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## Investigation into the Digital Divide

Dissertation



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 Learning 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

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## **Abstract**

This paper investigates citizens within Irish society and how they are able to interact with the Web. With massive investment going into public services through e-government it is potential is creating disadvantaged citizens and also inadvertently creating information poverty with certain demographics. A ethnographic research strategy has been conducted on a sample of 47 people aging from 16 to 65 and document how they interact with a web site, they were getting measured on their success rate on navigating around the site and their efficiency and effectiveness in completing given tasks. A website that I have developed is going to help in the research and it will be tested on the participants. The results showed that there is a divide between the sample of participants in their ability to complete the given tasks.

## **1. Introduction**

This study focuses on the impact the internet has had on people's lives and how it is becoming ever more important to have an online presence to be able to increase your awareness of what is going on around you. It examines people's interaction with a website to try and demonstrate that within Irish society there is a divide in place where people have technical abilities to interact with the internet at a proficient level and that other people don't have the same ability to do so. Looking at the evolution of the internet to see where it has come from and why people started to get online, and running parallel to the people that are creating online profiles and surfing the web there are people who have no online presence and wouldn't know how to go about doing so if they wanted to.

## **2. Literature Review**

Dewan, S Riggins, F J (2005) say, the digital divide refers to the separation between those who have access to digital information and communication technology (ICT) and those who do not. Many believe that universal access ICT would bring about global community of interaction, commerce, and learning resulting in higher standards of living and improved social welfare. However the digital divide threatens this outcome leading many public policy makers to debate the best way to bridge the divide. Much of the research on the digital divide focuses on first order effects regarding who has access to technology, but some work addresses the second order effects of inequality in the ability to use the technology among those who do have access.

The Organization for Economic Cooperation and Development defines the term "digital divide" as, the gap between individuals, households, businesses, and geographic areas at different socio-economic levels with regard both their opportunities to access information and communication technologies and to their use of the internet for a wide variety of activities. Cilian et al (2008)

Digital divide implies that significant minorities of the population are effectively denied access to a technology that, like other public facilities like libraries and motorways, is thought to be open to anyone.

### **2.1 Economic**

Porter, M (2001), the internet is an important technology as it provides better opportunities for companies to establish distinctive strategic positions than those offered by previous generations of information technology. The internet essentially gives a business another "shop window" so that they can conduct business to another market. It also gives them the opportunity to look at other things such as supplier costs. Porter, M (2001) says, the benefits of these structures to the business include lower costs from suppliers and access to wider

markets, while the advantages to the buyer are lower transaction costs, access to greater amounts of information and convenience of purchase

## **2 2 Employment**

Bulter T (2002) says in the information age, being on the wrong side of the digital divide can limit significantly a person's life chances. This is particularly true of the socially excluded, who have neither the wherewithal nor the opportunity to obtain highly paid, skill positions in IT.

According to O'Donnell, et al (2004), one of Ireland's main ICT challenges in the past decade is not a completely unique one: discrepancy in computer use between the haves and have-nots. At the beginning of the millennium, this "Celtic Tiger" was in midst of large economic growth and decreasing unemployment, but the country was grappling with a gap in e-inclusion between those already privileged positions and those could use employable skills the most. In 2001, only 30 per cent of out-of-work individuals in Ireland were "familiar" with computers, compared to 84% of students and 64% in the workforce.

Considering that late adopters of digital technologies are at risk of becoming more and more excluded from economic and social opportunities as internet usage becomes increasingly important for on the job tasks and personal interaction, bridging the gap is key to make sure all segments of Irish society have the opportunity to keep pace with the country.

## **2 3 Society**

According to Carveth, R & Krethchmer, S (2002), the biggest advantage Ireland has when it comes to the internet is language, the majority of online content is in English, the people that are able to read and speak it are immediately in a more favourable position for comprehending material and being welcomed into the environment. Similar advantages go for software and other technologies that are offered in English. This gives the opportunity to people are suffering within the

divide a greater chance of absorbing the internet as a whole and will not have to contest with language barriers in the process

Warschauer M (2004), in 1997, Ireland's national telecommunications company held a national competition to select and fund an "Information town" A major rationale behind the effort was to help overcome the gap between Ireland's emerging status as a multinational business centre of ICT production and the rather limited use of ICT among Ireland's own people and indigenous small business The prize money was 15 million pounds

Ennis was the winning town and they were given Internet ready personal computers for every family in the town Other initiatives included were an ISDN line to every small business that wanted one, smart –card readers for every business (for a cashless society), and smart cards for every family

Three years later a university researcher indicated that the town had little to show for its money Advanced technology had been trusted into people's hands with little preparation Training programs had been run, but they were not sufficiently accompanied by awareness programs as to why people should use the new technology in the first place And, in some instances, well-functioning social systems were disrupted in order to make way for the showcase technology

John Kennedy (2008) reports, for e-government to succeed in Ireland, it must begin with social inclusion The introduction of e-government initiatives and IT deployments aimed at improving citizen services such as Revenue Online and Motor Tax Online have been lauded, but outstanding failures such as the €150 million PPARS (Personnel, Payroll, and Related Systems) debacle have left many citizens asking exactly who were these investments meant to serve A ground-breaking study by the Mid-West Regional Authority (MWRA), in conjunction with similar groups in the Netherlands, Belgium and the UK, has found that future digital services from Government need to focus more on social inclusion and finding out how citizens – particularly in marginalised communities – want to access these services



Donat et al (2009) suggests the, Information and Communication technologies (ICTs) are the most important way of getting informed in our society Unfortunately not all people have access to the internet and ICTs and an amazingly large number of people do not have the abilities to use the ICTs in a proper way and, therefore, cannot draw advantages from its usage Clearly, whether people can be informed or not depends on access to the new media and the ability to use them

## **2 4 Education**

Servon L (2002) writes the digital divide concerns training or IT literacy – the ability to use IT for a range of purposes, and the knowledge of how and why IT can be used as a key resource For example, thus far policy has emphasized getting computers and the Internet into schools, but these efforts have been incomplete and inequitable Incomplete because teachers are not trained and supported to integrate technology into what they do And because when IT is used, it is often used for typing exercises and drills rather than to enable the acquisition of the kind of skills and thinking that the information society demands Inequitable because great differences exist in terms of the way IT is currently deployed in wealthier poorer schools Some schools have state of the art languishing is unused computer labs because the teachers do not know how to use the technology

## **2 5 Government**

Gouscos, et al (2001) says, governments are using the internet to provide public services to their citizens In so doing, governments aim for better relationships with businesses and citizens by providing more efficient and effective services

Dutta, S & Jain, A (2006) state the eEurope index analysed the state of countries' internet use, online public services, e-business environment, and infrastructure, then categorized the European Union members into four groups

based on the outcome "Leaders", "Totally aligned", "Somewhat aligned", "Development Required" and "Significant Development Required" Ireland finished 9 out of 25 European countries and was categorized as been "totally aligned" According to a source on the website of the World Bank, World Development Indicators only 55 per cent of the country was using the internet in 2006

John Kennedy (2011) reports, Communications Minister Pat Rabbitte TD pointed out that there are thousands of people living in Ireland today who have been left behind when it comes to the internet "These people miss out on opportunities most people now take for granted For example, those not yet engaged cannot send and receive emails, do a quick internet search to find information or the products they need on-line, play back the TV or radio programme they missed yesterday online when it suits them or even conduct their transactions with Government online saving themselves time, effort and often money They don't have the opportunity to save money by accessing a wider marketplace and often find better deals online or apply for jobs online – where many/most jobs are now advertised and applied for "

## **2.6 Demographic**

Laura O'Brien (2011) reports, Google and Age Action have joined forces to create 'Get Your Folks Online,' a website which gives people the resources to them help teach older family members how to use the internet The website gives two types of courses a beginner course and an improver's course where the user can avail of such lessons on shopping online, travel, social networking etc

Sinead Gibney, Social Manager for Google Ireland says, " What we're trying to do is to help people understand that they have a responsibility to pass on internet skills to their parents because what we find is that 35pc of people over the age of 50 are using the internet, whereas that's much higher in the under-50 age group We know that older people want to learn but they're not feeling confident enough to ask their children "

Sinead Gibney, Social Manager for Google Ireland says, "If we take on our own individual responsibilities to pass on these internet skills to our parents or somebody in our lives wanting to learn or who may not even be aware that they want to learn, then I think we can reduce this age action digital divide "

Despite the potential benefits usage may offer there is international evidence of the continued existence of an age related digital divide According to Pew Internet and American Life Project, 92 percent of Americans ages 18-29 are online (meaning they admit to using the Internet and e-mail at least occasionally) The rate falls modestly to 87 percent for those ages 30-49, and somewhat more steeply to 79 percent to those ages 50-64 But for those 65 and older the rate falls off a cliff, to 42 percent In the UK it is estimated that 6.4 million older people have never been online Considering how the Internet is becoming a fundamental tool in everyday life for shopping, booking travel and holidays, finding information and accessing government services, it is important that older people are not excluded or disadvantaged (CARDI, 2010)

## **2.7 E-service**

Without any geographical and physical barriers, the internet has been considered a competitive marketing channel in the hospitality and tourism industry (Doolin et al, 2002), this goes similarly with Internet related technologies Due to the rapid diffusion of Internet users (Li and Law, 2007), there has been a shift in people make arrangements in their daily lives The internet is regarded as an efficient marketing environment

There has been a substantial amount of scholarly work done on the topics of e-service quality and its dimensions According to Santos (2003), E-Service quality can be described as entire customer perceptions or evaluations of electronic service experience of the online marketplace Several different scales have been developed to measure E-service quality

The SERVQUAL scale has been recently employed by Barnes and Vidgen (2001), Kuo (2003), and Negash et al (2003) Barnes and Vidgen (2001)

proposed a WebQual scale with five key dimensions tangibles, reliability, responsiveness, assurance and empathy to analysis online book trade

Zeithaml et al (2002) and Parasuraman et al (2005) empirically examined E-S-QUAL, a multiple item scale with core service quality aspects and four dimensions efficiency, privacy, fulfilment and availability. The eTailQ scale developed by Wolfinbarger and Gilly (2003) provided four quality dimensions fulfilment/reliability, customer service, web design and security/privacy

However none of these scales adequately evaluate E-service quality due to the absence of any dimensions referring to hedonic quality items (Bauer et al , 2006). Bauer et al (2006) thus suggested a Transaction Process-based Framework (eTransQual), which includes intangible and emotional elements as well as utilitarian benefits, so as to comprehensively assess the E-service quality, and provides five dimensions functionality/design, reliability, process, responsiveness and enjoyment (Bauer et al , 2006)

The influence of e-service quality dimensions on e-service performance has been studied extensively (Bauer, et al , 2006, Lee and Lin, 2005, Parasuraman, 2005, Chen and Dubinsky, 2003, Wolfinbarger and Gilly, 2003). They found that the customer satisfaction and perceived values are assessed using the quality of the web site. A recent empirical study found that the quality of web site is positively associated with customers' perceived value (Bauer, et al , 2006, Parasuraman, 2005, Wolfinbarger and Gilly, 2003)

Looking at e-service scales it is important to understand that through these behavior models we can have a better understanding of how some people don't have a positive user experiences with certain web sites and in turn may be intimidated to use such sites or applications for future use. Understanding behaviors and fears can make training programs more beneficial to the people who find themselves not being able to use the Web.

### **3. Research Background**

#### **3.1. Hypothesis/Research Question and Objectives**

With the evolution of the internet and the rate of change that has been happening, a divide in society is being created right in front of us. It has become evident that there are people who are capable of interacting with the internet sufficiently and people who can't. With the advent of e-government in Ireland they are essentially creating disadvantaged citizens and actively creating information poverty, the people that are within this demographic are generally over 50 but there are younger people as well who feel are being left behind with the continued investment into e-services. With this divide being prominent in some demographics it goes in direct conflict with Tim Berners-Lee's vision of the Web, "The dream behind the Web is of a common information space in which we communicate by sharing information" (Berners-Lee, 1998)

#### **3.2 Birth of the Web**

The web and how people interact with it is constantly evolving, from the days where there was little or no interaction from the public to where people are giving up their credit card details on the web for their online banking. This shows that there has been a massive shift in how some people perceive the web and how it can become a part of their lives in some many ways. While there has been a considerable amount of change since its birth in 1989 there has been divides in society between people who can interact in the web and people who can't.

Information available from website, Tim Berners-Lee, a physicist at CERN, the European Organization for Nuclear Research, drew up a proposal in March 1989 for information management showing how information could be transferred easily over the Internet by using hypertext, the familiar point-and-click system of navigation through information. The idea was to connect hypertext with the Internet and personnel computers, thereby having single information network to help CERN physicists share all computers stored information at the laboratory.

Hypertext would enable users to browse easily between texts on the web pages using links (CERN, 2008) (see appendix H) for the first web page

Hypertext is a special type of database system, invented by Ted Nelson in the 1960s, in which objects (text, pictures, music, programs, and so on) can be creatively linked to each other. When you select an object, you can see all the other objects that are linked to it. You can move from one object to another even though they might have very different forms. Hypertext systems are particularly useful for organizing and browsing through large databases that consist of disparate types of information (Webopedia)

For example, while reading a document about boxers, you might click on the name Muhammed Ali, which could display various illustrations of Muhammed Ali on the screen. The icons that are selected to view associated objects are called Hypertext links.

Tim Berners-Lee (2000) created the World Wide Web in 1990, he writes, "We can create a common base for communication while allowing each system to maintain its individuality. That's what this proposal is about and globally hypertext is what will allow you to do it."

### **3.3 Web Technologies**

The core web protocols were,

- HTML
- URL
- HTTP

HTML stands for Hyper Text Markup Language, it's used predominantly for markup language for web pages. HTML elements are the basic building blocks for webpages, a markup language is a set of markup tags and HTML uses markup tags to describe web pages.

Uniform Resource Locator (URL) is the global address of documents and other resources on the Web, it is the generic term for all types of names and addresses.

that refer to objects on the World Wide Web. The term “Web address” is a synonym for a URL that uses HTTP/HTTPS protocol.

HyperText Transfer Protocol (HTTP) defines how messages are formatted and transmitted, and what actions Web servers and browsers should take in response to various commands. HTTP is called a stateless protocol because each command is executed independently, without any knowledge of the commands that came before it. This is the main reason that it is difficult to implement Web sites that react intelligently to user input.

During its evolution, Web 1.0 developed newer protocols to create more appealing websites,

- XML
- XHTML
- CSS

Extensible Markup Language (XML) is a set of rules for encoding documents in machine-readable form. The design goals of XML emphasize simplicity, generality, and usability over the Internet. It is a markup language much like HTML; it is designed to carry data, not to display data.

Extensible HyperText Markup Language (XHTML), it's a markup language that's almost identical to HTML 4.01. It is a stricter, cleaner version of HTML and is supported by all major browsers.

Cascading Style Sheets (CSS) is a style sheet language used to describe the presentation of a document written in a markup language. Its most common application is to style web pages in HTML/XHTML. CSS is designed to enable the separation of document content from document presentation, including elements such as the layout, colours, and fonts.

The server-side scripting technology used on the web 1.0 was used so that the server could dynamically generate web pages,

- ASP
- PHP
- JSP

- CGI
- PERL

Active Server Pages (ASP) are files that contain text, HTML tags and scripts. Scripts in an ASP are executed on the server. ASP has many functions,

- You can dynamically edit, change, or add any content of a Web page
- Respond to user queries or data submitted from HTML forms
- Access any data or databases and return the results to a browser
- Customize a Web page to make it more useful for individual users
- The advantage of using ASP instead of CGI and Perl, are those of simplicity and speed
- Provide security – since ASP code cannot be viewed from the browser
- Clever ASP programming can minimize the network traffic

PHP is a powerful tool for making dynamic and interactive Web Pages. PHP is widely used, free, and efficient alternative to competitors such as Microsoft's ASP. PHP files can contain text, HTML tags and scripts, PHP files are returned to the browser as plain HTML, they have a file extension of ".php", ".php3", or ".phtml". PHP runs on different platforms (Windows, Linux, Unix, etc.) and it is compatible with almost all servers used today (Apache, IIS etc.).

JavaServer Pages (JSP) is a Java technology that helps dynamically generate web pages based on HTML, XML or other document types. It was released in 1999 as Sun's answer to other client side scripting technologies such as ASP and PHP. JSP was designed so that the Java programming environment had enough support on the Web.

Common Gateway Interface (CGI) is a standard method for web server's software to delegate the generation of web pages to executable files. Such files are known as CGI scripts, they are programs, often stand-alone applications, usually written in a scripting language. An HTTP server is often used as a gateway to legacy information system, for example, an existing body of documents or an existing application. The Common Gateway Interface is an



agreement between HTTP server implementers about how to integrate such gateway scripts and programs

Perl is a high level, general- purpose, interpreted, dynamic programming language Perl was originally developed by Larry Wall in 1987 as a general purpose Unix scripting language to make report processing easier It has undergone many changes and revisions and become widely popular

The client side scripting technologies associated with the Web 1 0 are,

- JavaScript
- VBScript
- Flash

JavaScript is a scripting language that was designed to add interactivity to HTML pages, it is usually embedded directly into HTML pages JavaScript is an interpreted language (means that scripts execute without preliminary compilation), everyone can use JavaScript without purchasing a license

VBScript is a Microsoft scripting language and is the default language in ASP VBScript is only supported by Microsoft browsers (Internet Explorer) It works when a VBScript is inserted into an HTML document, Internet Explorer browser will read the HTML and interpret the VBScript The VBScript can be executed immediately, or at a later event

Flash is a multimedia platform used to add animation, video, and interactivity to web pages Flash is frequently used for advertisement, games and flash animations for broadcast More recently, it has been positioned as a tool for "Rich Internet Applications" (RIA's) Flash manipulates vector and raster graphics to provide animation of text, drawing, and still images

### **3.4. Web 1 0**

In the early years of Web 1 0 you could see some general attributes that shaped the Web. The information that was on the Web was fairly static and it was updated infrequently, the websites were coined as “brochureware” or “read only web.” There was very little in the way of the public being able to interact with the Web or contribute any content. This was the way website owners wanted it, the owners rather a system where they could establish an online presence and make their information to any user at any time. The web provided a significant amount of exposure for website owners that broke down geographical barriers between businesses and customers.

Available from their website (O'Reilly, 2005), here's the collections of strategies Tim O'Reilly considers to be part of the Web 1 0 philosophy.

- Web 1 0 sites are static. They contain information that might be useful, but there's no reason for a visitor to return to the site later. An example might be a personal Web page that gives information about the site's owner, but never changes. A Web 2 0 version might be a blog or MySpace account that owners update frequently.
- Web 1 0 sites aren't interactive. Visitors can only visit these sites, they can't impact or contribute to sites. Most organizations have profile pages that visitors can look at but not impact or alter, whereas wiki allows anyone to visit and make changes.
- Web 1 0 applications are proprietary. Under the Web 1 0 philosophy, companies develop software applications that users can download, but they can't see how the application works or change it. A Web 2 0 application is an open source program, which means the source code for the program is freely available. Users can see how the application works and make modifications or even build new applications based on earlier programs. For example, Netscape Navigator was a proprietary Web browser of the Web 1 0 era. Firefox follows the Web 2 0 philosophy and

provides developers with all the tools they need to create Firefox applications

Web 1.0 was a stagnant environment where the user had relatively no input and it failed to really get the public involved, they didn't see the value that could be added to the web by user entered content. The web was misunderstood, the people that did use it had missed user experiences and the people who didn't see the value of being online.

Mosaic was the first web browser that was credited with popularizing the World Wide Web. McEnerly K. W. (1995) writes, Mosaic provides a user friendly, graphically oriented interface based on the hypermedia concept to WWW servers on the Internet. Users with minimal computer experience can learn to navigate the Internet in less than 10 mins. The user browses through hypermedia screens containing links to information located around the world. The website at (W3.org) states Mosaic was also the first browser to display images in line with text instead of displaying images in a separate window (see appendix G).

In September 1993 at the University of Colorado, the first search engine of the World Wide Web was developed. It was called the World Wide Web Worm, the worm created a database of 300,000 multimedia objects which could be obtained or searched by keywords via WWW. This was the starting point for Web 1.0 search technologies, they were characterised by large indexes but had crude retrieval techniques.

Other search engines came along like Yahoo! Directory, WebCrawler and Altavista but in general the Web 1.0 search technologies missed the point on how to effectively retrieve queries, they focused too much on the size of the index. Relevance was ignored, in most cases web search was seen as hopeless.

With users beginning subjected to ineffective searches on the Web for their queries it was creating an unsatisfactory experience which potentially made people not want to interact with the Web on future occasions, they may have gotten somebody else that knew how to achieve the result or just not bothered and tried another means of getting the desired result.

The internet was vastly underestimated in its potential and by the mid-1990's the World Wide Web was growing at an exceptional rate (see appendix f) and by 1995 commercially the internet was starting to catch on with estimated usage of 16 million users. With significant amount of users online, it created an untapped market and also an international market. With corporations and large businesses realising this they decided to try and take advantage to their new market and make considerable amounts of investment on the Web.

Between 1997 till 2000 the "dotcom" boom took place. The phrase "get large or get lost" was the wisdom of the day. Buzzwords like networking, new paradigm, information technologies, consumer-driven navigation, tailored web experience, any many more example of empty double speak filled the media and investors with an eagerness for more.

It was clear that there was a problem with companies and investors taking all these risks. The first signs of the holes in the bubble came from the companies themselves. The significant amount of them reported huge losses and some folded outright within months of their offerings. The impact on the Silicon Valley venture capitalists was devastating, they were moving out of \$4 million dollar estates and moving back into their parent's garage.

This had huge implications of the internet and how business model had to be re-assessed. Understanding Web 1.0 and where it went wrong is where they were able to take a new approach to the technologies developers had developed. The research conducted on Web 1.0 was reactive, it was misunderstood in its potential and its implementation. It relied on old business models, it sold software as an application rather than a service, and they ignored their key asset which was the amount of data they were accumulating from their users. Businesses also ignored the power of the network which was that the more people you have on network the more useful it becomes. Companies considered the Web as a publishing medium, not something that people should be participating.

During the Web 1.0 days, the way the Web was perceived by the major corporations inhibited people's ability to use it. This may have contributed to a

divide in the early days of the internet. Internet access across the country and its availability had impacted on the usage of the internet throughout the country.

### **3.5 Web 2.0**

Web 2.0 is the network as a platform (see appendix I), spanning all connected devices. Web 2.0 applications are those that make the most intrinsic advantages of that platform: delivering software as a continually-updated service that gets better the more people use it; consuming and remixing data from multiple sources, including individual users, while providing their own data and services in a form that allows remixing by others; creating network effects through an "architecture of participation," and going beyond the page metaphor of Web 1.0 to deliver rich user experiences (O'Reilly, 2005).

MySpace.com was created in 2003; this was one of the primary social networking sites where people made their own profile and entered in personal details about themselves ranging from personal interests to putting up photos and videos. This was an instance of people creating their own personal space on the Internet.

The dynamics underlying Web 2.0 were down to social data, network effects and the wisdom of the crowd. Successful Web 2.0 aggregators have the best data, by this I mean, they have more of it and have easy ways to navigate through it so why would you go elsewhere?

The problem has been addressed by many companies so that they can create an enjoyable user experience; companies started to let the public create their own data. Such as Amazon reviews, Delicious bookmarks, Flickr's photos, Yahoo, Google indexed pages, technorati'd blogs, Wikipedia information etc. Letting the users create their own apps using the companies' data: you were essentially adding value to your data. It showed to the user that your data is better accessible compared to the competitor. The behaviour of the user was becoming a filter to the data and with the more you used the applications the better the application could trace your habits and preferences through your user profile.

The power of the Web is enhanced through the network effect produced as resources link to each other with the value determined by Metcalfe's Law. Hendler J et al (2007) states the network effect describes the value of a service to a user that arises from the number of people using the service. At its core, it captures that value increases as the number of users increases, because the potential links increase for every user as a new person joins. This is best quantified by what has come to be known as Metcalfe's law.

In Web 2.0 applications, much of that effect is delivered through social linkages realized via social networks online. The Web emerges through the link space realized between Web pages. The evidence of this is clear with the famous PageRank algorithm (Brin and Page, 1998) that was the reason for the success of Google.

The importance of a Web page is an inherently subjective matter, which depends on the reader's interests, knowledge and attitudes. But there is still much that can be said about the relative importance of Web pages. PageRank is a method for rating Web pages objectively and mechanically, effectively measuring the human interest and attention devoted to them (Brin and Page, 1998).

Harnessing the wisdom of the crowd was another contributor to the evolution of the web. The biggest success story from this in the Web 2.0 era is Wikipedia, where they involved large numbers of contributors who improve accuracy, completeness and clarity of articles, reducing bias (Kittur and Kraut, 2008). The wisdom of the crowd refers to the process of taking into account the collective opinion of a group of individuals rather than a single expert to answer the question. The process, while not new to the business world at least, was written about in detail by James Surowiecki in his book *The Wisdom of the Crowds*. The wisdom of the crowd applies to democratic journalism in that a group of non-experts determine what news is important, and then people outside the group can view the news based on those rankings.

The crowd tends to make its best decisions if it is made up of diverse opinions and ideologies. A crowd of like-minded individuals may contain bias, which can

cloud their judgement and cause a less useful response to a given question. Crowds tend to work best when there is a correct answer to the question being posed such as about geography or mathematics (James Surowiecki, 2004)

PageRank from Google is an excellent example of how harnessing the wisdom of the crowds can revolutionize companies' data. It treats a link to a page as an implicit vote of approval for that page, it then splits up the sites into hubs and authorities. Authorities confer high PageRank to a page and if an authoritative site points to a page it must be worth looking at. Hubs have many links pointing at them, if many people link to a page it must be worth looking at.

### Web 2.0 Core Competencies

- Services, not packaged software
- Forever beta = agility
- Hard-to-recreate data sources that get richer as more people use them
- Trusting users as co-developers
- Harnessing collective intelligence
- Software above the level of a single device. Include PCs, Macs, mobiles etc
- Lightweight UIs and rich user experience

(O'Reilly, 2005)

Web 2.0 tools have given us the ability to create a richer user experience with more interactivity and more powerful services. Web 2.0 is a merging of technologies, people, and attitude that has created an important shift in the way we think about and use the internet. There are many ways that Web 2.0 can be used to benefit business by saving them time and money, and offering a new mode of interaction with customers.

The evolution of the internet has seen many changes in its ideology, its technology and its accessibility. Through these factors it has drawn millions of people, however running parallel to the people who have subscribed to the internet there are people who don't see the value of some of the concepts that I

have dealt with in this research. Their failure to realize that through these changes on the internet, it can have a positive effect on their quality of life. Being afraid of changes in technology or not having the level of technical expertise will ultimately leave them left behind in society. They are essentially being excluded in some aspects of life by not being able to interact at a proficient level on the internet.



## 4. Architecture and Implementation

Information available at their website (Princeton, 2008), the best websites are created with a keen understanding of visitors' interests, needs and expectations. Text, visual design, organization and navigation should all work together to allow visitors to find key information and complete critical tasks quickly and easily.

Testing on the site was done on an ad-hoc basis, it was done throughout the whole development of the site. Due to the nature of the site I believe that it was the only form of testing I could implement during the development.

Keeping these guidelines, wireframes (see appendix E) were drawn up prior to the development process to give myself a sketch of what I hope to have as my final product. The structure of the website was drawn from the Adobe website for creating websites using HTML5.

To optimize the site target audience it must be broken up into primary and secondary audiences. The primary audience are the users that will be the main focus and a secondary audience who are important but not as critical.

The research I'm conducting I'm trying to identify people who cannot interact with web applications so they are the primary audience and the people that are capable of doing so I'm going to consider as my secondary audience.

In terms of the architecture research was conducted across the web on what was the main navigation icons on sites that were being run by restaurants. The most common navigation icon that kept on re-appearing was,

- Home
- Gallery
- Menu
- Contact

The other page that I believed to be a good addition to the website would be a reservations page where you would be able to check and see if the restaurant was busy at particular times and also it could be a reference point where one

could check for future bookings. The reservations page comprises of a Google calendar with all the days of the month, it is only accessible by the person who has implemented the calendar so people can't just arrive at the site and make a booking. It has to be rang in and when it is clarified on the restaurant's end to booking will be made visible on the calendar for people to see.

The home page has a mission statement for the business in the centre of the page. At the bottom of the page there are three other links to go to other pages, these are titled, Today's Specials, Wine List and News. The rationale behind these three links was basically from what I been taking in from looking at restaurant businesses around me and on the television. There are plenty of restaurant specials being advertised all over the country at the moment so I believed it was a good idea to have a designated page for specials the people can view them separately to the restaurant's main menu. The wine list page was essentially just so that people can view the wine the restaurant has to offer much the same as viewing what food they are serving. The events page was another idea that I thought would just from a business point of view restaurant owners could have special cocktail nights, have a live musician playing, new dish tasting etc.

The gallery page is where there are photos of the food in the restaurant for the users to have a look at. The contact page has a Google map on it, where a dummy address on the location of the restaurant. The menu page is where the restaurant menu is available. There are icons for Facebook and an icon for Twitter at the bottom right of the screen, these just take you to their respected sites. These sites are just another medium of advertisement and gaining exposure to people.

During the development of the website one of the main objectives I was trying to achieve was to maintain consistency throughout the site so that people can gain an awareness of where icons are throughout the site, another objective was not to have too many colours on the screen and for the viewer's eyes to be drawn to

the centre of the screen, this is because the main source of information on each page is located in the centre of the screen

The whole website is developed using HTML5, CSS3 and JavaScript. Pilgrim M (2010) writes, HTML5 is the next generation of HTML, superseding HTML 4.01, XHTML 1.0, and 1.1. HTML5 provides new features that are necessary for modern web applications. The structure of an HTML5 page is basically the same as for HTML 4.01 and XHTML 1.0, but some parts of the code are much simpler than before. It also standardizes many features of the web platform that web developers have been using for years, but that have never been vetted or documented by standards committee. HTML5 is designed to be cross-platform. You don't need to be running Windows or Mac OS X or Linux or any particular operating system in order to take advantage of HTML5. The only thing you need is a modern web browser. The latest versions of Apple Safari, Google Chrome, Mozilla Firefox and Opera all support many HTML5 features. The mobile web browsers that come preinstalled on iPhones, iPads, and Android phones all excellent support for HTML5. Even Microsoft has announced that the upcoming Version 9 of Internet Explorer will support HTML5 functionality.

According to the W3 schools website, CSS3 is used to control the style and layout of the web pages. CSS3 is the latest standard for CSS, it is completely backwards compatible, so you will not have to change existing designs. CSS3 is split up into "modules", the old specification has been split into smaller pieces, and new ones are also added. CSS3 is still under development by W3C however many of the new CSS3 properties have been implemented by modern browsers.

Some of the most important CSS3 modules are,

- Selectors
- Box Model
- Backgrounds and Borders
- Text Effects
- 2D/3D Transformation
- Animation

- Multiple Column
- User Interface

The environment used to build the web site was Dreamweaver CS5.5. Dreamweaver CS5.5 incorporates native support for the new HTML5 structural elements and many of the CSS3 properties supported by the latest browsers. It is the leading web authoring and editing software that provides visual and code level capabilities for creating standards-based websites and designs for desktop, smartphones, tablets and other devices.

Starting off the web site it was necessary to create a home page and with this home page I was going to create a template for the rest of the site with variations from page to page. The home page was naturally called home.html. The first task that was addressed was to create a basic style rule that treats the new structural elements as blocks. The reasons for this are because if not done results in other styles being incorrectly applied in older browsers. Padding and margins on the new elements were set to zero in the case of newer browsers unexpectedly adding default settings that may break the layout of the page.

Desktop.css was created as the new style sheet and the following style definition was added to the style sheet:

```
Article, aside, figure, footer, header, nav, section {  
    display: block;  
    margin: 0;  
    padding: 0;  
}
```

Once the style sheet was finished it was attached to home.html.

Figure 4.1 shows how the page looked like when it was initially created. **Figure 4.1**

```
1  <!DOCTYPE HTML>
2  <html>
3  <head>
4  <meta charset="utf-8 ">
5  <title>Untitled Document</title>
6  </head>
7
8  <body>
9  </body>
10 </html>
```

In the specifications to HTML5 the <header> element “represents a group of introductory or navigational aids ” Therefore the <header> contains the pages main heading, logo, and navigation menu The <header> also will contain another HTML5 structural element <nav>

Within the <header> five tabs were created in an unordered list which will eventually be the references on the page to the other pages on the site The tabs are Home, Menu, Reservations, Gallery, and Contact Dummy links are added and will be filled with proper links further along the development Figure 1 2 shows the wrapping of the main heading and navigation menu in a <header> element identifies them as a logical group that belong together both in structure and meaning The <nav> element identifies the unordered list as a navigation element The container <div> is just there to hold the page together

The rest of the home html page (see Figure 4 2) is just a mission statement from the business, three pods with links to other parts of the site and a footer For the mission statement element I decided on the <article> element this was just to represent a component of the page that consists of a self-contained composition <section> elements with used for the pods, <figure> elements for the images, and <article> for the list of news items

Figure 4 2

```

10 <body>
11 <div id="container">
12   <header id="logo">
13     <h1 class="block">The Med</h1>
14     <h2>Seafood Bistro</h2>
15   <nav>
16     <ul>
17       <li><a href="#">Home</a></li>
18       <li><a href="#">Menu</a></li>
19       <li><a href="#">Reservations</a></li>
20       <li><a href="#">Gallery</a></li>
21       <li><a href="#">Contact</a></li>
22     </ul>
23   </nav>
24 </header>

```

To hold the main section of the page together a <div> element is needed purely for styling so the <header id="logo"> is created

Having used the HTML5 structural elements of <header>, <footer>, <nav>, <section> and <article>, I've laid down the template that I am going to maintain throughout the web site. These properties are widely supported in modern browsers, but you may need to use browser-specific properties in combination with the official properties to ensure the widest possible support.

The variations between pages is very little, keeping the website consistent in its user interface was a goal that I had from the first day of development. On reservations.html page there is a Google calendar in the center of the screen, this was simply implemented by copying the Google calendar iframe from the Google calendar website and adding it specifically to the reservations.html page. The same process was applied to the contact.html page where the Google map iframe was added.

Bearing in mind that HTML5 structural elements hadn't been thought of when Internet Explorer was released in 2001, the unstyled page displays correctly in these older browsers. If you start adding CSS to the page Internet Explorer 6, 7, and 8 will fail to apply any style to the page. If the web site is viewed with JavaScript disabled by Internet Explorer or earlier, the HTML5 structural elements won't be styled, but the rest of the page will be seen.

Using an unordered list for a menu has become the widely accepted way as the most accessible ways of adding site navigation. With CSS3 properties being adopted by many browsers, to do a variety of styles that would previously relied on images and JavaScript.

Once the structure of the website was in place then it was just down to implement the CSS3 on top of the structure to give it a more appealing UI for the user.

## 5. Method

Qualitative research is collecting, analysing, and interpreting data by observing what people do and/or say. It is much more subjective than quantitative research and typically uses individual interviews and focus groups where comparatively small numbers of people are interviewed in-depth. Qualitative research generates rich, detailed data that contribute to in-depth understanding of the context.

Ethnography research is a form of qualitative research and was the type of research that was conducted when the user was interacting with the site. Ethnography research is a strategy mainly used in anthropology and sociology. It is the systematic and immersive study of cultures; it generally entails understanding behaviours and rituals of an entire culture. However, in this case, it's the understanding of behaviours and rituals of people interacting with individual websites and applications.

Conducting ethnography research is done by satisfying a couple of elements. Firstly, you must identify suitable candidates (see appendix D), secondly, you conduct early interviews (see appendix A), thirdly, you observe your users and finally, conduct an interview at the end. After the persona hypotheses were formulated, the interview derived from them.

During my research, finding ideal candidates was the first step to building a sufficient sample; these were some of the elements I took into consideration when finding the candidates,

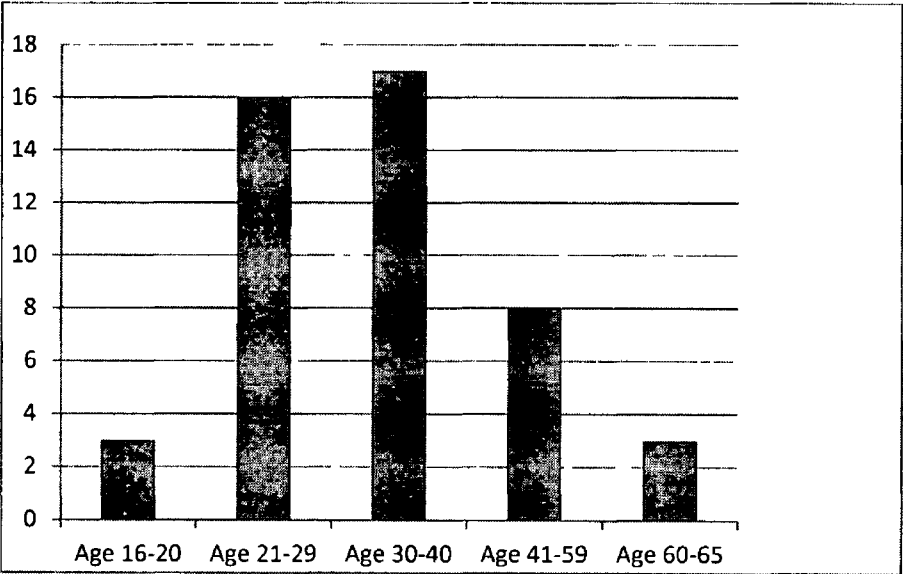
- Variety is key
- Different roles
- Different demographic variables
- Different behaviours



- Different levels of domain expertise
- Different levels of technical expertise
- Different environments

The sample size of people that took part in the testing was 47. The ages of people in the sample ranged from 16 to 60 (see chart 5.1) and all from a variety of different backgrounds and levels of ability. The only way that it was possible to achieve an adequate sized sample of people was to contact friends and family and ask if they would like to be a part of the research. Prior to the testing personas were drawn up to target certain audiences to compile the data for this research (see appendix A).

Chart 5.1



Male	27
Female	20
Age 16-20	3
Age 21-29	16
Age 30-40	17
Age 41-59	8
Age 60-65	3

The objective of the usability tests is to identify key issues with the people interacting with the web site. The job of the tester is to analyse, interpret and document the results. Usability testing is the collection of techniques used to measure characteristics of a user's interaction with a product with the goal of assessing the usability of that product.

When participants came into for testing I went through a certain procedure with each user to let them know exactly what was going on, which I broke down into three sections,

**Introduction,**

- Test of software not user
- No personal interest of experimenter
- User can help improve system
- Assure confidentiality
- Explain what data is recorded

**Test,**

- Participants complete given tasks
- No intervention
- Recording and measurement

**Debriefing,**

- Usability questionnaire (see appendix C)
- Go through tasks again and explore reasons, emotions and suggestions
- Thank participant

Traditionally there has been strong emphasis on the performance of the interface, however more recently there has been a shift towards User Experience when usability tests are taking place.

In this sample the participants were measured on a couple of different elements when they were given certain tasks to complete such as,

- Time on task
- Number of clicks
- Asking for help

To time the tasks I simply used a stop watch and I used a pen and paper to mark down the amount of clicks the participant was using to fulfil the task requested. I intentionally didn't have a mouse connected to the laptop to see if the participants were able to use the touch pad on the laptop. The reasons for this was because of the amount of smartphones that are available now with touch screens and other devices that you have to navigate through with the touch of your finger.

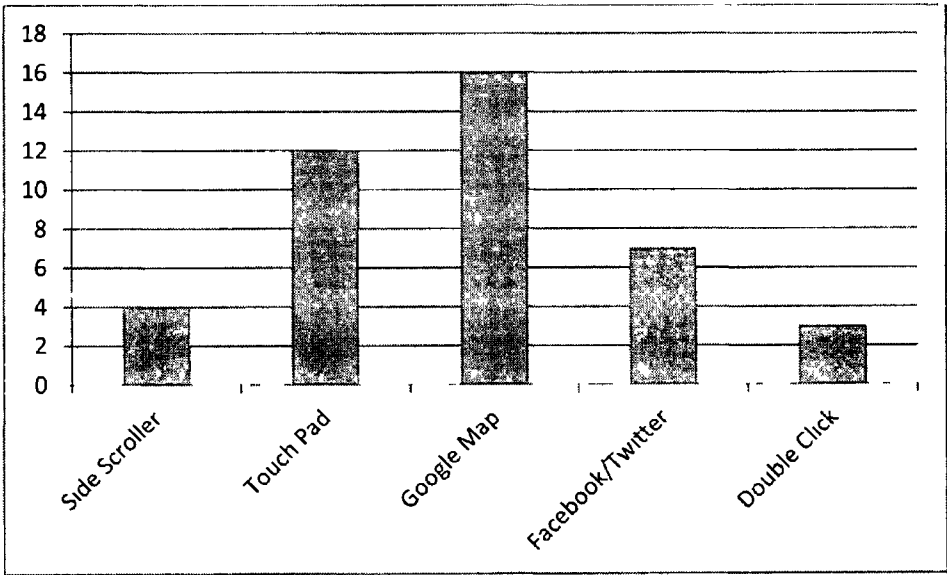
## 6. Results

Out of the sample size, 32 people were able to complete the tasks given, while 15 participants failed to complete the tasks given

Problems that the participants encountered on the task were (see chart 2),

- Not being able to use touch pad
- Double click on the mouse
- Side scroller
- Participant didn't recognise Facebook or Twitter icons
- Problems interacting with Google maps
- Trouble finding restaurant number

Chart 6 1



### Types of Errors

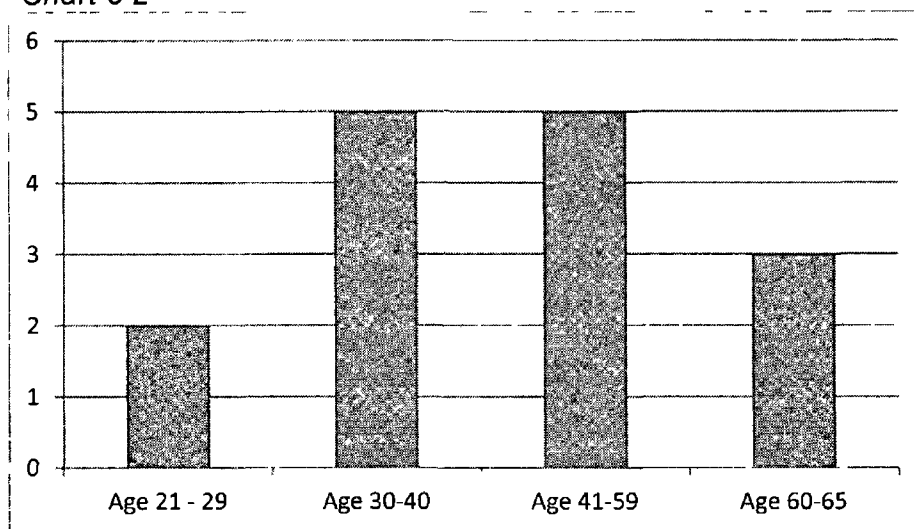
- |                    |    |
|--------------------|----|
| • Side Scroller    | 4  |
| • Touch Pad        | 12 |
| • Google Map       | 15 |
| • Facebook/Twitter | 7  |
| • Double Click     | 3  |

The sample comprised of 27 males and 20 females

- 3 ranged from 16 – 20
- 16 ranged from 21 – 29
- 17 ranged from 30 – 40
- 8 ranged from 41- 59
- 3 ranged from 60 – 65

Out of the 15 that didn't complete the task (see chart 6 2),

Chart 6 2



Failed

Participants

Age 21 – 29	2
Age 30-40	5
Age 41-59	5
Age 60-65	3

All of the participants that didn't complete the task didn't know how to interact with Google maps 3 people out of the 15 didn't know how to double click, over 50% of the participants did not recognise the Facebook or Twitter icon And over 50% of the users weren't able to use the side bar to scroll up and down the page Navigating around the page wasn't a huge problem for most of the participants, this was due to the task analysis pretty much prompting them where to go once they were on the site Most of the participants were able to identify a word in the task and find an icon for it to click on, such as, "find the most expensive dish on

the menu” , once the user heard the word menu and that there was a menu icon they made the assumption that the information must be in the menu page

The participants that weren't successful in the task completion all indicated in the interview that they had little to no experience with computers and spent time on the internet only when there was somebody there to help them fulfil the requirement they had such as booking flights, hotels

When it came to using the touch pad on the laptop out of the 47 participants that took the test 12 of them requested if they could use a mouse because they felt more comfortable with it. All the requests but one came from the 31 – 65 demographic. I found this interesting just from the point of view that if they had trouble using a touchpad on the laptop how successful would they be if they were to be using a smartphone and had to navigate through it by touching the screen on the phone

From usability testing standpoint the web site was received very well by the participants. The participants that were capable of using the technology were satisfied with its functionality and even the people that weren't capable to interact with the site gave a positive response to the site and said that it was down to their technological ability that they couldn't navigate around the site rather than the functionality of the website. Over 80% of the users felt the site was very easy to use. Out of the users that completed the task analysis all their answers on the usability questionnaire ranged from very easy to use and that their overall impression of the web site is very positive. This demonstrates the participants that had the greater technical ability had a satisfactory user experience with the site which was developed on sound technology and a well thought user interface.

If a participant didn't complete the tasks I went through with them when they were finished how to complete the tasks so that they knew what the objective of each task was.

## 7. Discussion

The objective from the testing was to identify what a divide is present within society. Also another objective was to see with the developed web site was capable of being used by people and to measure their user experience.

Interacting with the website is not the only concern, the participants in the testing were comfortable using the computer period with problems such as interacting with touch pads, side scroll bars and even the basic double click it demonstrates that basic computer skills need to be addressed just as much as composing training course to show people how to set up e-mail and to surf the web.

Participants did articulate that they had fears using computers in case they did something wrong with and it would stop working, also they felt that the internet wasn't an important commodity in their daily lives and didn't see the convenience of the services that it offer to them. They said that their ability was a major contributing factor to their willingness to start learn more about the internet and to start taking course in it to further their understanding.

According to the results from the tests I conducted it is safe to say that there is an issue with people being able to use an Internet website, this in-turn affects their ability to interact with information sources that are online such as public services.

More training courses have to be set up to help these people that can't use the site. From the research that was conducted on the digital divide it became clear that people, in some cases, don't see the importance of the web or how the web can contribute to their lifestyle. E-Inclusion is an issue where people need to realise that using the internet is of benefit to their lives and that having an online presence ultimately will keep you more informed with on goings domestically and internationally, also to avail of the millions of services the web has to offer.

Barriers to older people's usage of the internet are multiple including fear, security concerns, lack of access, knowledge and technical skills, lack of interest or not seeing the relevance of it for their lives. There may also be issues with

issues of confidence and accessibility of websites (e.g. need for larger interfaces, options for increasing fonts and contrast) (CARDI, 2010)



## **8. Future Perspectives**

Ideally online public services would have been use in the testing process to see the extent to what the government were offering online and what people were able to interact with the information content online. Due to the nature of thesis this was not possible but using a site that was developed on sound technology proved to be adequate. For future research to be conducted in this area e-government applications should be used for the testing on citizens where the tester can have a complete view of the public's ability in using these services.

Going through the same process that I conducted would give the government feedback on which people are in a disadvantaged position and also it could help them increase the functionality of their applications in the long run. The whole business of saving money is costing people who are a part of this digital divide.

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## **Appendices**

### ***Appendix A · Interview***

#### Interview

- 1 Male or female?
- 2 What age are you?
- 3 What is your profession?
- 4 Do you have an internet connection?
- 5 Do you have much experience with computers?
- 6 What internet applications/websites are you familiar with?
- 7 How many hours a week do you spend online?
- 8 How do you spend your time on the internet?

9 Do you feel that you can interact with the internet the way you would like to?

10 Is the internet important to your daily life?

## ***Appendix B. Task Analysis***

- 1 Can you locate the Facebook icon on the application?
- 2 Can you find the address of the restaurant on the map? What is it?
- 3 Can you find the phone number? What is it?
- 4 Can you see if there have been any reservations made?
- 5 What are the day's specials?
- 6 What is the most expensive dish on the menu?
- 7 Can you find where the photos of the restaurant are?
- 8 Can you locate the twitter icon?



### ***Appendix D. Usability Questionnaire***

**Question 1**      Do you feel that you successfully completed all the tasks on the task sheet?

**Yes      No**

**Question 2**      In relation to other software I have used, I found the Application prototype to be

**Very difficult to use   1   2   3   4   5   6   Very easy to use**

**Question 3**      In relation to the Viewer, I found the Application prototype to be

**Very difficult to use   1   2   3   4   5   6   Very easy to use**  
**N/A**

**Question 4**      The menu items were well organized and functions were easy to find

**Strongly disagree   1   2   3   4   5   6   Strongly agree**

**Question 5**      I immediately understood the function of each navigation bar item

**Strongly disagree   1   2   3   4   5   6   Strongly agree**

**Question 6**      All of the functions I expected to find in the menus were present

**Strongly disagree   1   2   3   4   5   6   Strongly agree**

**Question 7**      The buttons were well organized and easy to find

**Strongly disagree   1   2   3   4   5   6   Strongly agree**

**Question 8**      I immediately understood the function of each button

**Strongly disagree   1   2   3   4   5   6   Strongly agree**

**Question 9** All of the functions I expected to find on the navigation bar were present

**Strongly disagree 1 2 3 4 5 6 Strongly agree**

**Question 10** I found navigating around the Application screen to be

**Very difficult 1 2 3 4 5 6 Very easy**

**Question 11** My overall impression of the Application prototype is

**Very negative 1 2 3 4 5 6 Very positive**

**Name**

**E-mail**

**Date**

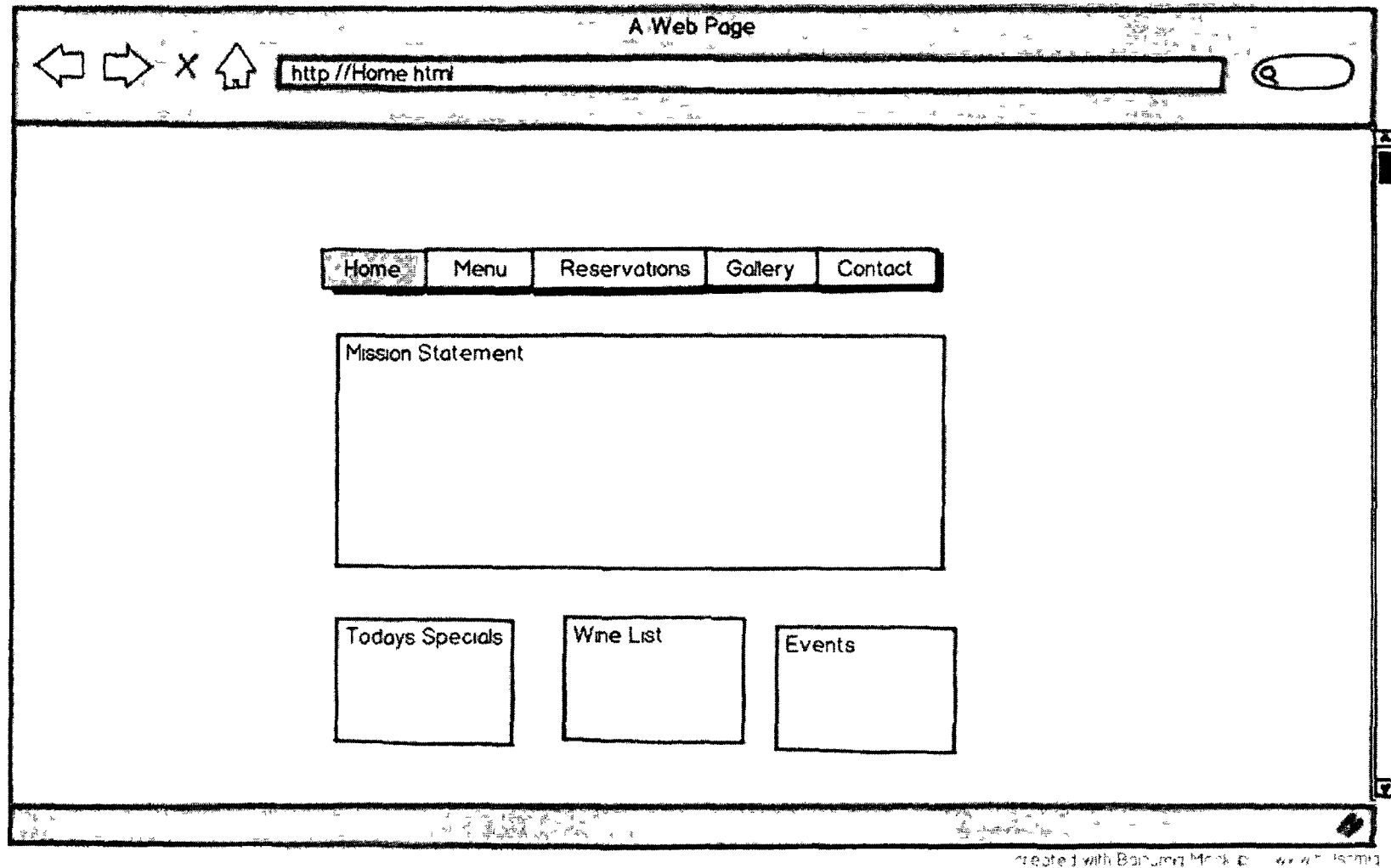
**Comments**

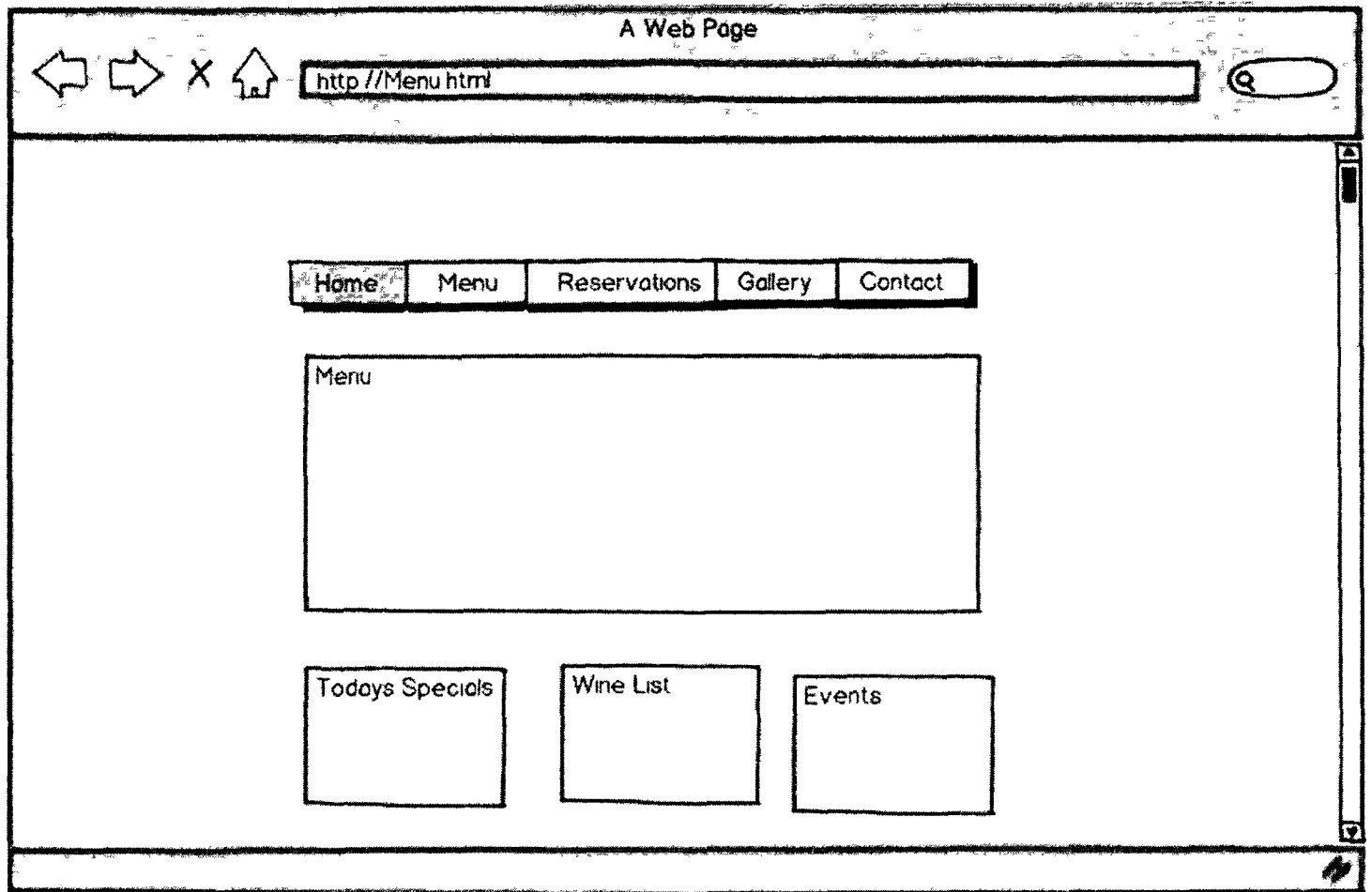
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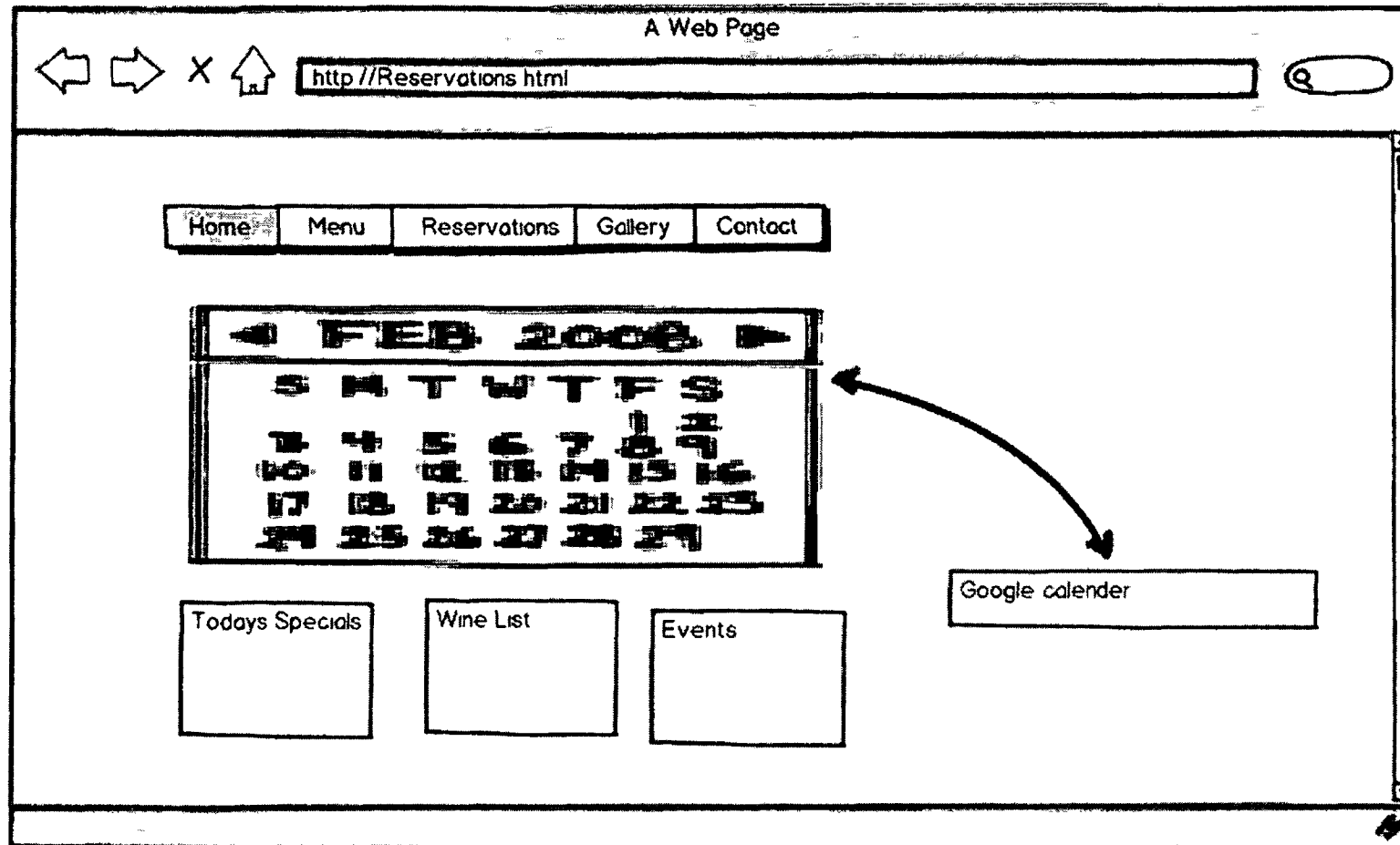
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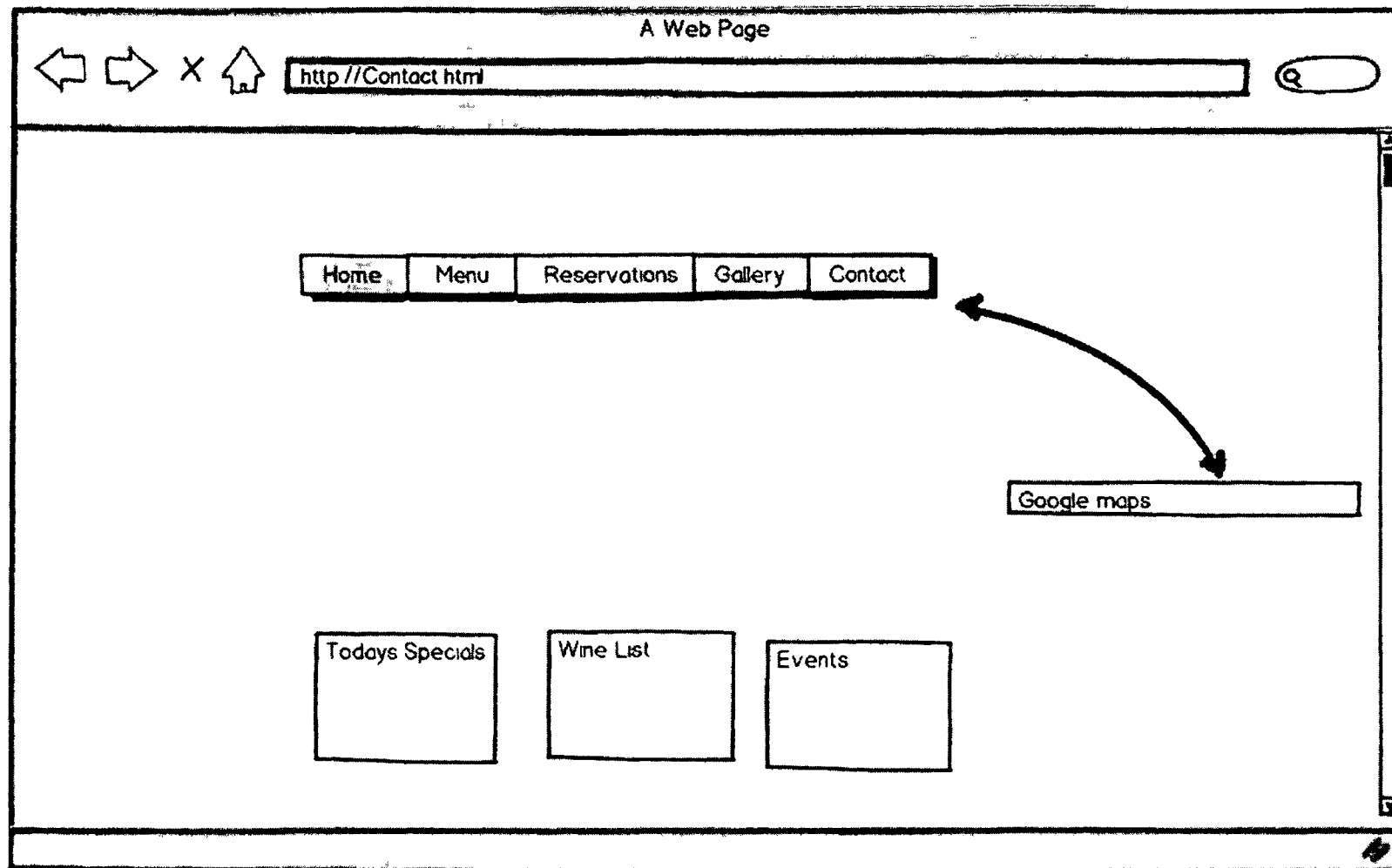
## Appendix E Wireframes





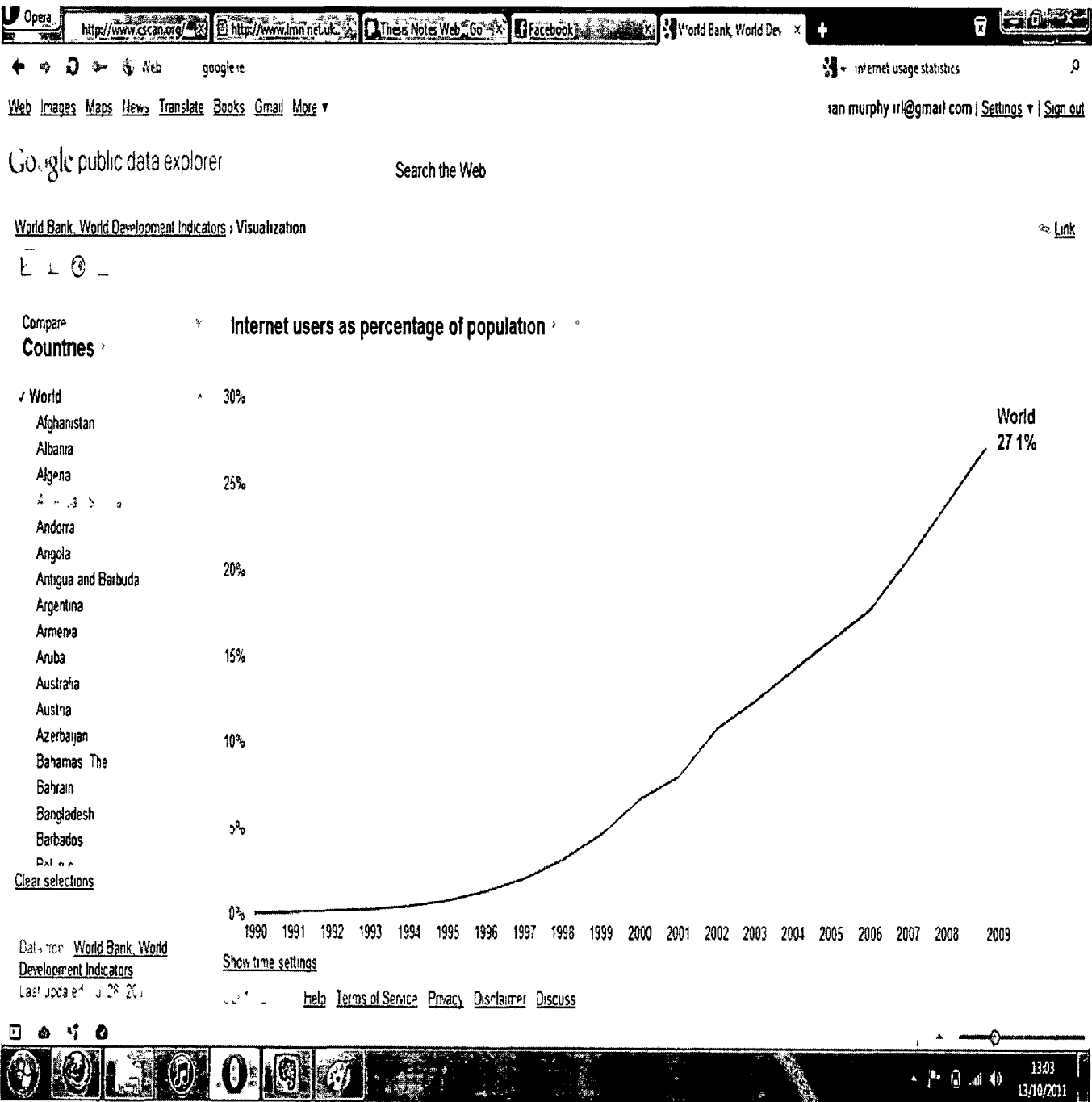






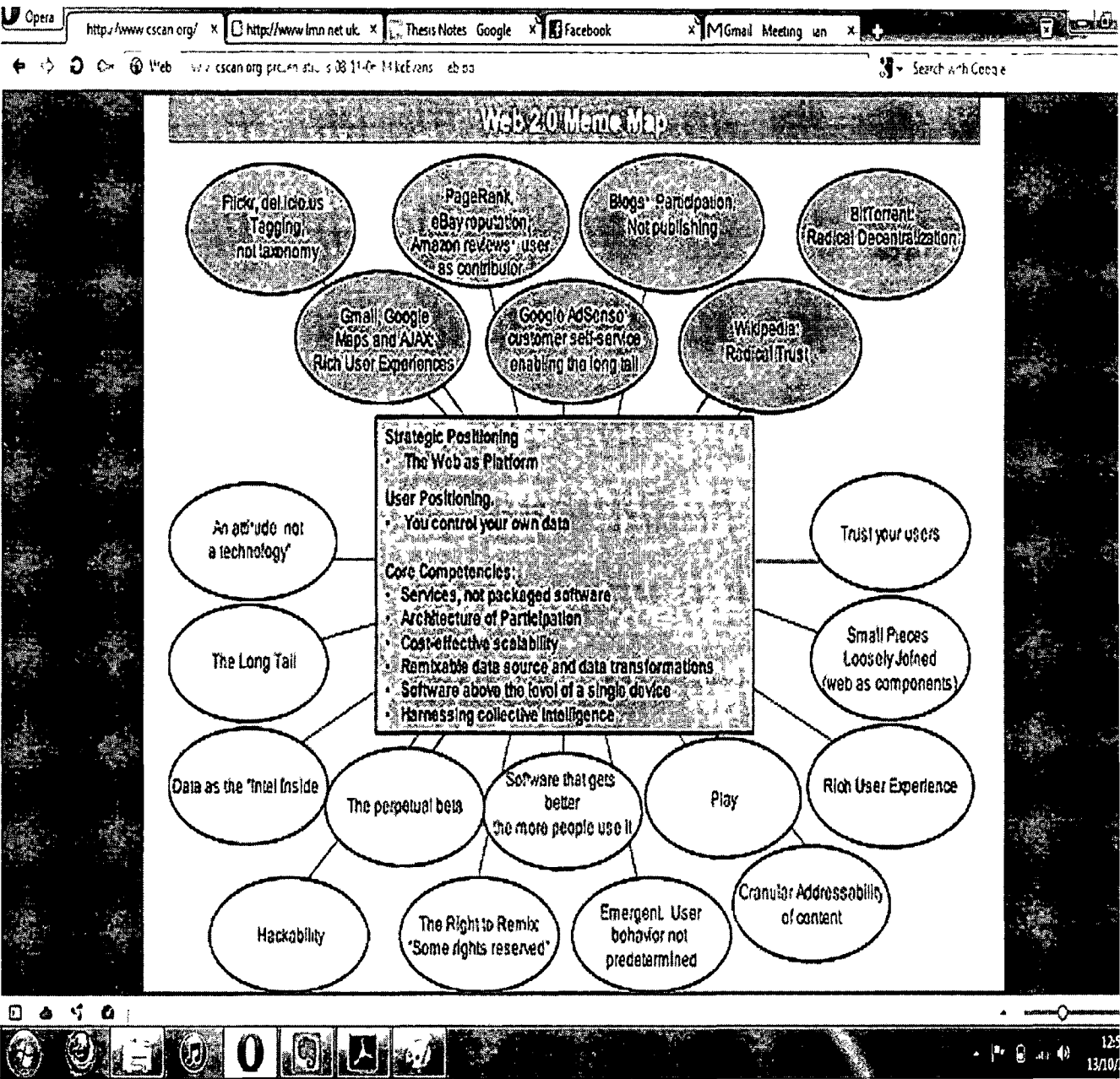
Page 40: Drawing Mockups - What Usability

# Appendix F

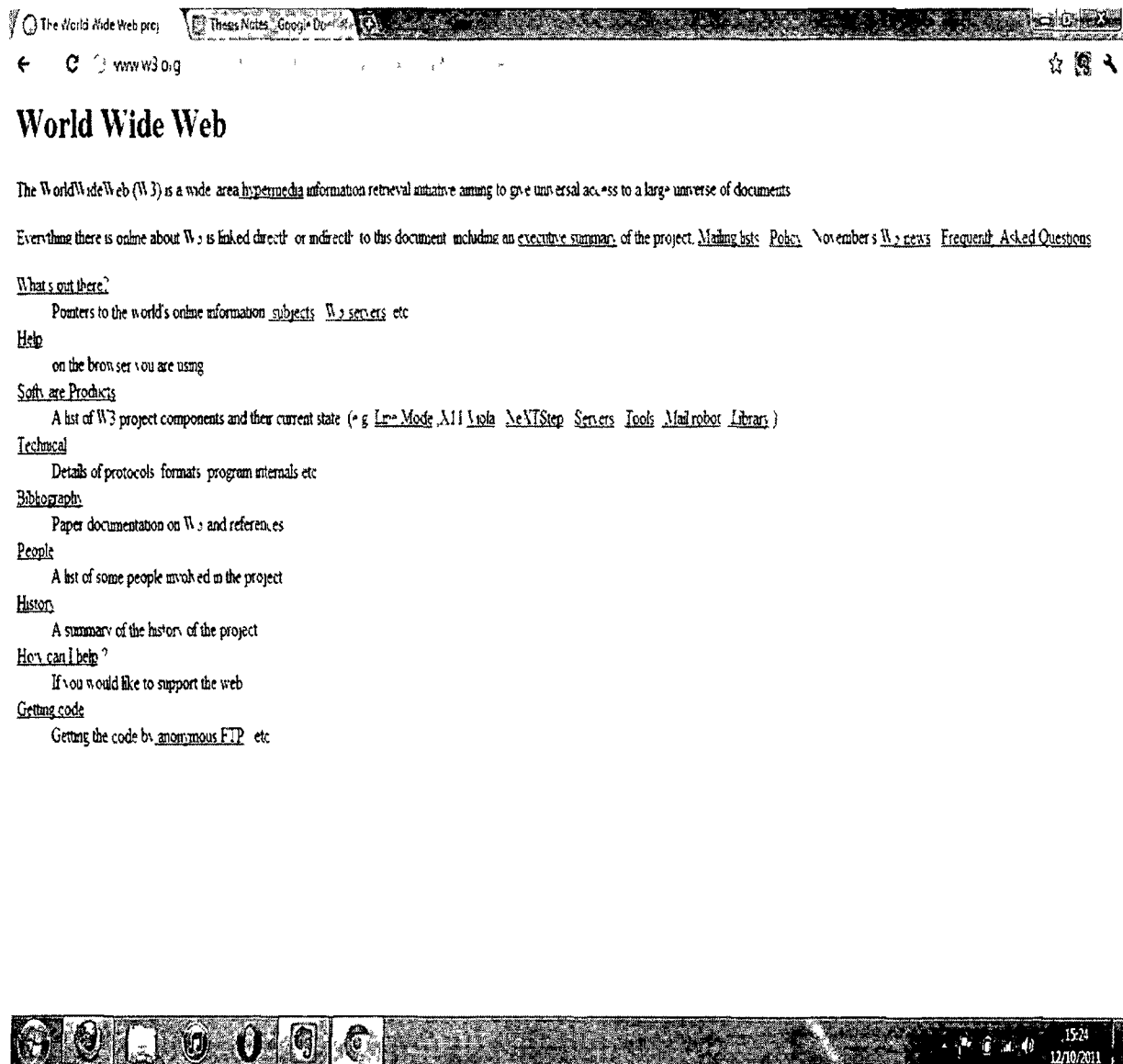




Appendix I



## Appendix H



Appendix G

