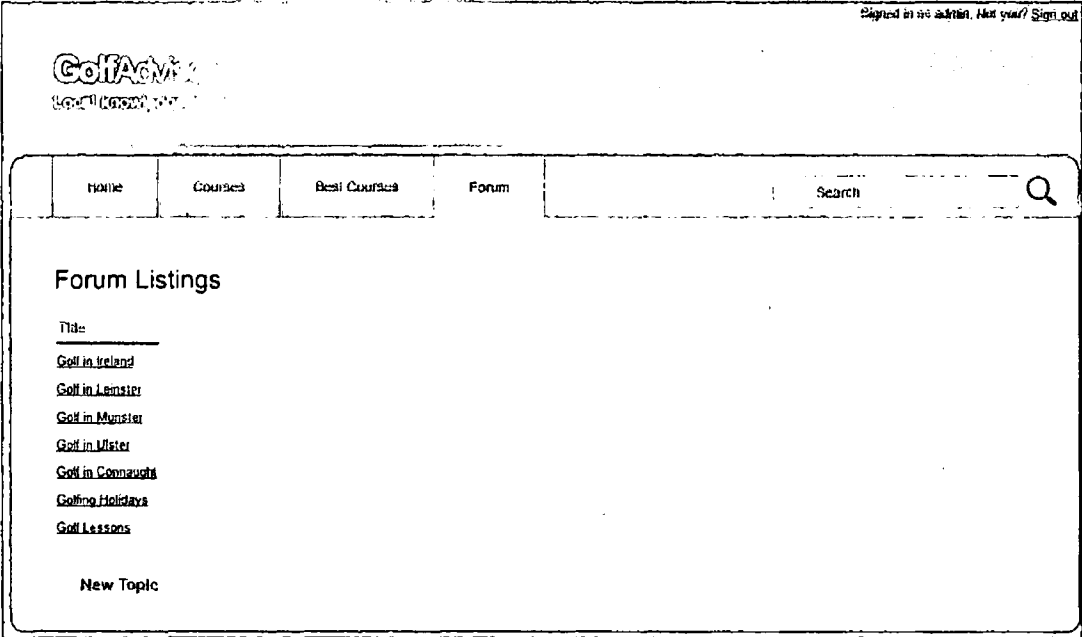


Figure 5-3 Golf Advisor - Forum Listings

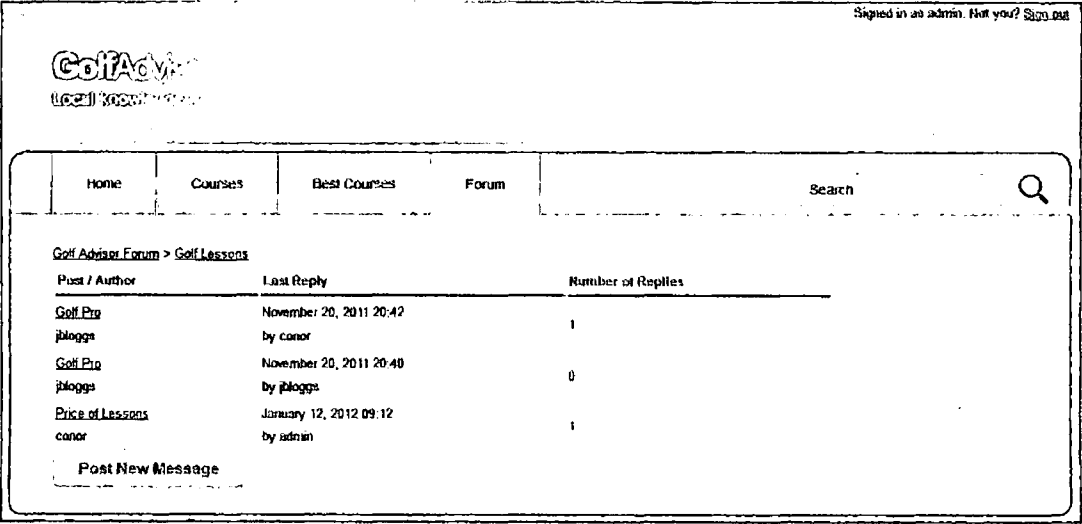


Figure 5-4 Golf Advisor Forum Posts

## **5.6. Testing**

### **5.6.1. Introduction**

Golf Advisor underwent extensive testing during the development process. The following types of test were performed:

- Unit Testing
- Functional Testing
- Usability Testing

This section details what was involved in the various tests and how they were carried out.

### **5.6.2. Unit Testing**

Unit tests were written to test all models in the application. These tests were used to ensure the applications data access layer performed as expected and the integrity of the data in the database was maintained.

Figure 5-5 is illustrative of the type of unit tests performed and Figure 5-6 indicates the results attained for a unit test on all models in the application.

```
class CourseTest < ActiveSupport::TestCase

  test "should not save a course without a name" do
    course = Course.new
    assert !course.save, "Saved course without a name!."
  end

  test "should not save a course without an address" do
    course = Course.new
    course.name = "Test Golf Course"
    assert !course.save, "Saved course without an address."
  end

  test "Save New Course" do
    course = Course.new
    course.name = "New Course Test"
    course.address = "1 Mayor Street, Dublin 2, Dublin"
    course.country_id = 1
    course.book_online_url = "http://www.bookonline.ie"
    course.description = "test description for unit testing!"
    course.email = "test@test.com"
    course.phone = "123456779"
    course.fax = "546456"
    course.num_holes = "18"
    assert course.save, "Error: couldn't save new Course ."
  end
end
```

Figure 5-5 Sample Unit Tests

```
c:\RailsApps\GolfAdvisor>rake test:units
(in c:\RailsApps\GolfAdvisor)
Loaded suite C:/Ruby192/lib/ruby/1.9.1/rake/rake_test_loader
Started
Finished in 3.642000 seconds.
37 tests, 37 assertions, 0 failures, 0 errors, 0 skips
Test run options: --seed 20515
c:\RailsApps\GolfAdvisor>
```

Figure 5-6 Unit Test Results

### 5.6.3. Functional Testing

In rails applications functional tests are carried out to test the various controller actions, i.e. that they respond to the incoming requests correctly. Although the application was extensively user tested during development, additional functional tests were also run to highlight any unforeseen errors.

```
c:\RailsApps\GolfAdvisor>ruby -Itest test\functional\countries_controller_test.rb
Loaded suite test/functional/countries_controller_test
Started
.....
Finished in 2.521000 seconds.

7 tests, 10 assertions, 0 failures, 0 errors, 0 skips

Test run options: --seed 59472

c:\RailsApps\GolfAdvisor>
```

Figure 5-7 Sample Functional Test

### 5.6.4. Usability Testing

The primary objective of usability testing is to identify and resolve any design issues that can lead to a poor user experience. Usability testing provides a heuristic evaluation of the application which can highlight deficiencies and inefficiencies in the application which are otherwise difficult to quantify.

Ultimately good usability testing should lead to improvements in efficiency, productivity and end user satisfaction.

The primary goals of this usability test are:

- Identify any design inconsistencies and usability problem areas within the website's user interface. Areas we will concentrate on are:
  - Navigation – can the user easily navigate the site to find what they are looking for?
  - Display – is the application data displayed in a consistent manner across all screens.
  - Validation – is user input validated in a consistent manner across all screens.

- Examine the web sites usage under controlled conditions with representative users to see how intuitive the application is. Users will be recorded performing a list of simple tasks, their ability to perform the tasks and the speed at which they are performed will act as a barometer to the websites efficient design.
- Establish user satisfaction with the design of the website and identify areas where improvements can be made.

#### **5.6.4.1. Usability Test Methodology**

Prior to usability testing a database was compiled of all golf courses on the island of Ireland. The database contained course, green fee and contact information etc. The locations of all the golf courses were geo-coded. Images were also added for courses in the region where the usability testing was taking place. The purpose of this was that although the application was still in development, it would appear to be the finished article to the testers and thereby enabling a proper evaluation.

The usability tests were conducted in the environs of an open plan office. A Mac computer with the GolfAdvisor web site and SilverBack [77] usability testing software installed was used for the tests. The participant's interaction both facially and on screen is recorded using SilverBack. The Participants signed a consent form acknowledging that: participation is voluntary, participation can cease at any time, and that the session will be recorded. Participants were encouraged to "think aloud" while doing the test as this could help indicate their thought process while performing the various tasks. Five test candidates were selected for recording; while a further 10 tests were carried out without being recorded.

Test candidates were selected based upon their likelihood to use a website such as Golf Advisor, i.e. they all had an interest in the domain. They were simply asked to use the site just like any site they found while browsing the web. The

rationale behind this was not to invalidate the research question of whether location awareness incentives user contribution.

Once the test was completed they were asked to fill out a post test questionnaire to indicate their overall impression of the website, how it was designed etc. They were asked to express their opinion on a differential scale ranging from "Strongly Disagree" to "Strongly Agree". This satisfaction assessment was used to benchmark the sites usability. They were also asked for any recommendations they may have with regard to improving the site.

The participants did not receive any training on how to perform tasks on the web site. The web site is designed in such a manner that it should be intuitive to a typical user, i.e. the navigation links and action buttons should be clearly and intuitively labeled so as not to require training.

If the participants required any help during the test it was available.

### 5.6.4.2. Usability Test Results

The usability testing highlighted some design areas where improvements could be made, with the primary one being the initial user login. When a user tries to rate/review a course they are prompted to login, a number of users tried to login before Signing up as the option to sign up was not immediately obvious. This login screen was subsequently redesigned to contain both a Sign In and Sign Up form (see Figure 5-8).

The screenshot shows the Golf Advisor website's login interface. At the top right, there is a link for "Sign Up or Sign In". The main navigation bar includes "Home", "Courses", "Best Courses", and "Forum", along with a search bar. The login section is divided into two columns:

- Existing Users - Sign In:** Includes fields for "Email" and "Password", a "Remember me" checkbox, and a "Sign In" button. A link for "Forgot your password?" is located at the bottom left of this section.
- New User? - Sign Up:** Includes fields for "Username", "Email", "Password", and "Password confirmation", with a "Sign Up" button at the bottom.

Figure 5-8 Golf Advisor Login Screen

Another criticism was that users could both Like and Dislike a golf course; this has also been remedied so that a user can only express a single opinion regarding a course.

The driving directions option on the course screen was also deemed unintuitive as it was available on a popup on the maps. This has now been moved to a search box on the main screen (see Figure 5-9), with jQuery being used to initiate the search when the return key is pressed.

### Map of the Local Area

The screenshot displays a web interface for a local search and driving directions feature. At the top, there is a search bar with the text "Local Search (e.g. hotels, restaurants etc.)" and a "Find" button. Below the search bar is a map of the Dublin area, showing various locations and a search result for "Clonsilla Hotel & Resort, Wicklow". To the right of the map, there is a list of search results, including "Clonsilla Hotel & Resort, Wicklow", "Clonsilla Hotel", and "The Clonsilla Hotel, Wicklow". Below the map, there is a section for "Clonsilla Hotel Dublin, IFSC, I.F.S.C., Dublin 1, Ireland" with a distance of "10.9 km - about 40 mins". Below this, there is a list of driving directions:

1. Head east on W Wall Quay toward Samuel Beckett Bridge 0.2 km
2. Take the 1st right onto Samuel Beckett Bridge 0.2 km
3. Take the 1st right onto Cavendish Ln 0.7 km

Figure 5-9 Local Search & Driving Directions

Other suggestions that were implemented as a result of the usability testing include:

- Distance to the course from the users current location displayed on the carousel on the index page.
- Open links to other sites in a new tab.
- Sorting best courses by distance from current location.

Overall there was a very positive reaction to the application as 100% of participants agreed or strongly agreed that the website was intuitive, easy to use



and well organized. Similarly all test participants agreed that the information contained within the site was easily accessible and could be consumed quickly. The location awareness feature was also extremely popular with users with 93% of those tested finding it useful.

Users were also complimentary about the how the rating system was implemented and were united in agreement that it was both useful and intuitive.

Finally there was some room for improvement from a usability perspective with regard labeling the various different menus and options within the application. 20% of participants felt that the function of some options was not immediately obvious during the initial testing. Labels on controls whose function was not immediately obvious to some users have been updated to better reflect their function.

Even though the application was very well received the usability tests did highlight some issues that needed to be addressed. Often when developing an application the developer becomes so familiar with how certain components function that they become oblivious to the fact that this may not be intuitive to other users. The majority of suggestions and enhancements that resulted from the usability tests were implemented in the final application.

Figure 5-10 illustrates the opinions of the fifteen users that tested the application from a usability perspective.



**Website was easy to use?**

**The website was well organised?**



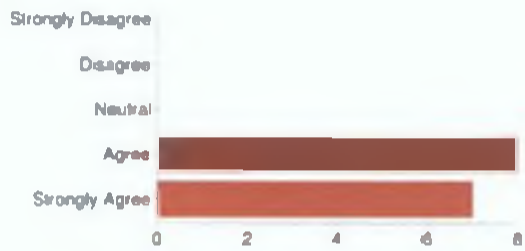
**Navigating the website was intuitive?**

**Could get information quickly?**



**Understood the function of each menu?**

**Found the location awareness useful?**



**Found user ratings useful?**

**Attribute rating system was intuitive?**

**Figure 5-10 Usability Testing - Questionnaire Results**

## **5.7. Summary**

In this chapter we looked at how the Golf Advisor application was implemented. The chapter began with overview of the applications functionality and this was followed by detailed descriptions of the various open source components used in its construction. Details of the agile approach taken to development, the development environment and the various technologies as part of the implementation were also discussed. The chapter concludes by outlining the various tests (unit, functional, usability) performed on the application as part of the implementation. Usability testing is afforded a more detailed analysis and the findings of these tests and details of any remedial work required is also presented.

## **6. Evaluation of Golf Advisor**

The objectives of this research as defined in the research question posed in Chapter 1 of this thesis are:

- I. Design, prototype and evaluate a location aware rating application for recreational activities.
- II. Use the prototype developed to evaluate if geo-location technology can be used to achieve greater user contribution on community rating sites for location based products or services.

The Golf Advisor application was designed and developed as a means of testing the research hypothesis. The application implements the technical and functional requirements outlined in chapters 4 and 5. It was designed to be easy to use and should be intuitive enough so that no training is required.

This chapter describes how the application developed was evaluated by outlining the experiment objectives, the metrics used, the methodology and the results attained. The chapter is concluded with some observations noted during the research.

### **6.1. Experiment Objectives**

The primary objective of the experiments carried out was to determine if location awareness can be used to increase user contribution in community online rating sites.

The secondary objective of the experiment was to ascertain the determinants for contribution or lack thereof.

### **6.2. Metrics Applied**

The metrics applied to prove the hypothesis of the research question was the measure of those that rated a golf course during the experiment. This was further

broken down to qualify those that rated their home course and those that rated other courses. Measures were also taken to qualify if initializing the application with golf courses from the user's locality was a determinant to contribution.

The post evaluation questionnaire contained questions regarding demographic information, usability heuristics and application specific analytical questions.

The survey questions were to ascertain the following information:

- Age Profile
- Golf Club/Society membership
- Use of online social networks
- Experience of reviewing/rating products or services on line.
- Did they rate/review a golf course using Golf Advisor

The analytical questions were broken into two sections, one to be completed by those that reviewed a site and one by those that didn't. The function of these questions was to identify the factors that led to their participation or lack thereof, but fundamentally they were to identify if the use of location awareness technologies had any influence on their decision to contribute.

Those that contributed a review/rating were asked to provide some factual data such as if they reviewed a course where they are a member and if they also reviewed other courses they had played. The remaining questions required the user's opinion on the deciding factors to leave a review. This required the user to answer based upon a five point differential scale ranging from "Strongly Disagree" to "Strongly Agree". They were also afforded the opportunity to outline any other factors that were not contained in the list of questions. Candidates that did not contribute a review were asked provide the reasons for their decision again from a list of questions using a differential scale.

### **6.3. Methodology**

To research the effectiveness of the application, test candidates were selected based upon their likelihood to use an application such as Golf Advisor. A sample size of 15 participants was used, with the gender breakdown of 13 male and 2 female. All test participants are golf enthusiasts with all but one being current members of golf clubs. The single non-member is a former member of a golf club but still plays golf regularly.

Each test participant was given a brief overview as to what the Golf Advisor application is and was asked to use the application for evaluation purposes. They were not given any predefined instructions and were told they could stop at any point. Prior to reviewing the application they were told they would be asked to complete a simple online questionnaire pertaining to their experience. The questionnaire is available in Appendix A of this document.

Observations were noted while the test participants were reviewing the application and an informal post test discussion/interview was carried out with each participant to assess their overall opinion of the site and record any observations they may have.

To further research the influence of location awareness within the application the last five test candidates were initially shown the application without sharing their location. When the user chooses not to share their location the map on the applications index page defaults to the centre of Ireland, from there it was observed how each user proceeded.

#### 6.4. Results

The results of the experiment were broadly in line with the expectations formed from showing potential users different prototypes during the development of the application. Although the participants in the research were effectively a captive audience, they were representative of the typical audience for an application such as Golf Advisor. The benefits of using location awareness could be seen immediately when users first experienced the application, with 80% of those tested instinctively looking at the information for their "home" course.

The application was evaluated based upon the results from a sample of 15 participants. Figure 6-1 illustrates that the sample chosen represents a broad age profile. All participants are golf enthusiasts with the vast majority of being golf club members, as shown in Figure 6-2. An interesting statistic is that 87% of the sample, use of some form of online social network, given the age profile of the test sample. Figure 6-4 indicates that 33% of those questioned had never previously rated/reviewed anything online before. This means that Golf Advisor achieved a conversion rate of 80% of previous non-contributors.

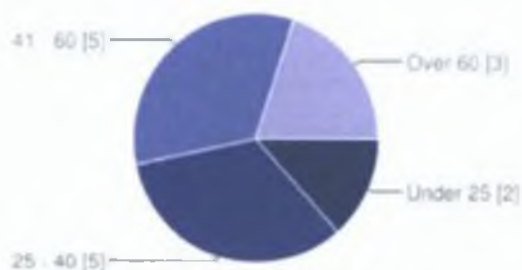


Figure 6-1 Age Profile of Test Sample

Age Group	Num. Testers	% of Sample
Under 25	2	13%
25 - 40	5	33%
41 - 60	5	33%
Over 60	3	20%



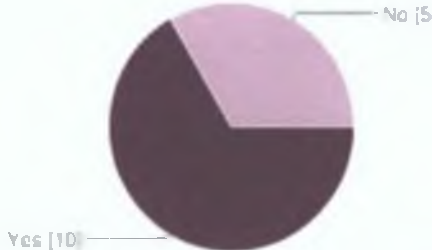
Member	Num. Testers	% of Sample
Yes	14	93%
No	1	7%

Figure 6-2 Membership of Golf Club or Society



Use Social Networks	Num. Testers	% of Sample
Yes	13	87%
No	2	13%

Figure 6-3 Usage of online social networks



Reviewed	Num. Testers	% of Sample
Yes	10	67%
No	5	33%

Figure 6-4 Previously reviewed/rated a product or service online

Out of the 15 candidates that took part in the research, 14 rated/reviewed a golf course (Figure 6-5), of these 12 reviewed courses they are members of (Figure 6-6), while 73% of users that rated a course also rated one or more additional courses they had played.





Figure 6-5 Reviewed Course



Figure 6-6 Reviewed Home Course

87% of those tested conceded that the use of their location to provide information about golf courses in their area was a determinant in their decision to contribute, while 93% found the use of location data more engaging (see Figures 6-7, 6-8).



Fig. 6-7 Local data incentivized contribution



Figure 6-8 Found location data engaging

The use of the user's location to provide images of local courses and the interactive map of the local area along with a simple rating system were undoubtedly antecedents to the user's decision to rate/review a golf course (see Table 1). They immediately aroused the user's interest in how the golf courses in their locality were presented. With the majority of participants this initial curiosity usually developed into a sense of allegiance and a desire to promote their club or area. In many cases, participants appeared just as curious as to the rating of courses neighbouring their home course.

Table 1 Determinants to Rate/Review a Golf Course



Figure 6-9 Map of the Local Area



Figure 6-10 - Seeing courses the use has played



Figure 6-11 Simple Rating System



Figure 6-12 Desire to Help Others



Figure 6-13 Desire to Promote Club/Area



Figure 6-14 Like/Dislike Option

Other qualitative factors that were considered in the user's decision to contribute were their desire to help others or to promote their local club or area. The research indicates that for the majority of those tested the desire to help others is not a major consideration; their prime motivator is the promotion of their club/area (see Figures 6-12, 6-13).

The questionnaire also highlighted that the majority of users were indifferent to the like/dislike option (Fig. 6-14). This was one of the most unexpected findings of the research as prior to the experiments this was perceived as a real incentive to contribution as it offered instant gratification with virtually no mental exertion. While most participants did indeed "Like" or "Dislike" one or more courses during their evaluation, when questioned the majority seemed apathetic to its value. However, as the users were predominantly using the site to review courses as opposed to using it as a decision making platform, it's effectiveness in assisting decision making remains undetermined.

Finally when tests were carried out with the geo-location feature disabled only one candidate (20% of the sample) initially searched for their home course, with the remainder preferring to pan around the map looking at random courses. Of those observed only a single user reviewed a course they had played under these conditions.

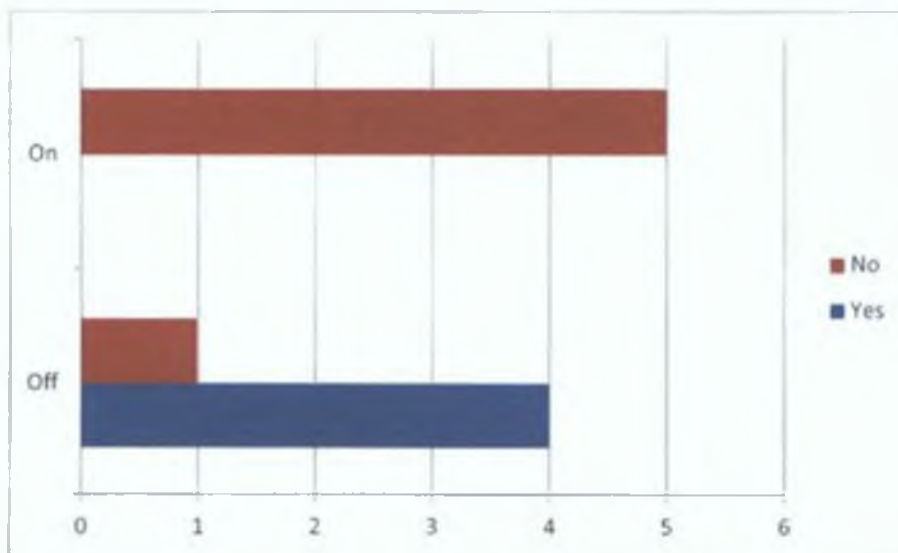


Figure 6-15 Review/Rated Golf Course with location awareness On/Off

### **6.5. Observations**

The following observations were noted while conducting the experiments and during the post evaluation interviews:

The test results show conclusively that when location data is used to serve users with locale based information it increases the probability of their participation in community based rating sites. Observing users interact with the website, the map of the local area coupled with familiar images was extremely engaging. While initializing the application with a map displaying the location of golf courses in the user's locality certainly aroused their curiosity, it was their desire to promote their club or locality that was the real determinant in their decision to rate a course or write a review. However, most users did in fact provide appropriate ratings for their courses, often one was surprised by the level of consideration users gave to their rating of different attributes.

The design decision to make written reviews optional was the correct one as very few of the test participants contributed a written review, and most conceded that if it had been compulsory they would not have rated a course. 93% of participants agreed or strongly agreed that the simple rating system was a determinant in their decision to rate a course with 60% stating outright that if textual reviews were compulsory they would not have reviewed a golf course. The design of the attribute rating system was also positively received with most of the participants liking the way it conveyed the course ratings and that it was easy to understand.

It was interesting to see that with location awareness turned off only 20% of those tested panned the map on main page to their area with the remainder either looking at the courses in the selected area or searching for the more prestigious courses. This showed that users are easily distracted and unless they accessed the application with the intention of rating a site, their conversion from consumer to contributor is unlikely. Therefore the use of geo-location to provide user specific content is a very effective tool for developing a bond with the user

that can increase the likelihood of their contribution, through their desire to promote their golf course or area.

The willingness to review a golf course by those that took part in the experiment was very encouraging. Although the results were very positive, the decision to participate was a combination of a number of factors, namely location awareness, interest in the domain and the desire to promote their golf course/area. While user participation cannot be directly attributable to location awareness alone it certainly acts as a catalyst to contribution.

Overall the research threw up no real surprises bar the fact that although most participants did use the Like/Dislike option, when later questioned they were ambivalent as to its merit. Users definitely found the site very engaging and I was frequently surprised by the amount of time participants spent evaluating the application considering they were not given an agenda. The fact that many users questioned why certain courses they looked at had not been rated yet is testament to this.

Finally, it is worth noting that currently, location data in Ireland for fixed line connections can leave a lot to be desired, especially outside of the large urban areas. Depending on your internet service provider (ISP), your physical location may be nowhere near the location registered against the IP address they've provided you with. However one would expect this to improve significantly in then not too distant future as location aware websites become more prevalent.

## **6.6. Summary**

In this chapter we reviewed the objectives of this research and detailed the experiment performed to evaluate it. The metrics being applied to qualify the results of the experiment were also documented as was the methodology used to carry out the experiment. A summary of the results was provided which conclusively showed that location awareness can indeed be used to incentivize participation in online community rating sites for the recreational sector. This

chapter concludes with a review of the observations noted during the experiments.

## 7. Future Perspectives

The research carried out produced very compelling evidence that location awareness technologies can be used to encourage contribution to community rating system for recreational activities. However as the research was carried out in a specific domain and the test candidates were selected because of their interest in the said domain, it would be interesting to see if the findings carry through to other areas where users are more detached from the subject.

A commonly reoccurring theme in the post test interview was the development of a mobile version of the application, as most users saw the benefit of finding the best course in the locality as getting directions to it on their mobile device. Such an application may also give users the impetus to rate a course after playing it, due to the convenience of it being available.

As the architecture of the application can easily be applied to any location based recreational activity there is plenty of scope to develop the application for other domains such as mountain biking, hill walking or skiing.

From a research perspective a possible future direction would be the creation of a non specific location based community rating system, i.e. get people in the area to rate products or services from the area. It would effectively enable the creation of "local" communities online, as restrictions could be put in to prevent users from outside a certain radius posting reviews.

One of the possible benefits of such a system would be the prevention of extreme views from people that have had limited exposure to the product or service. It would also be an effective means of promoting local products and services. It would certainly be a challenge to develop location aware community spirit. Although a relatively simple concept, it would also enable local businesses to promote themselves to their customers in an extremely efficient manner.

Overall, the ability to tailor a websites content based upon the user's location offers unlimited possibilities, for example cookery sites could provide recipes requiring local produce that's in season etc. As this technology for non mobile



devices is only in its infancy, one can only assume that we're going to be spoiled with imaginative implementations of the technology over the coming months/years. One would expect news and media sites to be amongst the first to embrace it as it will enable the creation of local news channels from a centralized location.

# Appendices

## Appendix A - Golf Advisor Questionnaire

Thank you for taking the time to review the GolfAdvisor application. Can you please take the time to fill out this questionnaire regarding your experience.

This is NOT a test and there are no right or wrong answers!

Please feel free to provide additional information to qualify your opinion/answers where necessary.

\* Required

---

### Age Profile? \*

- Under 25
- 25 – 40
- 41 – 60
- Over 60

### Are you a member of a golf club or society? \*

- Yes
- No

### Your opinion of the GolfAdvisor website: \* (This is to enhance the website from a usability perspective.)

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The website was easy to use?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The website was well organised?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Navigating the website was intuitive?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Could get information quickly?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Immediately understood the function of each menu?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Found the location awareness useful?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Found user ratings useful?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Attribute rating system was intuitive?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Are there any additional features you would like included in the application?**

**Other comments?**

(Any additional information you feel may be of benefit.)

**Do you use online social networks?**

(Are you an active user of sites such as Facebook, Twitter, LinkedIn, Youtube etc.)

- Yes
- No

**Have you ever previously reviewed/rated a product or service on-line? \***

- Yes
- No

**Did the provision of golf course information for your area influence your decision to contribute to the website? \***

- Yes
- No

**Did the use of your location incentivise you to contribute ratings for facilities in your area? \***

- Yes
- No

**Did you find the provision of location based information more engaging? \***  
(Is location based data more likely to keep you interacting with a website.)

- Yes
- No

**Did you Rate/Review a course(s) with Golf Advisor? \***  
(Including Like/Dislike)

- Yes
- No

**User Submitted Review/Rating**

This section is to be completed by users that submitted a Review/Rating

**Did you Rate/Review a course that you are a member of?**

- Yes
- No

**Did you Rate/Review other courses you have played?**

i.e. did you rate/review courses other than your home club

- Yes
- No

**Please rate how the following factors influenced your decision to Rate/Review a course:**

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Map of the local area?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Images of local courses?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Seeing courses you've played?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Desire to help others?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Desire to promote your club/area?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Simple rating system?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Optional textual review?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Like/Dislike option?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Any other factors?**

Please outline any other factors in your decision to Rate/Review a course?

▲

▼

◀

▶

**Other comments?**

Any additional information you feel may be of benefit.

▲

▼

◀

▶

**User Did not Review/Rating**

This section is to be completed by users who did not submit a review/rating.

**Please rate how the following factors reflect your decision NOT to Rate/Review a course:**

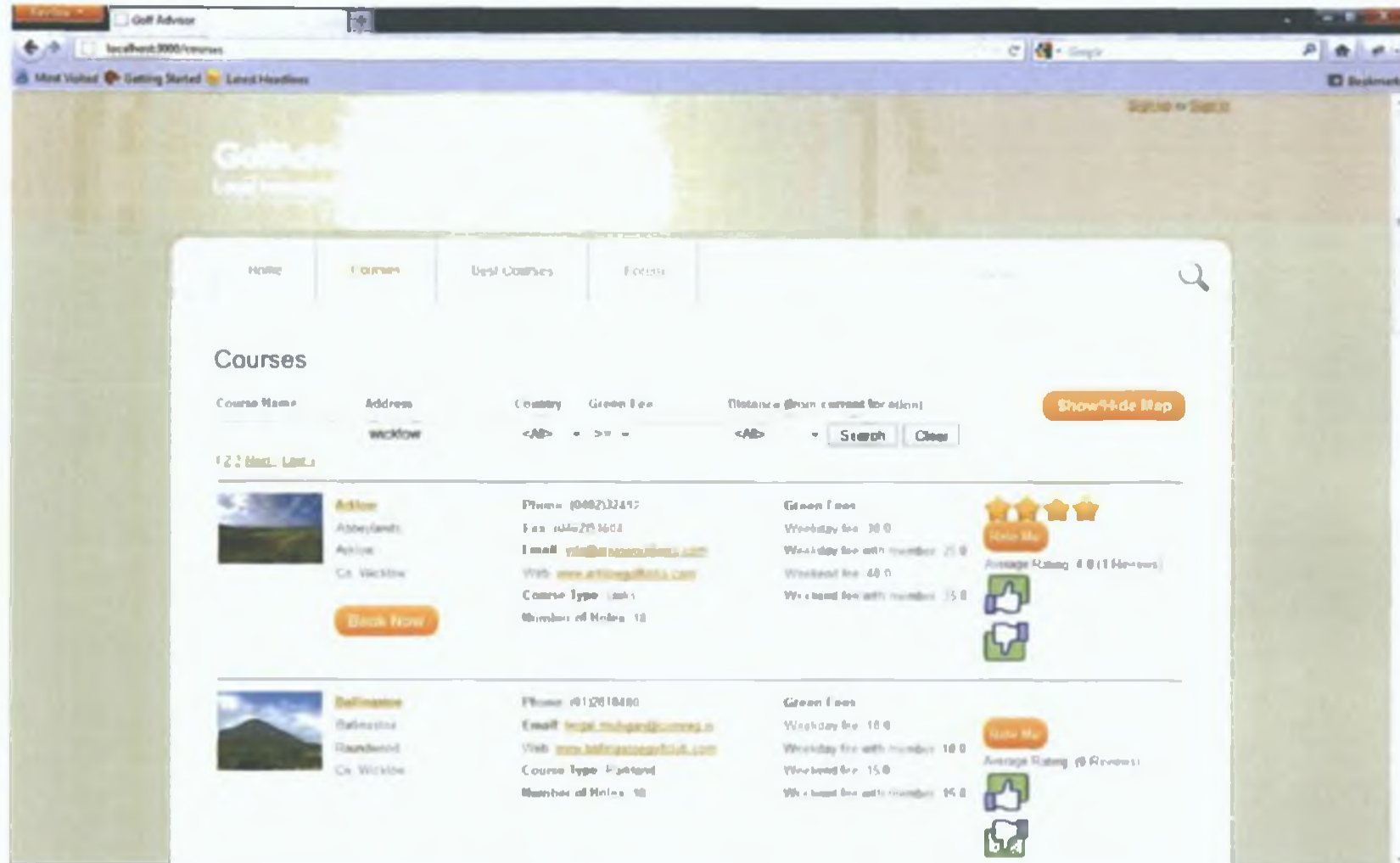
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I never review anything on-line?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I didn't want to create a user account?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was unable to create a user account?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I hadn't played any of the courses listed?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was looking at courses in a different area?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was more interested in reading other peoples reviews?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Any other factors?**

Please outline any other factors in your decision NOT to Rate/Review a course that were not reflected above.

**Other comments?** Any other information you feel may be of benefit.

Appendix B: Golf Advisor Screen Shots



Appendix B-1 Golf Advisor - Course Listings



The screenshot shows a web browser window with the URL 'localhost:3000/courses/38'. The page displays details for the 'Blainroe' golf course. The navigation menu includes 'Home', 'Courses', 'Best Courses', and 'Finger'. A search bar is located in the top right corner.

**Course: Blainroe**

Address: Blainroe, Co. Wicklow, Country: Ireland  
 Phone: (0404)68165, Fax: (0404)9365, Email: info@blainroe.com, Website: www.blainroe.com  
 Course type: Parkland, New holes: 0

**Green Fees**

Weekday fee: €10.0  
 Weekday fee with member: €7.0  
 Weekend fee: €10.0  
 Weekend fee with member: €7.0

[Book Online](#)

**Course Information**

Route	Length	Par
Championship	6175	72
Men's	6175	72
Forward	5858	72
Water	5858	72
Ladies	5447	74

**About Blainroe**

With 100 years from all 18 holes, this enjoyable and challenging parkland course carries the prestigious Hueston A. San design signature and is recognized as one of the finest courses on the East Coast since it's an option at 1978 designed and built in the late 1970's the first (and only) design was recognized by his son and later an international Master. 25 years later and is now widely recognized as one of the finest layouts and a top value in the Wicklow area.

**Ratings**

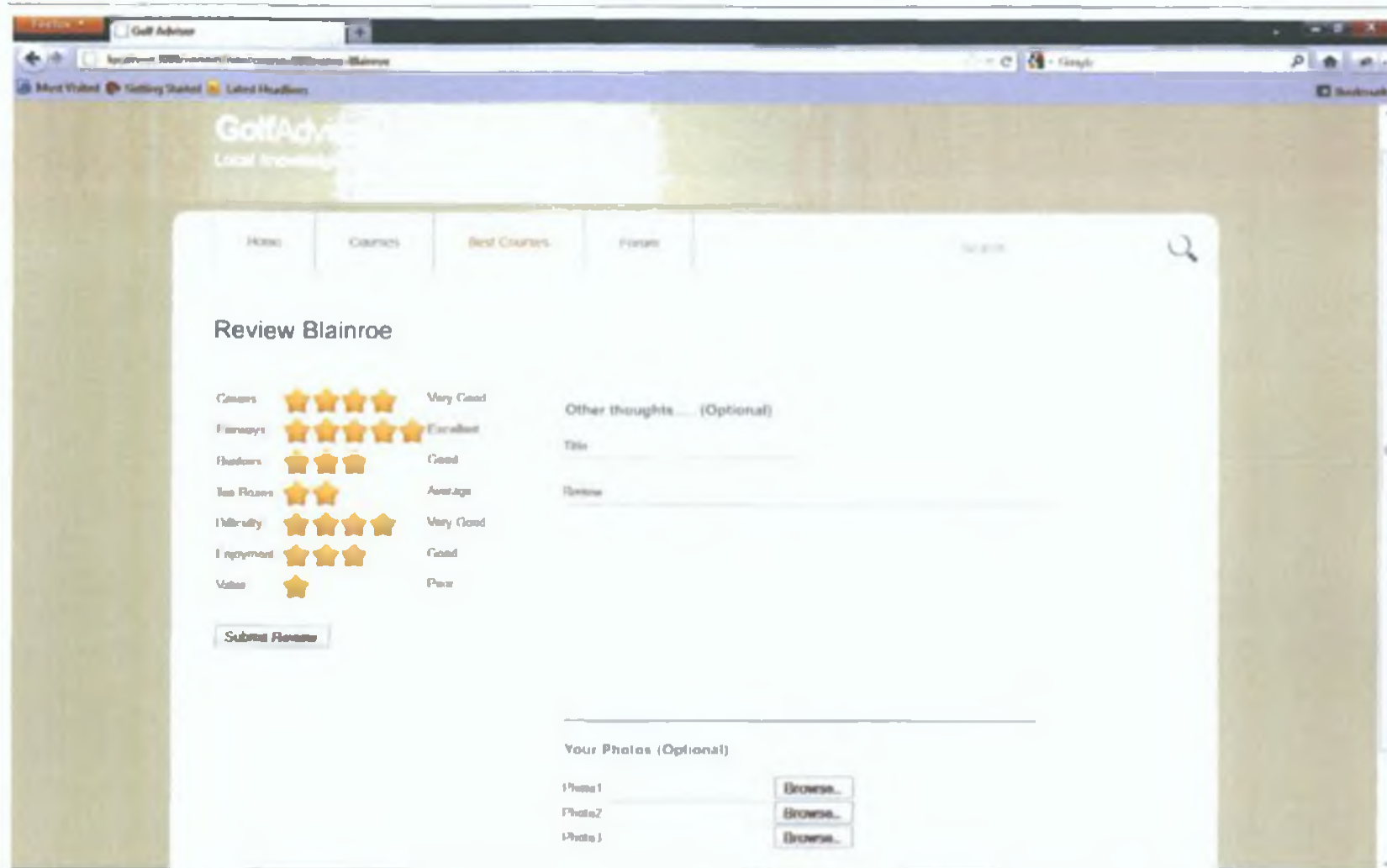
3 stars (3 out of 5)  
 Average Rating: 3.75 (1 Reviews) [Rate Me](#) [Write a Review](#)

5 people like this course | 7 don't like this course

**Recent Reviews**

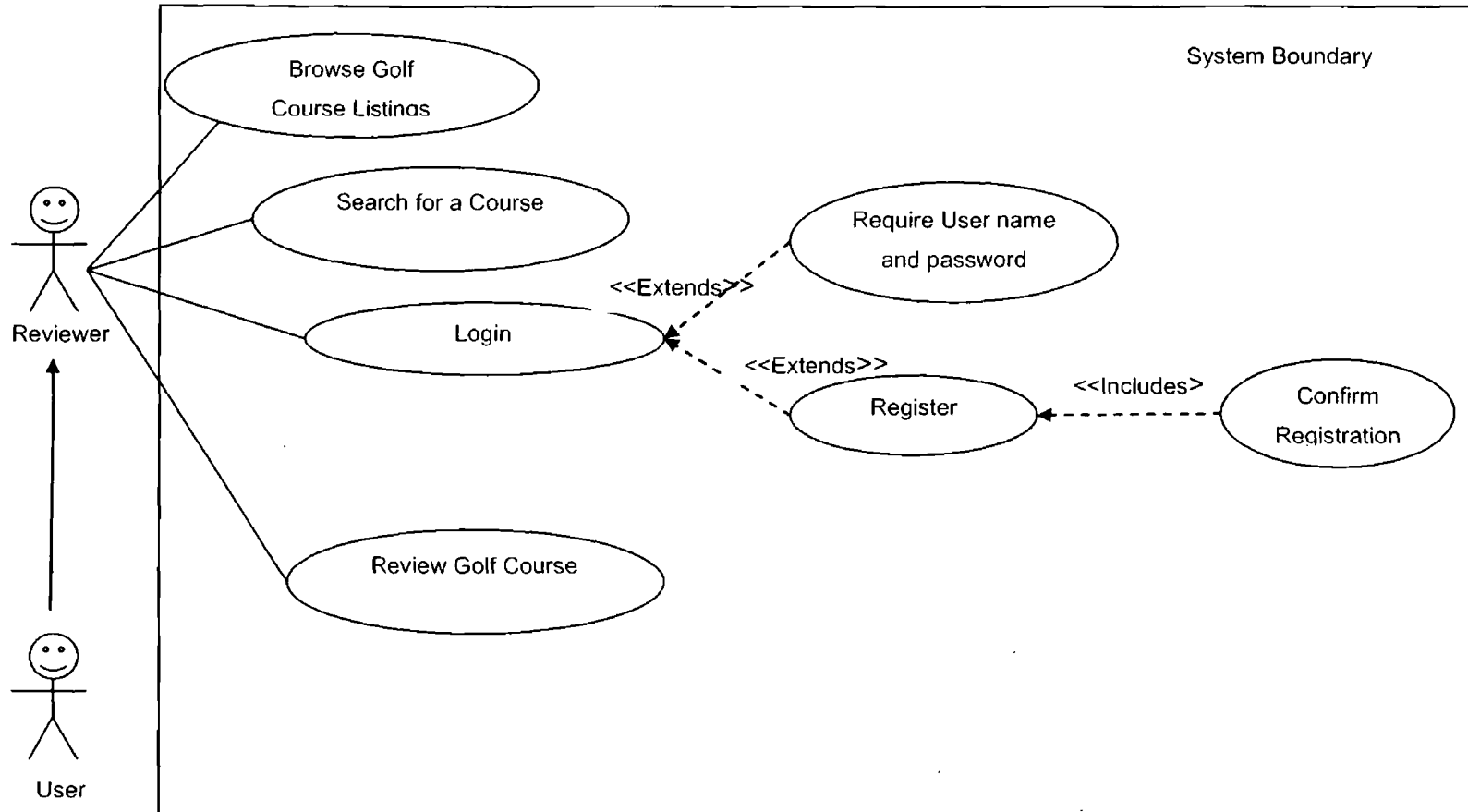
Reviewed by: [User Name]  
 Date: 2011-12-21

Appendix B-2 Golf Advisors - Course Details

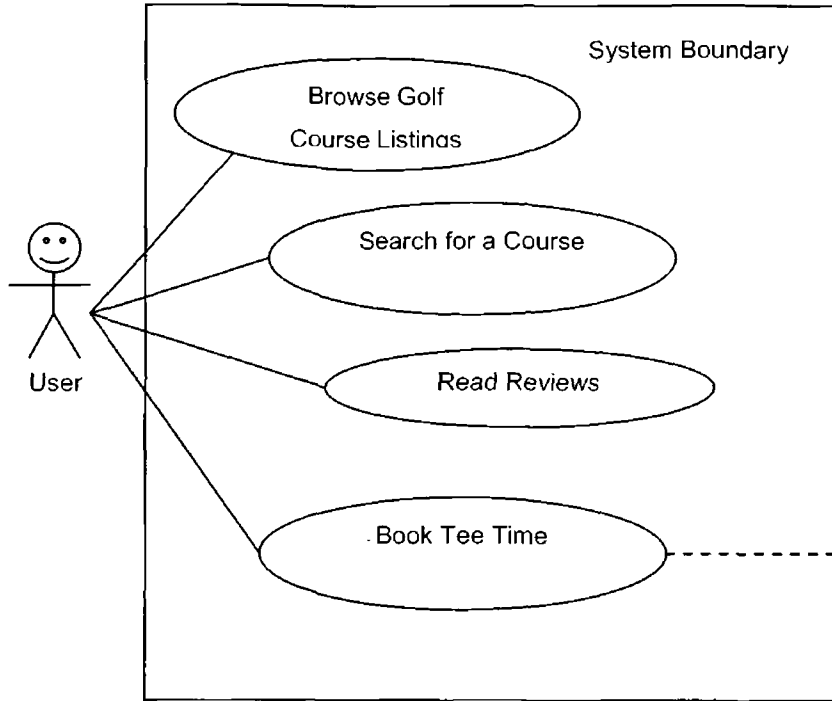


Appendix B-3 Golf Advisor - Review Course

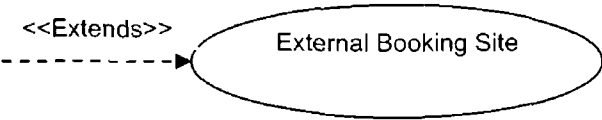
**Appendix C: Use Cases**

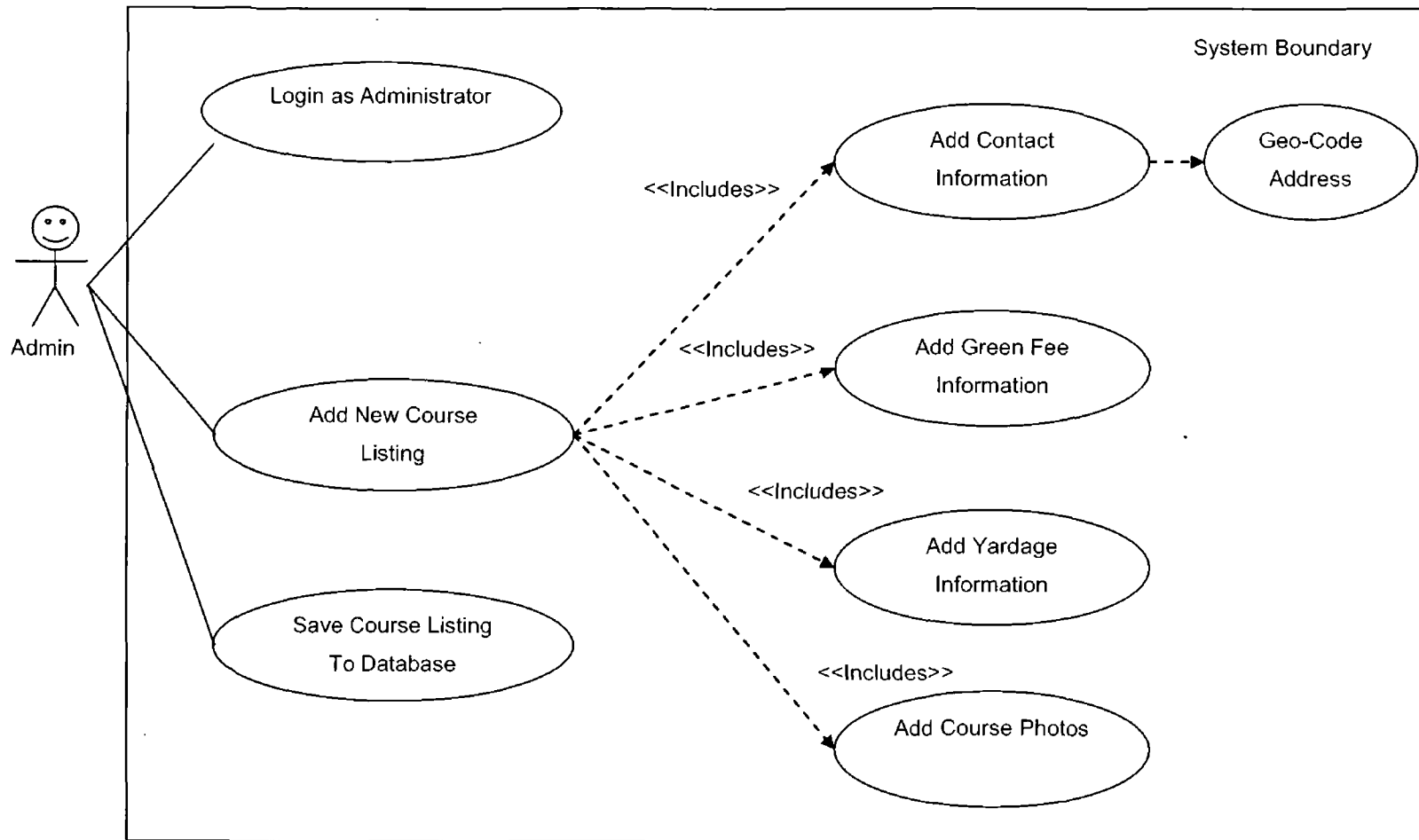


**Use Case 1 - User Reviews a Course**

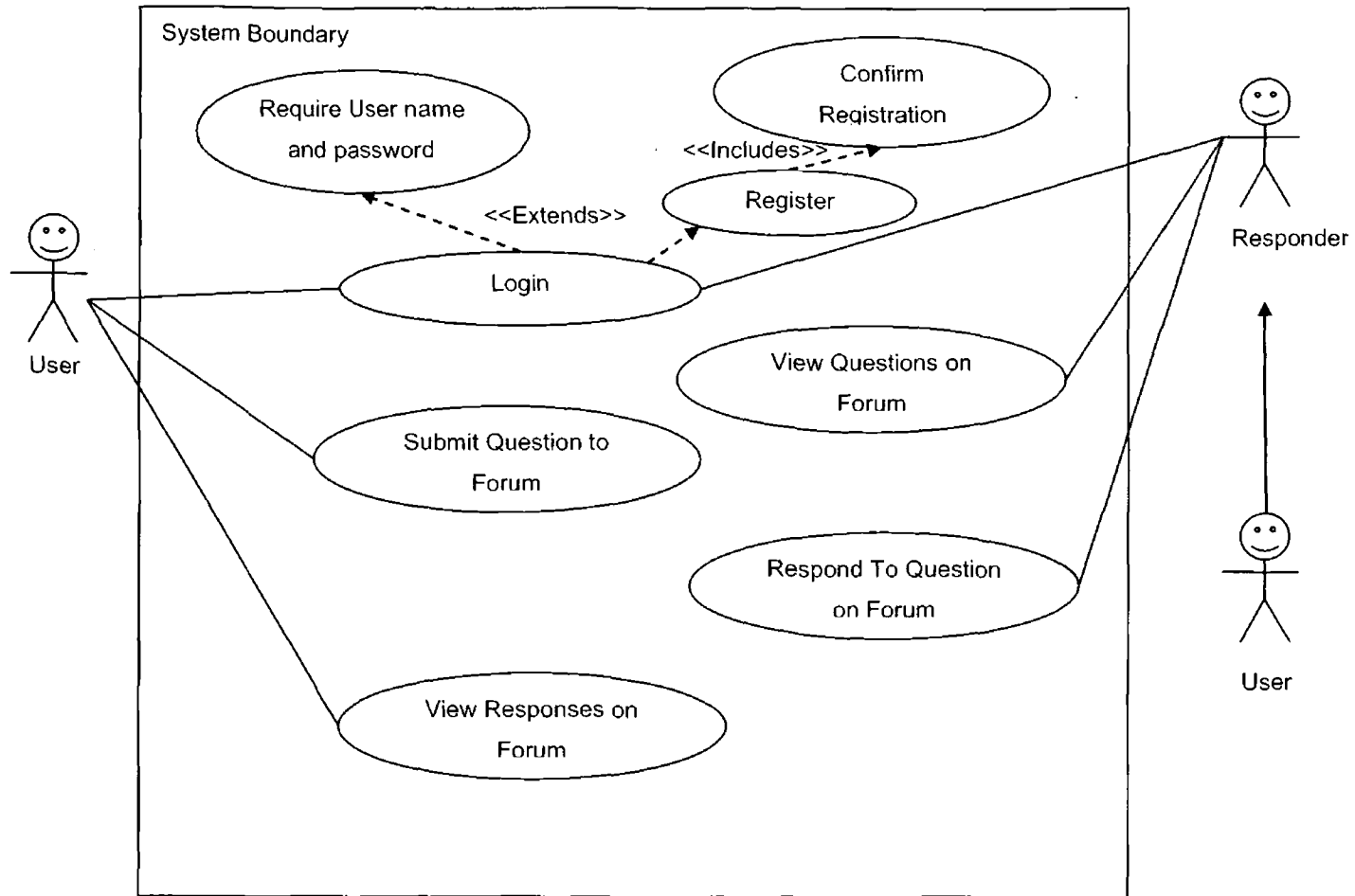


**Use Case 2 - Book Golf**



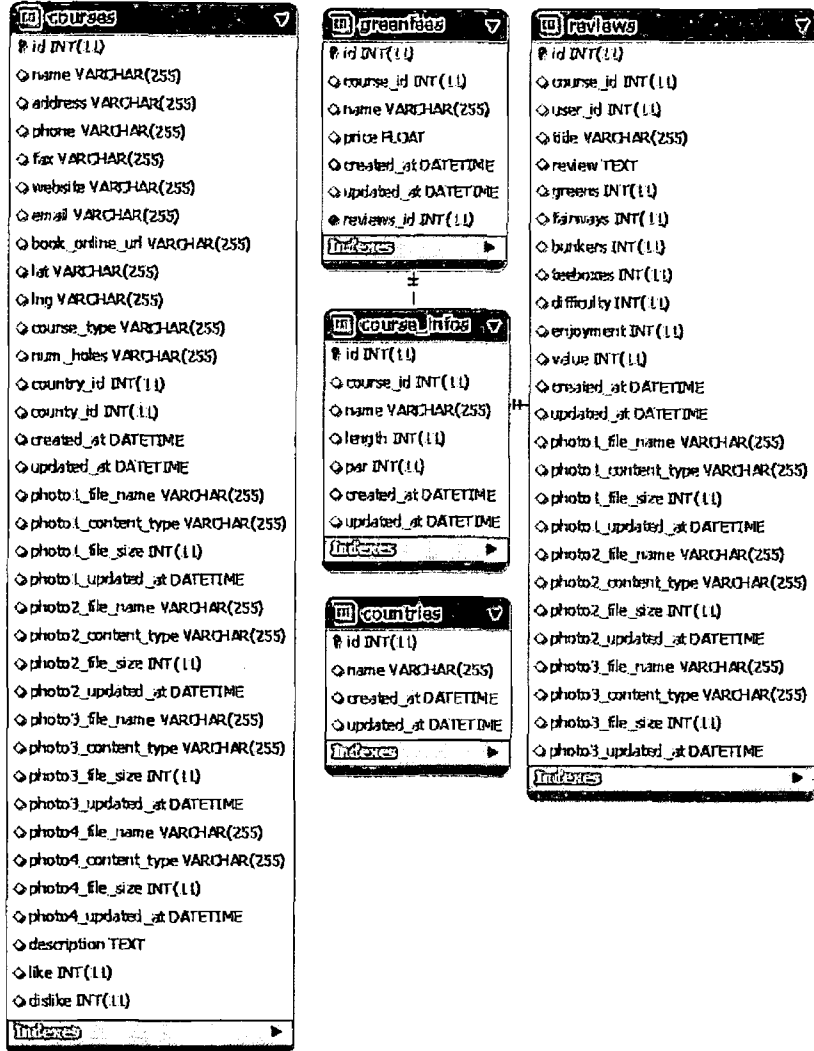


Use Case 3 - Add Course Listings



Use Case 4 - User Forum

## Appendix D: Database Structure



Appendix D-1 Golf Advisor Database Structure



users
id INT(11)
email VARCHAR(255)
encrypted_password VARCHAR(128)
reset_password_token VARCHAR(255)
reset_password_sent_at DATETIME
remember_created_at DATETIME
sign_in_count INT(11)
current_sign_in_at DATETIME
last_sign_in_at DATETIME
current_sign_in_ip VARCHAR(255)
last_sign_in_ip VARCHAR(255)
created_at DATETIME
updated_at DATETIME
username VARCHAR(255)
administrator TINYINT(4)
Indexes

conversations
id INT(11)
title VARCHAR(50)
board_id INT(11)
user_id INT(11)
created_at DATETIME
updated_at DATETIME
Indexes

boards
id INT(11)
title VARCHAR(50)
created_at DATETIME
updated_at DATETIME
Indexes

comments
id INT(11)
user_id INT(11)
conversation_id INT(11)
body TEXT
created_at DATETIME
updated_at DATETIME
Indexes

## References

1. Adjei, M.T., Noble, S.M. & Noble, C.H., 2007. Online Customer-To-Customer Communications as Drivers of Relationship Quality and Purchase Behavior. *AMA Winter Educators Conference Proceedings*, 18, pp.166-167. Available at: <http://search.ebscohost.com/login.aspx?direct=true&db=bth&AN=32571661&site=ehost-live&scope=site>.
2. Andriole, S., 2010. Business impact of Web 2.0 technologies. *Communications of the ACM*. Available at: <http://eric.ed.gov/ERICWebPortal/recordDetail?accno=ED337514> [Accessed September 27, 2011].
3. Barsky, E. & Purdon, M., 2006. Introducing Web 2.0 : social networking and social bookmarking for health librarians. *Health (San Francisco)*, 67, pp.65-67.
4. Casaló, L.V., Flavián, C. & Guinalíu, M., 2011. Understanding the intention to follow the advice obtained in an online travel community. *Computers in Human Behavior*, 27(2), pp.622-633. Available at: <http://linkinghub.elsevier.com/retrieve/pii/S0747563210000890>.
5. Chen, T.F. & Jung, C., 2009. BUILDING A PLATFORM OF BUSINESS MODEL 2.0 TO CREATING REAL BUSINESS VALUE WITH WEB 2.0 FOR WEB INFORMATION SERVICES INDUSTRY. *International Journal of Electronic Business*, 7(3), pp.168–180. Available at: <http://www.mendeley.com/research/building-platform-business-model-2-0-creating-real-business-value-web-2-0-web-information-services-industry/> [Accessed October 4, 2011].
6. Chen, X. & Shi, S., 2009. A Literature Review of Privacy Research on Social Network Sites. *2009 International Conference on Multimedia Information Networking and Security*, pp.93-97. Available at: <http://ieeexplore.ieee.org/lpdocs/epic03/wrapper.htm?arnumber=5368970> [Accessed July 25, 2011].
7. Chung, J.Y. & Buhalis, D., 2010. Web 2.0: A study of online travel community. *Information and Communication Technologies in*. Available at: <http://eprints.bournemouth.ac.uk/6833/>.
8. Cole, M. & Brooks, L., 2009. Social aspects of social networking. *International Journal of Information Management*, 29(4), pp.248-248. Available at: <http://linkinghub.elsevier.com/retrieve/pii/S0268401209000504>.
9. Doney, P.M. & Cannon, J.P., 1997. An Examination of the Nature of Trust in Buyer-Seller Relationships. *Journal of Marketing*, 61(2), p.35. Available at: <http://www.jstor.org/stable/1251829?origin=crossref>.
10. Fairweather, P. & Trewin, S., 2009. Cognitive impairments and Web 2.0. *Universal Access in the Information Society*, 9(2), pp.137-146. Available at: <http://www.springerlink.com/index/10.1007/s10209-009-0163-2>.
11. Fazli, M. & Sam, M., 2008. Website Quality And Consumer Online Purchase Intention Of Air Ticket. *Applied Sciences*, (2006), pp.20-25.

12. Ganesan, S., 1994. Determinants of Long-Term Orientation in Buyer-Seller Relationships. *Journal of Marketing*, 58(2), p.1. Available at: <http://www.jstor.org/stable/1252265?origin=crossref>.
13. Geyskens, I. et al., 1996. The effects of trust and interdependence on relationship commitment: A trans-Atlantic study. *International Journal of Research in Marketing*, 13(4), pp.303-317. Available at: <http://search.ebscohost.com/login.aspx?direct=true&AuthType=cookie,uid&db=bah&AN=11943745&site=ehost-live&scope=site>.
14. Gloor, P. a et al., 2008. Finding collaborative innovation networks through correlating performance with social network structure. *International Journal of Production Research*, 46(5), pp.1357-1371. Available at: <http://www.tandfonline.com/doi/abs/10.1080/00207540701224582>.
15. Gretzel, U, 2008. Use and Impact of Online Travel Reviews. *SciencesNew York*, pp.35-46. Available at: <http://www.springerlink.com/index/X740X784R6W527T0.pdf>.
16. Gretzel, Ulrike & Yoo, K.Y., 2008. Use and Impact of online travel review. In Proceedings of the 2008 International Conference on Information and Communication Technologies in Tourism. pp. 35-46.
17. Heidinger, C., Buchmann, E. & Böhm, K., 2009. Towards collaborative web-based impact assessment S. A. Chun, R. Sandoval, & P. Regan, eds. *Proceedings of the 10th Annual International Conference on Digital Government Research dgo 09*, pp.190-198. Available at: <http://portal.acm.org/citation.cfm?id=1556211>.
18. Hennig-Thurau, T et al., 2004. Electronic word-of-mouth via consumer-opinion platforms: What motivates consumers to articulate themselves on the Internet? *Journal of Interactive Marketing*, 18(1), pp.38-52. Available at: <http://linkinghub.elsevier.com/retrieve/pii/S1094996804700961>.
19. Hennig-Thurau, Thorsten & Walsh, Gianfranco, 2004. Electronic Word-of-Mouth : Motives for and Consequences of Reading Customer Articulations on the Internet. *International Journal of Electronic Commerce*, 8(2), pp.51-74. Available at: <http://mesharpe.metapress.com/index/b7dymemlew40fj11.pdf>.
20. De Hertogh, S., Viaene, S. & Dedene, G., 2011. Governing Web 2.0. *Communications of the ACM*, 54(3), pp.124-130. Available at: <http://portal.acm.org/citation.cfm?id=1897882> [Accessed September 27, 2011].
21. Jiang, B.-J. & Chen, P.-Y., 2007. An Economic Analysis of Online Product Reviews and Ratings. *Social Science Research Network*, (October). Available at: [Jiang.Chen2007EconomicAnalysisof.pdf](http://Jiang.Chen2007EconomicAnalysisof.pdf).
22. King, W., 2006. The Collaborative Web. *Information Systems Management*, 23(2), pp.88-88. Available at: <http://www.informaworld.com/openurl?genre=article&doi=10.1201/1078.10580530/45925.23.2.20060301/92676.9&magic=crossref>.
23. Kumar, N., Scheer, L.K. & Steenkamp, J.-B.E.M., 1995. The Effects of Supplier Fairness on Vulnerable Resellers. *Journal of Marketing Research*, 32(1), pp.54-65. Available at: <http://www.jstor.org/stable/3152110>.
24. Lathia, N., 2009. Computing Recommendations with Collaborative Filtering. In *Collaborative and Social Information Retrieval and Access Techniques for Improved User Modeling*. Information Science Reference, pp. 23-38. Available at:

- <http://books.google.com/books?hl=en&lr=&id=ICRlc-Id58MC&oi=fnd&pg=PA23&dq=Computing+Recommendations+with+Collaborative+Filtering&ots=FKOH41-qfM&sig=1Ej-Z6EAeHF7WvogkFGZODdIDM>.
25. Lukosch, S. & Bourimi, M., 2008. Towards an Enhanced Adaptability and Usability of Web-Based Collaborative Systems. *International Journal of Cooperative Information Systems*, 17(04), p.467. Available at: <http://www.worldscinet.com/ijcis/17/1704/S0218843008001944.html>.
  26. Mayer, R.C., Davis, J.H. & Schoorman, F.D., 1995. An Integrative Model of Organizational Trust. *Academy of Management Review*, 20(3), pp.709-734. Available at: <http://www.jstor.org/stable/258792?origin=crossref>.
  27. Miguéns, J., Baggio, R. & Costa, C., 2008. Social media and Tourism Destinations: TripAdvisor Case Study. *Tourism*, 2008, pp.1-6. Available at: <http://www.iby.it/turismo/papers/baggio-aveiro2.pdf>.
  28. Miranda, C & Jorge, A.M., 2009. Item-Based and User-Based Incremental Collaborative Filtering for Web Recommendations. *Springer*, 5816, pp.673-684. Available at: <http://www.springerlink.com/index/861k581047371165.pdf>.
  29. Miranda, Catarina, 2009. Collaborative Filtering for Web Recommendations. *Progress in Artificial Intelligence*, pp.673-684. Available at: <http://www.springerlink.com/index/861k581047371165.pdf>.
  30. Morgan, R.M. & Hunt, S.D., 1994. Morgan, Robert M., The Commitment-Trust Theory of Relationship Marketing, *Journal of Marketing*, 58:3 (1994:July) p.20. *Marketing Journal*, 3(July), pp.20-38.
  31. Nusair, K.K. & Kandampully, J., 2008. The antecedents of customer satisfaction with online travel services: a conceptual model. *European Business Review*, 20(1), pp.4-19. Available at: <http://www.emeraldinsight.com/10.1108/09555340810843663>.
  32. Okrant, M.J., 2011. Golf Tourism. *Tourism Management*, 32(3), pp.703-704. Available at: <http://linkinghub.elsevier.com/retrieve/pii/S0261517710001159>.
  33. O'Connor, P., 2010. Managing a Hotel's Image on TripAdvisor. *Journal of Hospitality Marketing Management*, 19(7), pp.754-772. Available at: <http://www.tandfonline.com/doi/abs/10.1080/19368623.2010.508007>.
  34. Palakvangsa-na-ayudhya, S. et al., 2011. Nebular : a Sentiment Classification System for the Tourism Business. *World*, pp.293-298.
  35. Rahayu, D.A. et al., 2010. RnR: Extracting Rationale from Online Reviews and Ratings. *2010 IEEE International Conference on Data Mining Workshops*, pp.358-368. Available at: <http://ieeexplore.ieee.org/lpdocs/epic03/wrapper.htm?arnumber=5693321> [Accessed September 27, 2011].
  36. Reprints, D.O.W.J. & Opinion, A.S., 2007. Deconstructing TripAdvisor. *New York*, pp.1-6.
  37. Ridings, C.M., Gefen, D. & Arinze, B., 2002. Some antecedents and effects of trust in virtual communities. *The Journal of Strategic Information Systems*, 11(3-4), pp.271-295. Available at: <http://linkinghub.elsevier.com/retrieve/pii/S0963868702000215>.

38. Sigala, M., 2011. Special Issue on Web 2.0 in travel and tourism: Empowering and changing the role of travelers. *Computers in Human Behavior*, 27(2), pp.607-608. Available at:  
<http://linkinghub.elsevier.com/retrieve/pii/S0747563210000774>.
39. Siguaw, J.A., Simpson, P.M. & Baker, T.L., 1998. Effects of Supplier Market Orientation on Distributor Market Orientation and the Channel Relationship: The Distributor Perspective. *Journal of Marketing*, 62(3), pp.99-111. Available at:  
<http://www.jstor.org/stable/1251746>.
40. Smyth, P.C.B., Wu, G. & Greene, D., 2010. *Does TripAdvisor Makes Hotels Better?*, Available at: <http://www.csi.ucd.ie/files/ucd-csi-2010-06.pdf>.
41. Sparks, B.A. & Browning, V., 2011. The impact of online reviews on hotel booking intentions and perception of trust. *Tourism Management*, 32(6), pp.1310-1323. Available at:  
<http://linkinghub.elsevier.com/retrieve/pii/S0261517711000033>.
42. Vb, C., 2006. Pew Internet & American Life Project.  
<http://www.pewinternet.org/index.asp>, p.0. Available at: <http://www.pewinternet.org/>.
43. Vermeulen, I. & Seegers, D., 2009. Tried and tested: The impact of online hotel reviews on consumer consideration. *Tourism Management*, 30(1), pp.123-127. Available at: <http://linkinghub.elsevier.com/retrieve/pii/S0261517708000824>.
44. Vásquez, C., 2010. Complaints online: The case of TripAdvisor. *Journal of Pragmatics*. Available at:  
[http://www.sciencedirect.com/science?\\_ob=ArticleURL&\\_udi=B6VCW-51S0DIS-1&\\_user=7774818&\\_coverDate=12/21/2010&\\_alid=1629103308&\\_rdoc=1&\\_fmt=high&\\_orig=search&\\_origin=search&\\_zone=rslt\\_list\\_item&\\_cdi=5965&\\_sort=r&\\_st=13&\\_docanchor=&view=c&\\_ct=194007&\\_acct=C000047645&\\_version=1&\\_urlVersion=0&\\_userid=7774818&md5=c799901bcf80e5e8f972380f049f92d5&searchtype=a](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VCW-51S0DIS-1&_user=7774818&_coverDate=12/21/2010&_alid=1629103308&_rdoc=1&_fmt=high&_orig=search&_origin=search&_zone=rslt_list_item&_cdi=5965&_sort=r&_st=13&_docanchor=&view=c&_ct=194007&_acct=C000047645&_version=1&_urlVersion=0&_userid=7774818&md5=c799901bcf80e5e8f972380f049f92d5&searchtype=a).
45. Weaver, A.C., 2008. Social Networking A. E. Grant & J. H. Meadows, eds. *Computer*, 41(2), pp.97-100. Available at:  
<http://ieeexplore.ieee.org/lpdocs/epic03/wrapper.htm?arnumber=4454412>.
46. West, A.G. et al., 2011. Trust in collaborative web applications. *Future Generation Computer Systems*, In Press,. Available at:  
<http://linkinghub.elsevier.com/retrieve/pii/S0167739X11000100>.
47. Ye, Q, Law, R & Gu, B, 2009. The impact of online user reviews on hotel room sales. *International Journal of Hospitality Management*, 28(1), pp.180-182. Available at: <http://linkinghub.elsevier.com/retrieve/pii/S0278431908000546>.
48. Ye, Qiang et al., 2008. Measuring the Value of Managerial Responses to Online Reviews - A Natural Experiment of Two Online Travel Agencies. *Information Systems Journal*, p.115. Available at: <http://aisel.aisnet.org/icis2008/115/>.
49. Ye, Qiang et al., 2011. The influence of user-generated content on traveler behavior: An empirical investigation on the effects of e-word-of-mouth to hotel online bookings. *Computers in Human Behavior*, 27(2), pp.634-639. Available at:  
<http://linkinghub.elsevier.com/retrieve/pii/S0747563210000907>.
50. Yoo, K.H., 2008. What Motivates Consumers to Write Online Travel Reviews? *Information Technology*, 10(4), pp.283-295. Available at:

- <http://openurl.ingenta.com/content/xref?genre=article&issn=1098-3058&volume=10&issue=4&spage=283>.
51. Dellarocas, C. & Narayan, R., 2006. What motivates consumers to review a product online? A study of the product-specific antecedents of online movie reviews. *Advances in Consumer Research*, p.1-6. Available at: [http://digital.mit.edu/wise2006/papers/2b-3\\_finalwise2006abstract-dell-narayan.pdf](http://digital.mit.edu/wise2006/papers/2b-3_finalwise2006abstract-dell-narayan.pdf).
  52. Hock, R. (2007). *The Traveler's Web: An Extreme Searcher Guide to Travel Resources on the Internet*.
  53. Ruby on Rails Web framework, available from <http://rubyonrails.org/download> [last accessed 4th December 2011].
  54. Devise Authentication framework, available from <https://github.com/plataformatec/devise> [last accessed 4th December 2011]
  55. Google Maps Javascript API V3  
<http://code.google.com/apis/maps/documentation/javascript/> [last accessed 4<sup>th</sup> December 2011].
  56. AJAX available from <http://www.w3schools.com/ajax/default.asp> [last accessed 4th December 2011].
  57. JSON available from <http://www.w3schools.com/json/default.asp> [last accessed 4th December 2011].
  58. Google Geocoding API available from <http://code.google.com/apis/maps/documentation/geocoding/> [last accessed 4<sup>th</sup> December 2011].
  59. JQuery available from <http://www.jquery.com> [last accessed 4<sup>th</sup> December 2011]
  60. Authlogic: model based ruby authentication solution, available from <https://github.com/binarylogic/authlogic> [last accessed 3rd January 2012].
  61. Kaminari: A Scope & Engine based, clean, powerful, customizable and sophisticated paginator for Rails 3, available from <https://github.com/amatsuda/kaminari> [last accessed 4th January 2012].
  62. Paperclip: file attachment management for ActiveRecord, available from <https://github.com/thoughtbot/paperclip> [last accessed 4th January 2012].
  63. Imagemagick available from <http://www.imagemagick.org/> [last accessed 4<sup>th</sup> January 2012].
  64. jQueryUI: jQuery user interface library, available from <http://jqueryui.com/> [last accessed 4<sup>th</sup> January 2012].
  65. MySQL: open source database, available from <http://www.mysql.com> [last accessed 4<sup>th</sup> January 2012].
  66. Scott, B. & Neil, T. (2009). *Designing Web Interfaces: Principles and Patterns for Rich Interactions*. ISBN-10: 0596516258
  67. Bernstein-Wax, J., 2007. WHAT MOTIVATES PARTICIPATION IN ONLINE COMMUNITIES? *mediamanagementcenter.org*, (May). Available at: <http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:What+motivate+s+participation+in+online+communities?#0>.
  68. Andrews, Dorine (2002). Audience-Specific Online Community Design, *Communications of the ACM*, Vol. 45, No.4.

69. Wellman, B. An electronic group is virtually a social network. Culture of the Internet. Sara Kiesler, Ed. Lawrence Erlbaum, Mahwah, NJ, 1997.
70. Koh, Joon; Kim, Young-Gul; Butler, Brian; Bock, Gee-Woo (2007). Encouraging participation in virtual communities, Communications of the ACM, Volume 50, Number 2. Pages 68-73.
71. Rothaermel, F. and Sugiyama, S. Virtual Internet communities and commercial success: Individual and community-level theory grounded in the atypical case of TimeZone.com. Journal of Management 27, 3 (Aug. 2001), 297–312.
72. Preece, J., Nonnecke, B., Andrews, D. (2004). The Top 5 Reasons for Lurking: Improving Community Experiences for Everyone, Computers in Human Behavior, 2, 1.
73. HTML 5 Geolocation API Specification, available at <http://dev.w3.org/geo/api/spec-source.html> [last accessed 7th December 2011].
74. HTML 5 Introduction, W3Schools, available at [http://www.w3schools.com/html5/html5\\_intro.asp](http://www.w3schools.com/html5/html5_intro.asp) [last accessed 7th Dec. 2011]
75. HTML 5 Specification Document, W3.org, available at <http://dev.w3.org/html5/spec/Overview.html> [last accessed 7th Dec. 2011]
76. MarkerClusterer for Google Maps V3, available at <http://google-maps-utility-library-v3.googlecode.com/svn/trunk/markerclusterer/docs/reference.html> [last accessed 14th January 2012]
77. Silverback, usability testing software, available at <http://silverbackapp.com/> [last accessed 14<sup>th</sup> January 2012]