

**Department of Computing**

**SmilieFace: An Innovative Affective Messaging Application to  
Enhance Social Networking**

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Master of Philosophy (Computer Science)  
of  
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## Declaration

This thesis contains no material that has been accepted for the award of any other degree or diploma in any university.

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgement has been made.

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# Abstract

Social Media can be defined as a media that uses highly accessible and scalable publishing techniques for social communication. Communication on Social Media sites is generally divided into asynchronous (where one would leave a message that its recipients can read and respond to at their own convenience: e.g. Emails) or synchronous (where the sender and recipient must be online at the same time and messages are exchanged almost instantaneously: e.g. Instant Messaging). Many facets of Social Media use an avatar as a digital representation of the user. The avatar can be as simple as a graphical representation or as complex as a 3-Dimensional digital representation whose movement and actions are fully controllable by its user. Avatars are suitable in either communication, with avatar responsiveness often being a key factor in their use.

Social Media, especially Social Network Sites, often requires emotional or affective communication. Many early Social Media sites successfully facilitated this need by allowing emoticons or ‘smilies’ in messages. Therefore, it is possible that an asynchronous communication type service, which uses an avatar to relay *affective* messages, may be effective in the Social Network Sites branch of Social Media. Facebook has emerged as the primary Social Network Site, and it was assumed to be the perfect social environment in which to develop and evaluate SmilieFace, an innovative affective messaging application.

This research designs, implements, and evaluates SmilieFace – a Facebook application which uses avatar based video to relay asynchronous *affective* messages. The objective is to serve as an innovative and engaging messaging application that enhances Social Networking. This research aims to show that SmilieFace is a robust and scalable application that is easy to use and engaging for its users on the Facebook platform. Its ability to facilitate the exchange of affective messages will serve as an alternative way for people to communicate with their friends on Facebook. The research will also show issues encountered during SmilieFace's development, including the surprising anomaly of the difficulty of attracting people to use and evaluate the application.

# Preface

The research presented in this thesis has been published in conferences. The research has resulted in the following presentations/publications:

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Hengky, H., A. Marriott, and D. McMeekin. 2012a. *2nd Annual International Conference on Web Technologies & Internet Applications (WebTech 2012), 7 May 2012: SmilieFace: developing and evaluating an affective Facebook Application.*

This paper was presented at the 2<sup>nd</sup> Annual International Conference on Web Technologies & Internet Applications, May 2012, and won the Best Student Paper Award. This paper describes the design, development and evaluation of SmilieFace – an *affective* messaging Facebook application. Chapter 4 which detailed the SmilieFace Facebook Client Application and Chapter 5 which described the SmilieFace Server provided material for this paper.

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Hengky, H., A. Marriott, and D. McMeekin. 2012b. *5th International Conference on Human System Interactions (HSI 2012), 6-8 June 2012: SmilieFace: Evolving Interface Design.*

This paper was presented at the 5<sup>th</sup> International Conference on Human System Interactions, June 2012, and describes the evolution of Smiliemail stemming from its original web-interface to mobile-interface culminating in the conception of SmilieFace - an *affective* messaging Facebook application. The interface design evolution from Smiliemail to SmilieFace as described in Chapter 3 provided material for this paper.

## Table of Contents

Abstract.....	i
Preface .....	ii
Table of Contents.....	iii
Table of Figures.....	vi
Table of Tables .....	ix
Introduction.....	1
1.1 Research Objectives.....	3
1.2 Thesis Outline .....	3
Literature Review.....	5
2.1 Social Media .....	5
2.1.1 Collaborative Projects .....	6
2.1.2 Blogs and Micro-Blogs.....	7
2.1.3 Content Communities .....	9
2.1.4 Virtual Worlds .....	13
2.1.5 Virtual Communities .....	16
2.1.6 Social Network Sites.....	22
2.1.7 Privacy and Security Issues .....	26
2.1.8 Previous Research in Social Media.....	28
2.1.9 Justification of Facebook as the Social Network.....	31
2.1.10 Social Media Conclusion .....	34
2.2 Digital Representation .....	36
2.2.1 Smilies and Emoticons .....	36
2.2.2 Avatars .....	40
2.2.3 Agent.....	41
2.2.4 Smiliemail.....	43
2.2.5 Digital Representation Conclusion.....	56
2.3 Computer Mediated Communication.....	57
2.3.1 CMC and its implications.....	57
2.3.2 Computer Mediated Communication Conclusion .....	58
2.4 Conclusion.....	60
Research and Design Methodology .....	62
3.1 Research Methodology .....	63

3.2 Design Methodology .....	66
3.2.1 Design Development.....	66
3.2.2 Design Implementation.....	68
3.2.3 Research Outcomes .....	69
3.3 Hypotheses .....	70
3.4 Limitations and Delimitations .....	71
3.4.1 Limitations.....	71
3.4.2 Delimitations.....	72
3.5 Data Collection and Analysis.....	72
3.5.1 Data Collection.....	72
3.5.2 Data Analysis.....	73
3.5.3 Admissibility of Data .....	73
3.6 Ethical Considerations.....	73
3.7 Conceptual Solution.....	74
3.8 Conclusion.....	75
SmilieFace Facebook Client Application .....	76
4.1 Design Concept .....	77
4.2 SmilieFace Architecture .....	86
4.3 How to compose a SmilieFace video message .....	88
4.4 Implementation Issues.....	91
4.4.1 Getting Started.....	92
4.4.2 Utilizing the SDKs. ....	96
4.4.3 Adapting to Facebook changes. ....	97
4.4.4 Migrating to HTTPS. ....	101
4.4.5 SmilieFace in different browsers and platforms.....	102
4.4.6 Accessing SmilieFace in different devices.....	105
4.4.7 Notifying users of an incoming SmilieFace message. ....	106
4.4.8 Displaying a SmilieFace message. ....	109
4.4.9 Sharing a SmilieFace message.....	112
4.4.10 Implementation Issues Conclusion. ....	114
4.5 The Evolution of SmilieFace User Interface .....	115
4.6 Conclusion.....	117
SmilieFace Server .....	118
5.1 SmilieFace Server Processes .....	119

5.1.1 Database Message Format.....	119
5.1.2 Server Processing .....	120
5.2 SmilieFace Message Production Pipeline Modules .....	122
5.3 SmilieFace Server Issue and Concern.....	125
5.4 Conclusion.....	125
Data Collection .....	127
6.1 Experiment.....	127
6.2 Questionnaires .....	128
6.2.1 Demographic Form .....	129
6.2.2 Sender Evaluation Form.....	131
6.2.3 Viewer Evaluation Form.....	133
6.2.4 Summative Form .....	134
6.3 Recruitment Process and Data.....	136
6.3.1 Recruiting participants for the evaluation .....	136
6.3.2 Recruitment Data.....	138
6.3.3 Recommendation for future evaluations.....	146
6.4 Conclusion.....	147
Data Analysis and Results .....	148
7.1 Database Statistics .....	148
7.2 Demographic Form .....	150
7.3 Sender Evaluation Form.....	161
7.4 Viewer Evaluation Form.....	171
7.5 Summative Evaluation Form .....	174
7.6 Conclusion.....	185
Conclusion .....	187
8.1 Conclusion for Research Objectives.....	187
8.2 Conclusion for Each Hypothesis.....	188
8.3 Implications for Theory .....	190
8.4 Future Research .....	190
References.....	192
Appendices.....	202

## Table of Figures

Figure 1 Twitter Timeline copyright from Davidsson (2010) .....	10
Figure 2 History of Social Media copyright from Valencia (2011) .....	25
Figure 3 Emoticons from Sánchez et al. (2006) .....	39
Figure 4 VHML Structure (VHML 2001).....	49
Figure 5 Action Research Spiral (adapted from (Kemmis and McTaggart 1988)).....	64
Figure 6 Spiral Model Software Development Life Cycles (Boehm 1986) .....	67
Figure 7 Conceptual Solution Diagram .....	74
Figure 8 Facebook Canvas (Facebook 2010f).....	77
Figure 9 Smiliemail Web Interface .....	78
Figure 10 SmilieFace Tabs (images are blurred to protect user privacy).....	79
Figure 11 SmilieFace Interface Design .....	81
Figure 12 Recipient List (images are blurred to protect user privacy).....	82
Figure 13 Design Concepts for Android Smiliemail (Hengky 2010) .....	82
Figure 14 Android Smile Interface (Hengky 2010).....	83
Figure 15 SmilieFace Interface.....	86
Figure 16 Default Smiley Faces .....	89
Figure 17 More Smiley Faces .....	90
Figure 18 Developer App authorization box (Facebook 2010g) .....	93
Figure 19 Developer App (Facebook 2010g).....	94
Figure 20 OAuth Dialog Box (Facebook 2010g) .....	95
Figure 21 Server-side Flow Authentication (Facebook 2010k).....	99
Figure 22 Security Warning for FireFox users.....	102
Figure 23 Compatibility Tag (Morciniec 2011).....	103
Figure 24 Dialog Box for a Wall Post (Facebook 2010q).....	108
Figure 25 Notification Box (Facebook 2010g).....	108
Figure 26 SmilieFace Message .....	114
Figure 27 SmilieFace UI.....	115
Figure 28 SmilieFace Architecture .....	118
Figure 29 SmilieFace Server Flow Diagram .....	121
Figure 30 SmilieFace Active Users (1/10/2012 - 27/10/2012).....	138
Figure 31 SmilieFace Users Demographics (1/10/2012 - 27/10/2012) .....	138
Figure 32 SmilieFace Users Base (1/10/2012 - 27/10/2012) .....	139
Figure 33 SmilieFace Active Users (18/10/2012 - 13/11/2012).....	140
Figure 34 SmilieFace Users Demographics (18/10/2012 - 13/11/2012) .....	140
Figure 35 SmilieFace Users Base (18/10/2012 - 13/11/2012) .....	140
Figure 36 SmilieFace Active Users (14/11/2012 - 11/12/2012).....	141
Figure 37 SmilieFace Users Base (14/11/2012 - 11/12/2012) .....	142
Figure 38 SmilieFace Active Users (11/12/2012 - 7/1/2013).....	142
Figure 39 SmilieFace Users Base (11/12/2012 - 7/1/2013) .....	143
Figure 40 SmilieFace Active Users (7/1/2013 - 3/2/2013).....	143
Figure 41 SmilieFace Users Base (7/1/2013 - 3/2/2013) .....	144
Figure 42 SmilieFace Active Users (3/2/2013 - 2/3/2013).....	145
Figure 43 SmilieFace Users Base (3/2/2013 - 2/3/2013) .....	145



Figure 44 Daily English User .....	150
Figure 45 Gender Distribution .....	151
Figure 46 Age Distribution .....	151
Figure 47 Level of Education .....	152
Figure 48 Familiarity with Emails .....	152
Figure 49 Familiarity with SMS .....	153
Figure 50 Familiarity with Instant Messaging .....	153
Figure 51 Familiarity with YouTube .....	154
Figure 52 Familiarity with Video Games .....	154
Figure 53 Familiarity with Avatars .....	154
Figure 54 Familiarity with Second Life .....	155
Figure 55 Familiarity with Cell Phones.....	155
Figure 56 Familiarity with Smart Phones .....	155
Figure 57 Familiarity with iPad (tablet devices).....	156
Figure 58 Familiarity with Facebook.....	156
Figure 59 Familiarity with Google .....	156
Figure 60 Familiarity with Social Network Sites.....	157
Figure 61 Familiarity with Social Media Sites .....	157
Figure 62 Preferred Communication Method .....	158
Figure 63 Preferred ways to access Facebook.....	158
Figure 64 Time Spent on Facebook.....	159
Figure 65 Time spent on the Internet .....	159
Figure 66 It is easy to create a SmilieFace Message .....	161
Figure 67 The SmilieFace Application is intuitive .....	162
Figure 68 It is Quick and Easy to Create a SmilieFace Message.....	163
Figure 69 The Tags Helped Me to Express My Emotion in My Message .....	164
Figure 70 Would You Use the SmilieFace Application Again in the Future? .....	165
Figure 71 I Look Forward to Seeing How My Friends React to the SmilieFace Message I Sent to Them .....	166
Figure 72 I Look forward to receiving a SmilieFace message in return .....	167
Figure 73 The SmilieFace Message is Interesting .....	171
Figure 74 I Can Understand the Feeling That the Sender is Trying to Convey .....	172
Figure 75 I Look Forward to Receiving More SmilieFace Messages? .....	173
Figure 76 I Look Forward to Send a SmilieFace Message in Return .....	173
Figure 77 SmilieFace is an innovative way to communicate on Facebook.....	174
Figure 78 SmilieFace is an Effective Way to Communicate on Facebook.....	175
Figure 79 SmilieFace Allowed Me to Express My Emotion.....	175
Figure 80 SmilieFace Improved My Interactions With Friends on Facebook .....	176
Figure 81 Would You Use SmilieFace Again?.....	177
Figure 82 Would You Recommend SmilieFace? .....	178
Figure 83 Do You Know of a Similar Application?.....	179
Figure 84 Did SmilieFace Enhanced Your Social Networking Experience on Facebook?.....	179
Figure 85 How Often Did You Check Your SmilieFace Messages? .....	180
Figure 86 How Often Did You Use SmilieFace?.....	181
Figure 87 How many SmilieFace Message Did You Received? .....	181

Figure 88 How Many SmilieFace Did You Send Out? ..... 181  
Figure 89 Does it Meet Your Expectation for a Messaging Application?..... 182  
Figure 90 Does it Meet Your Expectation for a Messaging Application in the Future?..... 183

## Table of Tables

Table 1 Social Media Summary .....	34
Table 2 Japanese Emoticons and Western Emoticons adapted from Yuasa, Saito and Mukawa (2006) .....	38
Table 3 SmilieFace Server processing capabilities .....	126
Table 4 SmilieFace Messages Sent.....	149
Table 5 User's Login Count.....	149
Table 6 Familiarity Statistic Summary .....	160
Table 7 Sender Form Statistics Summary .....	170
Table 8 Viewer Form Statistics Summary .....	173

# Chapter 1

## Introduction

Mutale's (2005) Smiliemail is a web based application that creates, sends and receives "affective messages" to enhance online communication by creating a way for the user to create affective and engaging content with the use of avatars. "Affective Messages" can be defined as messages that convey the author's feelings or intentions when read (Picard 1997).

An avatar can be defined as a digital representation of a user in the virtual world, which might be in the form of a simple pictorial graphic, or a fully animated character (Holzwarth, Janiszewski, and Neumann 2006). When people use a particular avatar, it may influence their perception of themselves and the way others perceive them, and also affect their message perception and retention (Nowak and Rauh 2005, 2008). Hence, an understanding of the influence of avatars is of theoretical and pragmatic relevance to researchers.

"Affective Messages" can be created by using an avatar capable of emulating various emotions by changes in its facial expression as well as the changes in the intonation of its voice whilst the avatar is articulating the sender's written text message.

Smiliemail (Mutale 2005) - <http://www.smiliemail.org> was based upon the MetaFace Framework (Beard 2004), Text To Emotional Speech (Stallo 2000), and VHML – <http://www.vhml.org/> (VHML 2001; Gustavsson, Strindlund and Wiknertz 2001). Smiliemail has been extended by Zvonko (2009) and Hengky (2010) so as to be available on smart phones and Tablets as an Android application. All of these environments preserved the effective creation and displaying of affective video messages.

Social Media Sites are a group of Internet-based environments that allow the creation and exchange of user-generated content. Social media can be classified into six different types: collaborative projects, blogs and micro-blogs, content communities, virtual worlds, virtual communities, and Social Network Sites. (Kaplan and Haenlein 2010)

Boyd and Ellison (2007, 2011) defined Social Network Sites (SNS) as web-based services where users construct a public or semi-public profile which contain a list of other users with

whom they share a connection, and they are able view and traverse their list of connections and those made by others within the system. By joining Social Network Sites, people are able to create their own digital persona in the internet as a representation of themselves and seek other users that they share a connection with, creating a list of these users. In this way, they are able to connect with old friends or seek new ones via the connections that they share.

Social Media types which are conversational based and require messages to be exchanged back and forth - either asynchronously (where one would leave a message that its recipients could read and respond at their own convenience) or synchronously (where the sender and recipients must be online at the same time and messages are being exchanged almost instantaneously), perhaps between multiple users – would benefit from *affective* communication. This can be facilitated by using emoticons or ‘smilies’. Hence the use of an avatar as a digital representation of its user to relay *affective* messages would be best implemented in the Social Network Sites branch of Social Media.

Facebook is a social utility tool that helps people to communicate and keep in touch with their friends, family and co-workers. Facebook facilitates the sharing of information through the social graph and the digital mapping of people's real-world social connections. Facebook allows its users to create profiles and articulate their social networks through “friend” requests, wherein one user asks another to approve or verify the connection that they share. If the relationship is approved, the person appears on the users’ friend list, and vice versa. Every friendship link in Facebook is mutual and has to be approved and verified by both parties (Lampe, Ellison, and Steinfield 2007). Facebook also allows developers to create their own applications to run on the Facebook platform.

Due to the massive popularity of Facebook, which as of March 2013, reportedly has 751 million monthly active users who used Facebook mobile products, 655 million daily active users on average, and 1.11 billion monthly active users (Facebook 2013), combined with the lack of research on Facebook application user experience, it was deemed that Social Network Sites are an excellent type of Social Media to focus on, and that Facebook would be the preferred Social Network Site on which the research will be based. This research aims to improve users’ interactions in Facebook by providing an innovative avatar based video messaging application capable of sending affective messages.

## 1.1 Research Objectives

The purpose of this research is to:

- Integrate Smiliemail with Facebook in the form of a third party application implemented on the Facebook Platform.
- Develop a robust and scalable SmilieFace environment, capable of producing *affective videos* in a timely manner.
- Enlist a substantial number of users, who will provide evaluations on the ease of use and the enjoy-ability of the SmilieFace application within Social Networking.

## 1.2 Thesis Outline

The content of this thesis is structured as follows:

- Chapter 2 is a literature review of the parent theories that drove this research, which came from the fields of Social Media, Digital Representation and Computer Mediated Communication (CMC). The research problem centred on the use of avatars as a digital representation for people in Facebook, to enhance its users' interactions with each other by providing an improvement in the field of CMC.
- Chapter 3 describes the Research Methodology and Design Methodology used in the research. The hypotheses that drove the research as well as the outcomes the research hopes to achieve were listed along with the limitations and delimitations that constricted the research were also specified. The steps taken to gather and analyse data were explained and the way the research handled the data obtained was also given, along with any necessary ethical considerations.
- Chapter 4 discusses in detail SmilieFace's design concept and the previous research that acted as the foundations for the creation of the application, its architecture and its specific major components. A tutorial on how to compose a SmilieFace message and the implementation issues encountered are provided as well.
- Chapter 5 introduces the SmilieFace Server and the major components it is comprised of. A breakdown of a SmilieFace message, as well as how the server processed a

SmilieFace message request and how a video is produced are also given.

- Chapter 6 details the data gathering process, the methods used and all the issues encountered during the data collection of this research. Issues such as the difficulties in gathering users and evaluators for the application as well as the surprising anomaly of where the majority of Facebook users who installed SmilieFace's are from.
- Chapter 7 provides analysis of the data gathered during the evaluation period of the research and discusses whether the hypotheses that drove the research are proven.
- Chapter 8 presents the conclusion for each hypothesis and the objectives met by the research as well as how it impacts on future research.
- Appendices include the Information Sheet and the Evaluation Forms, the contents of the SmilieFace Database, Smiliemail and SmilieFace Interface, and the contents of the attached CDROM.

# Chapter 2

## Literature Review

This thesis will primarily address video **Avatar** usage within **Social Network Sites (SNS)**. It has the potential to enhance the user's experience whilst they are visiting or using SNS and other Social Media outlets.

While the world is currently experiencing a massive boom of interest and adoption in *Social Media* and especially in **Social Network Sites**, the concept of *Social Media* itself can be traced back as early as 1988. Root (1988) recognized the importance of the social process and collaborative efforts within a workplace, suggesting the need for direct low cost access to other people through multimedia communication channels. The term *Social Media* and **Social Network Sites** itself was only coined many years after.

Furthermore, research into *Social Media* and **Social Network Sites** is still a new and emerging area. As more and more researchers investigate and explore this rapidly evolving burgeoning field, a vast amount of literature on this research area will become available.

This Literature Review will cover extensively the knowledge fields of *Social Media*, Digital Representation, and Computer Mediated Communication (CMC). *Social Media* itself can be divided into six different types: *Collaborative projects*, *blogs and micro-blogs*, *content communities*, *virtual worlds*, *virtual communities*, and *social network sites*. The focus of this research is on *social network sites* and specifically Facebook. Another focus of this research is Digital Representation, which cover Smilies and Emoticons, **Avatars**, and Agent. However the main focus will be on the use of video **Avatar** to convey *affective* messages. One of the goals of this research will be to improve the field of CMC.

### 2.1 Social Media

*Social Media* can be defined as an amalgamation of Internet-based applications that base their ideological and technological foundations on Web 2.0, and which allow the creation and exchange of user-generated content (Kaplan and Haenlein 2010). In layman terms, it is a media outlet for social interaction, which emphasizes the use of highly accessible and scalable publishing techniques.



According to Kaplan and Haenlein (2010), *Social Media* takes many different forms, such as internet forums, weblogs, social blogs, micro-blogging, wikis, podcasts, pictures, video, rating and social bookmarking. By applying a set of theories in the field of media research (social presence, media richness) and social processes (self-presentation, self-disclosure), a classification scheme for different *social media* types can be created. It was further suggested that there are six different types of *social media*: ***Collaborative projects, blogs and micro-blogs, content communities, virtual worlds, virtual communities, and social network sites.*** Enabling technologies include: blogs, picture-sharing, v-logs, wall-postings, email, instant messaging, music-sharing, crowd-sourcing, and voice over IP. Many of these *social media services* can be integrated into websites and webpages (Facebook's like button, Google's +1 button, etc.). These social network aggregation platforms allow the collection and organization as well as the sharing of content from various *social media services* that the user has subscribed to.

A review of the various widely accepted *Social Media* platforms that have extensively reached millions of users worldwide will be discussed in the following section. Within this review, a justification explaining why this research is centred on a particular *Social Media* platform will also be provided.

### **2.1.1 Collaborative Projects**

***Collaborative Projects*** refer to the type of *Social Media* where a group of users of the media are able to work together on the same task over the Internet (Kaplan and Haenlein 2010). The users are able to add their input, discuss and verify the work of other users they are working with to complete the task.

## **Wikipedia**

One example of a ***Collaborative Projects*** type of Social Media is *Wikipedia*. *Wikipedia* is a free web-based encyclopaedia project available in multiple languages. It has been written collaboratively by volunteers around the world with knowledge about the subject, and almost all of its articles can be edited by anyone with access to the site (Wikipedia 2010b).

## Google Wave

Another example of *Collaborative Projects* type of Social Media is *Google Wave* which was accessible via <http://wave.google.com>. *Google Wave* allows users to communicate and work together with richly formatted text, photos, videos, maps, and more in a workspace referred to as the “Wave”. Any participant in the “Wave” can reply anywhere in the message, edit contents and invite more participants to collaborate on the project in real time. A Playback capability allows anyone to rewind the wave to see who said what and when (GoogleWave 2010).

An analysis done by Webb (2010) and Clijsters, Dijk and Dijk (2009) sees the *Wave* as a hybrid form of communication where a user can participate in *Waves* by actively leaving messages, editing content and collaborating with others. Users can also be passive participants, observing while content is being created, deleted, and edited whilst their commentary can be provided at the end.

As of August 2010, Google discontinued the development of *Wave* as a standalone product since *Wave* did not meet the user adoption rate deemed acceptable by Google (Hölzle 2010).

There are other *Social Media* sites which emphasize collaboration, such as *Digg* (<http://www.digg.com/>) and *Reddit* (<http://www.reddit.com/>). Users of these sites decide which news is popular and should be shared with other users within the site and which news is deemed unworthy and should be removed from the site. This form of *Social Media* relies heavily on *User Generated Content (UGC)*. The various media content publicly available in these sites are created and heavily influenced by their own end-users, and in the case of the *Collaborative Projects*, numerous end-users join their efforts together in order to achieve a common goal. The primary reason that it is free is because millions of users have contributed without being paid for their contributions (Cherry 2013).

### 2.1.2 Blogs and Micro-Blogs

*Blog or Blogging* is described as the act of maintaining or adding new content to one’s weblog (Kaplan and Haenlein 2010). The *Blog* is similar to an online diary where the user can post their thoughts and opinions about events that occurred, or pictures or music that they would like to share with others. *Micro-Blogs* typically have smaller content than a *Blog* and are limited in term of their textual or graphical content.

Glance, Hurst, and Tomokiyo (2004) defined a weblog or in short a '**blog**', as a web page with a set of dated entries, in reverse chronological order, maintained by its writer via a weblog publishing software tool. There are several genres of weblog content.

1. **Online Journal.** The **blog** publisher shares publicly the daily events of their life via the **blog** instead of being confined to private notebooks. Online journals are appealing for the reader of the blog who enjoy a form of peeping and the ongoing feedback or even fame serves as an appeal for the writer (Glance, Hurst, and Tomokiyo 2004).
2. **Commentary.** This **blog** publisher is a pundit, a self-declared expert, who publishes updates and analysis of events within their **blog**. In the earlier days of the internet, they published newsletters online or via e-mail (Glance, Hurst, and Tomokiyo 2004).
3. **Newscaster.** The **blog** publisher serves as a news filter: the voracious reader who gathers up to hundreds of publications (both digital and traditional media), determines what is informative, and publishes lists of links to the most interesting news, with minimal or no accompanying commentary (Glance, Hurst, and Tomokiyo 2004).
4. **Self Expression.** The **blog** publisher is a writer or an artist, who self-publishes their stories, art, music, photographs on their blog (Glance, Hurst, and Tomokiyo 2004).

## LiveJournal

*LiveJournal*, as the name implies, is an **Online Journal** type of **blog** genre. *LiveJournal* is a community publishing platform, where blogging is combined with a social networking element. It serves as a place where a wide array of creative individuals share common interests, meet new friends, and express themselves. *LiveJournal* encourages communal interaction and personal expression by offering a user-friendly interface and a customizable journal. The service's individuality stems from the way highly dedicated users utilize simple tools, along with the instinct for individual expression, to create new venues for online socializing (LiveJournal 2010). According to Raynes-Goldie (2004), *LiveJournal* is not limited as just an **Online Journal**, it can also be utilized to serve as a virtual venue where knowledge can be created as well as shared. Kim (2008) developed an open and interactive model for the use of **blogs** in an educational context which in due course paved the way for Chong (2010) to claim that **blogging** will be able to aid in enhancing the initialization of students into academic research.

## Twitter

*Twitter* is a real-time information network that connects its users to the latest *blog* that other users find interesting. At the heart of *Twitter* are small bursts of information or status updates called *Tweets* which are emitted by users of *Twitter* themselves to inform other users. Each Tweet can have a maximum of 140 characters in length. Connected to each *Tweet* is a rich details pane that provides additional information, deeper context and embedded media such as photos, videos and other media content.

By using *Twitter*, users publish their opinion about something (**Commentary**), share links to something they find interesting (**Newscaster**) and post pictures or photographs that they have taken (**Self Expression**). Albeit all of these are limited within the constraints of the size of information that its users can submit at a time (Twitter 2010). Romero et al. (2010) suggested that *Twitter*'s immense potential provides an excellent platform for online marketing as well as disseminating news updates. Figure 1 depicts the progression of *Twitter* since its conception until 2010.

*Blogger* (<http://www.blogger.com/>) is another example of an **Online Journal** type of *blog* which is very similar to *LiveJournal*. *Tumblr* (<http://www.tumblr.com/>) is an example of a *Twitter* like site and shares the same versatilities and similarities. There are a plethora of other *blog* sites available on the web, but they are all intended to enable their users to share and spread their thoughts with other people on the web via their *blog*.

### 2.1.3 Content Communities

*Content Communities* is the type of *Social Media* that relies extensively on content provided and generated by a community of users in the web. The people in these communities consists of those who wish to exhibit, promote and share their work with other people in the online communities. Their work may consist of videos, pictures, photos, etc.

## YouTube

*YouTube* allows its community of users to watch and share original videos worldwide. *YouTube* provides their users with easy uploading and sharing of video clips, which are accessible as well as upload-able across the Internet through websites, mobile devices, blogs, and email. *YouTube* users are able to see news and current events, find videos about their hobbies and interests (YouTube 2010).

## Timeline

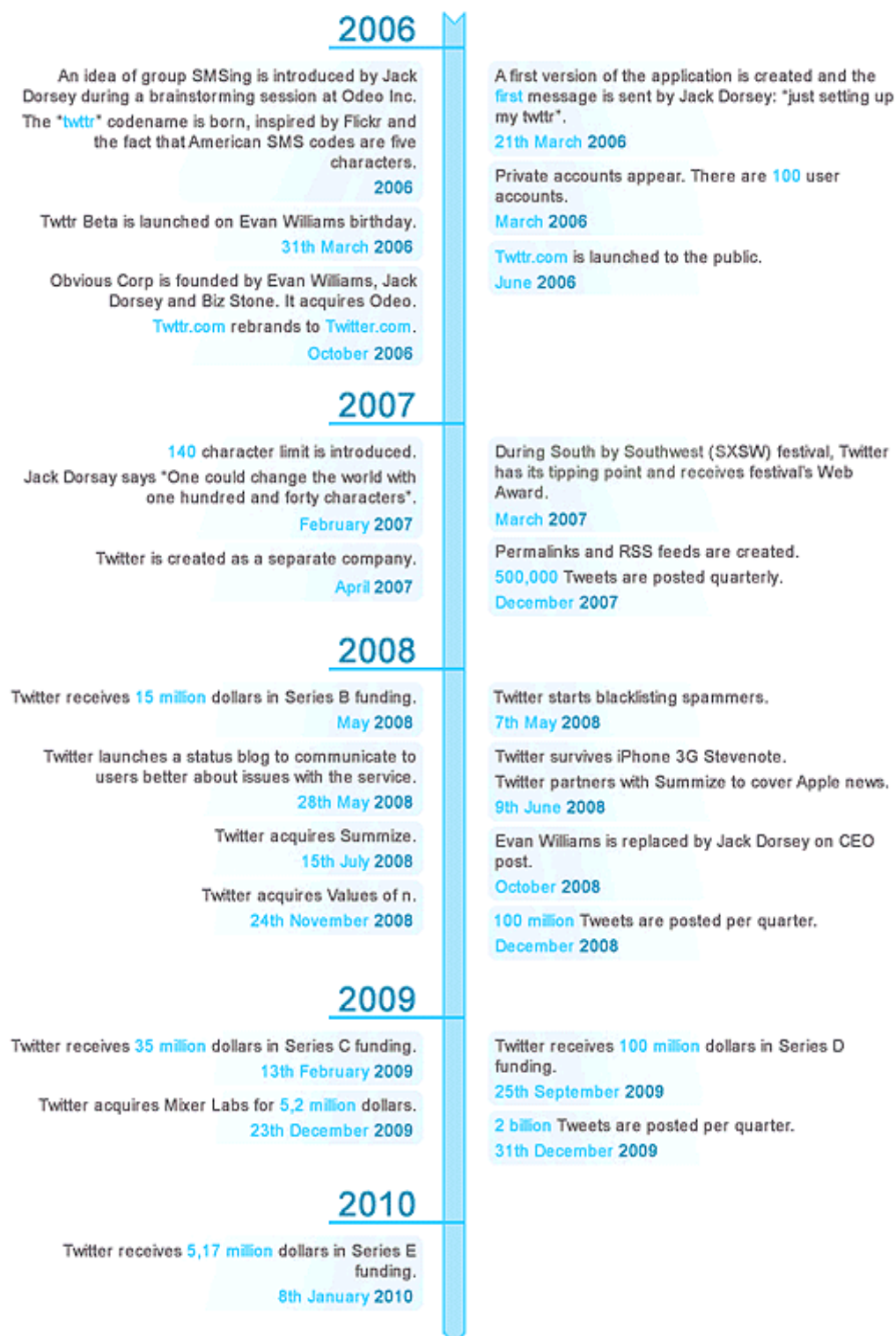


Figure 1 Twitter Timeline copyright from Davidsson (2010)

Gueorguieva (2008) has shown how *YouTube* has affected election campaigns in a simple yet significant way in the U.S by reaching out to the youngsters, the so called “next Internet generation”, and encouraging them to vote. When candidates post their campaign ads on *YouTube*, they increase their potential exposure at a low cost or no cost at all, facilitating a viable outlet where lesser known candidates will be able to broadcast their message to the masses, whilst also allowing campaigns to raise contributions and recruit volunteers online. This indicates how *YouTube* can be utilized as a means to exhibit one’s view, promote one’s self and share one’s thought with a massive audience which might not been reachable had it not been for the availability of said *Social Media* at a minimal cost.

Carlisle (2010) used *YouTube* in an educational context. In this instance, *YouTube* was used as a teaching aid to teach undergraduate students an introductory course in Java. Three participating lecturers created and posted short *YouTube* videos regarding the materials to be covered in their lectures. From the experiments conducted on three groups of students with different levels of interaction between the students and the lectures, a discovery was made. The group that had less interaction with the lecturer, had relied more on the *YouTube* videos and had a better understanding of the materials taught in the lecture compared to the other groups.

This opens up a whole new paradigm in teaching, one that enables educators to combine their efforts and pool their resources together and consolidate their teaching materials into *YouTube* videos. By consolidating their teaching materials into *YouTube* videos, not only have they made it possible for their students to acquire help with their studies that is accessible at any time and from anywhere by anyone with an Internet access, they also provided other *YouTube* users who have an interest in learning, the same aid that the undergraduate students are privileged to.

## **deviantART**

*deviantART* was created to entertain, inspire, and empower the artist in everyone. Founded in August 2000, *deviantART* is the largest online social network for artists and art enthusiasts. It has over 13 million registered members, and attracts 35 million unique visitors per month. As a community destination, *deviantART* is a platform that allows emerging and established artists to exhibit, promote, and share their works within a peer community dedicated to the arts. The site's vibrant social network

environment receives over 100,000 daily uploads of original art works ranging from traditional media, such as painting and sculpture, to digital art, pixel art, films and anime (deviantART 2010).

Similar sites such as:

- *Dailymotion* (<http://www.dailymotion.com/>)
- *Metacafe* (<http://www.metacafe.com/>)
- *Flickr* (<http://www.flickr.com/>)
- *Picasa* (<http://picasa.google.com/>)

are heavily driven by the content provided by their user communities and without such support, the sites would not gain popularity and would cease to be, once the communities of users stopped uploading content.

According to Christodoulou and Styliaras (2008), due to the evolution of art projects which are gravitating towards larger installations, more and more artists tend to collaborate and use digital technology in a scattered way. As *Social Media* is able to bring people who share the same interests together and facilitate a way for them to collaborate with one another, it may influence how digital art projects are created as well as motivate people to express themselves through art individually or as a group.

As *Content Communities* sites promote the sharing of media content between users, sites such as *YouTube* and *deviantART* facilitate a place where artists are able to promote and exhibit their art. The users would also be able to find fellow artists that they wish to collaborate with through the sites. Although *Content Communities* sites might be an excellent way for an artist to promote and share their work with the world as well as linking them to other artists, it is not the only type of *Social Media* that allowed them to do so, as even *blogs* would be able to provide such service, but it would not have the same level of exposure and networking ability as *Content Communities* sites. Only a *Virtual Social World* such as *Second Life*, which will be further elaborated on in the next section, can provide the same exposure and service to the artists as *Content Communities* sites. *Second Life* allows their users to open their own virtual gallery, where not only can they display their own work of art but work by other artist as well within the *Virtual Social World*. This is important because it demonstrates that *Social Media* can be used as social networking tools, and serve as an effective and powerful tool to promote and broadcast one's self and one's work to the entire world, which would otherwise prove to be a difficult to achieve.

### 2.1.4 Virtual Worlds

A *virtual world* is a type of *Social Media* that often takes the form of a computer-based simulated environment, through which users can interact with one another, and where the users take the form of avatars (digital representation of themselves) visible to others graphically. These avatars are usually depicted as textual and two-dimensional, or even three-dimensional. The user is placed in a computer-simulated world and presented with perceptual stimuli. The user can manipulate elements of the modelled world and thus experience virtual presence to a certain degree. Kaplan and Haenlein (2010) categorized the *virtual worlds* that appear similar to the real world as a *Virtual Social World*, and those that are similar to a fantasy world as a *Virtual Game World*. Communication between users can range from text, to graphical icons, visual gesture, and sound.

Castronova (2001) observed that a *Virtual World* should have these three defining features:

- **Interactivity:** it exists on one computer yet is accessible remotely and simultaneously by a large number of people, with any interactions performed by one user also able to affect other users within the *virtual world*.
- **Physicality:** users access the *virtual world* through an interface that simulates physical environment on their computer screen and is generally ruled by the natural laws of Earth.
- **Persistence:** the *virtual world* will continue to run regardless with or without the existence of the user as the *virtual world* remembers the locations of other users and objects as well as the ownership of said objects.

It was also suggested that the communications that took place within the *virtual world* that allow social interaction are **not** a simulation of human interactions but they **are** human interactions albeit a slightly evolved form (Castronova 2001).

What differentiates a *Virtual Social World* from a *Virtual Game World* is the main objective that its users have when visiting the said world. In a *Virtual Social World* the central purpose of the users is mainly to socialize and interact with other users in a *virtual world* without any constraints, and by carrying out tasks, objectives and activities similar to the ones they perform in real life. A *Virtual Game World* on the other hand, is primarily focused on the gaming experience of its users while social interactions with other users within the *virtual world* are a by-product of the whole virtual experience that the *Virtual Game World* provides.



Another factor that distinguishes a *Virtual Social World* from a *Virtual Game World* is how avatars are used as a digital representation of its user in the *Virtual World*. Users in a *Virtual Social World* are able to customize their avatars freely, ranging from choosing the physical appearance of their avatars, to selecting the clothing that their avatars wear.

Users are also encouraged to put in as much detail as possible on their avatars, as their avatars will be their digital representation in the *Virtual Social World*. Other users' perceptions of one's avatars will affect their interactions with one another in the *Virtual Social World* similar to the real world itself.

Although customizing one's avatars in a *Virtual Game World* is possible, most users are more concerned on the practicality of the appearance of their avatars in the *virtual world* instead of treating it as an extension of themselves as users normally would in a *Virtual Social World*.

The prime objective for user customization in the *Virtual Game World* would be to obtain and equip their avatars with the most powerful or rarest gear or accessories they could find. In contrast, the main objective for users customization in the *Virtual Social World* would be to obtain and accessorize their avatars with items that would best reflect their personality and taste in the real world (Nardi and Harris 2006; Kaplan and Haenlein 2009).

Contact between people in the game is not limited to encounters and communication within the *virtual worlds* itself, as depending upon the degree of immediacy presented, it can also encompass computer conferencing and text based *chat rooms*. It is common for people who meet in the *Virtual World* to shift their discussion and interaction away from the game, either by joining *Online Forums* or *Instant Messaging* one another, or even meeting face-to-face (Nardi and Harris 2006).

## Second Life

*Second Life* (SL) is a *virtual world* which enables its users to interact with each other through avatars. It allows the users to explore, meet other users, socialize, participate in individual and group activities, create and trade virtual property and services with one another, or travel throughout the world (SecondLife 2010).

Messinger et al. (2009) describe the *virtual world* in *Second Life* as a globally shared playground and workspace. And within this *virtual world*, players - more commonly

referred to as *residents* - are able to shape the world around them, particularly their virtual property. *Residents* are able to write code in order to manipulate the environment, trade objects and property in exchange for money, make or purchase their clothing, participate in group excursions, work, explore, play and interact socially within the *virtual world*. As *residents* work, trade, provide and pay for services as well as purchase and sell goods and products, all these activities gives rise to an enormous virtual economic ecosystem which is parallel to the economic ecosystem in the real world, especially when the game itself allows the currencies in the *virtual world* to be exchangeable with real life currencies and vice versa.

Kaplan and Haenlein (2009) distinguished *Second Life* from other *virtual worlds* by presenting the fact that its users hold the copyright on all the content that they create in the game and are allowed to sell this content to other users in exchange for virtual money known as Linden Dollars (L\$). Linden Dollars can also be converted into real currencies. It was also noted that some considered *Second Life* to be more than just a mere computer game. Some considered it as an extension of their real life due to the likeness of the *virtual world* to the real world, as well as the immersive nature of the game itself (Kaplan and Haenlein 2009).

## SmallWorlds

*SmallWorlds* is a *virtual world* that runs inside the web browser, without the need to download or install any other software. *SmallWorlds* combines media, web content, and casual games into a highly accessible and compelling 3D world that integrates seamlessly with the rest of the web, bringing *virtual game worlds* into the mainstream. *SmallWorlds* allows users to create and customize their own rooms and worlds, and fill them with a wide variety of items and activities for them and their friends to enjoy together. The users will then be able to share experiences like playing games, watching YouTube videos, listening to their favourite bands, browsing through photo galleries with their online friends and acquaintances (SmallWorlds 2010). Its failure to topple the popularity of *Second Life* can be attributed to its inability to replicate the enormous virtual economic ecosystem parallel to real life economic ecosystem that exists in *Second Life*. The lack of real life companies backing *SmallWorlds* by maintaining their virtual presence in *SmallWorlds* as they do in *Second Life* is also a mitigating factor of their failure (Kaplan and Haenlein 2009).

Bainbridge (2007), while investigating the scientific research potential of *virtual worlds*, used the term *virtual world* to describe an electronic environment that visually mimics complex physical spaces, where people are represented by animated characters, and are able to interact not only with each other but with virtual objects as well. The investigation focused on the *virtual world* that exists in *Second Life* and *World of Warcraft* (<http://www.worldofwarcraft.com/>) and discovered that both worlds sustain complex internal economies with their own currencies, both worlds also enable their users to perform useful tasks for each other, and both worlds also facilitate social interactions within the *virtual world*, albeit their specific features are quite different from each other.

They all share some common threads with one another as they brought the users to *virtual worlds*, where the environments are created so that the users can simulate some real life experiences virtually. Real life experiences such as travelling, trading, making new friends, even socializing are emulated within the *virtual worlds* by using avatars which serve as a digital representation of themselves carrying out quests or tasks that might resemble the ones that they normally do in real life.

### 2.1.5 Virtual Communities

*Virtual communities* can be defined as social congregations that originated in the Internet when enough people carry on those public discussions long enough, with sufficient human emotions, culminating in webs of personal relationships (Rheingold 2000). Wellman and Gulia (1999) suggested that unlike real life communities, which are normally bounded based on social status or closeness of proximity as well as localities, *virtual communities* transcend their real life counterparts, as a *virtual community* can simply be founded and bounded by shared interests which can span from any part of the world, and the people within the *virtual community* would be able to share the same level of attachment to one another even if they have not met each other face to face in real life.

One of the most pervasive types of *virtual community* includes *social networking services*, which can consist of diverse sets of *virtual communities* bound together by an assortment of reasons such as shared interest, mutual cause, etc. These *virtual communities* all encourage interaction, sometimes focusing around a particular interest, or sometimes just to communicate. They allow users to interact over a shared passion, whether it is through **online message boards, online chat rooms, social network sites, or virtual worlds.**

## Online Message Boards Communities

An *online message board* typically refers to a forum where people can discuss thoughts or ideas on various topics. *Online message boards* allow users to choose which “thread” or board of discussion they would like to read or contribute to. A user is able to start a discussion by making a post on a thread and other users are able to choose either to respond to the discussion by adding their own post to that thread or simply resume reading without making any contributions.

*Online message boards* are not conversation based because user responses are not instantaneous. It would be best defined as *asynchronous communications*, where one would leave a message that its recipients could read and respond at their own convenience. *Instant Messaging* is an example of *synchronous communications*, where all the users involved in the discussion or conversation are online at the same time and messages are being interchanged in real time.

Usually, the user will make a response to a previous discussion whenever the user revisits the message board. Unlike a conversation, users of an *online message board* are required to repetitively visit the site in order to check for responses. Participation in an *online message board* is not limited, as anyone is allowed to be a part of the *virtual community* and participate upon registration. Registered users can also choose not to contribute their thoughts and simply view the various threads.

## Online Chat Rooms Communities

As the *virtual communities* formed in *online message boards* and forums gradually became larger and more popular, a need for a way to communicate instantaneously between people within the *virtual communities* emerged. An *online message board* typically requires its users to wait until another user has replied to their posting. Since the *virtual communities* may be comprised of people located from all around the world with different time zones, a reply to a post might take quite some time before it arrives. The development of *online chat rooms* allowed people to talk to whoever was online at the same time as they were. This way, once a message is sent, the online users could immediately send their response back.

Users have the options of joining an existing *chat room*, or start a new *chat room* if they are unable to find one that matched their interests. Real time chatting has also

been implemented into virtual games, where people could play against one another whilst communicating through text. Presently, *chat rooms* on all sorts of topics can be discovered or created in order to facilitate a place where people who share similar interest can communicate with each other. *Chat rooms* are now provided by Internet Relay Chat (IRC) and other individual websites such as Yahoo, MSN, and AOL.

*Chat room* users communicate mostly through text based messaging, usually in the form of an input box, a message window, and a participant list. Users can type their text based message in the input box where it would later be sent to the providing server. The server will then transmit the message and display it on the message window of everyone in the *chat room*. The message window allows the conversation within the *chat room* to be tracked and a time stamp is usually placed next to the message once it is posted. Normally, there is a list of users who are currently in the *chat room*, so that people can see who is in their **virtual community**.

*Chat rooms* allow users to communicate as if they are speaking to one another in real life. As *chat rooms* also allow users to get to know one another as if they were meeting in real life, it is easy for users to form a virtual community. As an individual *chat room* can be created by anyone, it would be relatively easy to gather people assuming they share similar interest within the *chat room*; an interest that allows them to bond with one another along with a willingness to form a friendship online. These typically serve as the basis for forming **virtual communities**.

## **Virtual Game Worlds Communities**

*Virtual Game Worlds* allow the most interaction between people within the **virtual communities** compared to any other form of *Social Media*. In this type of **virtual community**, people are represented by an avatar which serves as their digital representation in the **virtual game world**.

Users are able to create and customize their own avatar character (from choosing the avatar's outfits to designing the avatar's house) and subsequently control their character's life and interactions with other characters in the 3-D **virtual game world**. Although it is similar to a computer game, there is however no real objective for the players as there is no end game and the game will continue forever until they lose interest.

A *virtual game world* simply gives users the opportunity to build and operate a fantasy life in the virtual realm. Characters within the world can communicate to one another through exchanging text based messages and have almost the same interactions people would normally have in real life. For example, characters can socialize with one another and hold intimate relationships online.

The type of *virtual community* within the *virtual game world* is not only formed by allowing people to converse with others in real time, but also by encouraging engagement and interaction with other users in order to advance their progress in the game itself. The avatars that the users create can be human-like and can be based on the users themselves, or adopt an entirely different personality.

Interaction between characters in the *virtual game world* is not limited to exchanging text based messages, as by having the interaction within a *virtual game world* simulating a real world, user will be able to have a virtual experience (such as having avatars go on a date in the *virtual game world*) as well.

A *virtual community* formed in a *chat room* may offer real time conversations, but people can only talk to one another. While in a *virtual game world*, characters can do activities together, not unlike what they could do in reality. Communities in *virtual game worlds* are most akin to real life communities as the characters (*avatars*) are physically in the same place, even if the users who are operating the characters are not. It is close to reality, except that the characters are digital.

Nardi and Harris (2006) studied the collaborative play that is essential in *World of Warcraft* and concluded that social relations between players in the *virtual game world* greatly affect the users experience whilst playing the game. The collaborations that took place in the *virtual game world* may be spontaneously formed with strangers, or formed with offline friends and family. While it is suggested that collaboration play in *virtual game world* appears to help reinforce existing social ties for the players, it is not uncommon for these players to seek new friends and form new friendships in the game.

Most *Massively Multiplayer Online Role Playing Games (MMORPG)* encourage the formation of *virtual communities* within the *virtual game world*. This is done by facilitating a way for players to group together, socialise, pool resources and combine

their efforts to accomplished tasks, typically through the concept of joining a “guild” or forming a “party”. The “guild” concept is akin to the concept of a clubhouse in the real world, where people who might not have any existing connections with one another, become members of the club and are entitled to certain benefits privileged only to members of the club. The “party” concept usually refers to the concept of forming a group (usually temporary) and consists of people who may not know each other in real life or in the *virtual game world* but share the same goal in the *virtual game world*, typically in order to defeat a foe or monsters that are too difficult to defeat alone without the help of other players.

## **Social Network Services Communities**

*Social network services* are considered the most prominent type of *virtual community* and they are either a website or software platform that focuses on creating and maintaining relationships. Typically, the *virtual communities* that exist in *social network sites* are formed in real life and later migrate to the *social sites* which gradually grow by gathering new friends found either through the sites or through real life meetings.

These sites normally require one to create a profile or an account, filled with information that makes them identifiable to other users of the site. By adding friends or contacts that they know in real life, a connection can be made which will allow them to locate old friends as well as gather new friends. The purpose of the *social network services* is to allow its users to keep in touch with their friends and acquaintances’ effortlessly. On most *social network services*, one can upload photos and videos, chat, make new friends, reconnect with old friends, and join groups or causes. All of these features encourage people to form a community, large or small, on the Internet (Boyd 2004, 2007; Boyd and Ellison 2007; Donath and Boyd 2004; Ellison, Steinfield, and Lampe 2006, 2007; Lampe, Ellison, and Steinfield 2007).

It has been previously discussed how *virtual communities* are formed in *internet message boards*, *online chat rooms*, *virtual game worlds*, and *social network services*. It can be noted that as people communicate with each other online, participate in online discussions, share their interest on the internet, as well as socializing with others through the internet, relationships are formed and strengthened until *virtual communities* are eventually formed.

A *virtual community* can consist of people from all around the world, regardless of their current geographical locations, age, race, occupation, lifestyle, etc. Just by communicating, participating, interacting and socializing with others through various modes available in the web, bonds are formed and developed further until they eventually become a part of a community, a *virtual community*.

It has been suggested that *virtual communities* might encompass more than people as evident in the event described and documented by Foner (1993), where an artificial intelligence agent called *Julia* created by Mauldin (1994), managed to interact, converse and even convince other users within the *TinyMUD* (**Tiny Multiple User Dungeon**) that it was in fact human.

Mowbray (2002) suggested that the use of ‘bots’ or artificial intelligence agent without informing other users of the fact, might cause the feeling of embarrassment and frustration, as users are misled into believing that they are in fact conversing with a real human. This, however, has not stopped *online chat rooms* and *virtual game worlds* from implementing these ‘bots’ in order to chat or provide help to its users.

*Ragnarok Online* (<http://www.playragnarok.com/>) is another game that portrayed a *Virtual Game World* and just like *World of Warcraft* (<http://www.worldofwarcraft.com/>), both allow its users to interact with thousands of simple artificial intelligence (AI) characters. The simple AI characters are normally referred to as *Non Player Characters* or **NPC**, which can either be friendly (merchant characters that trade with the players) or unfriendly (foes or monsters that the players have to defeat in order to progress). These NPCs form an integral part of the gameplay in the *Virtual Game World* as well as serving as a part of the *online community* that exists in the *Virtual Game World* (Bainbridge 2007).

Messinger et al. (2009) and Kaplan and Haenlein (2009) noticed a trend within the *Virtual Social World* specifically in *Second Life*, where a great variety of real-world organizations maintain a presence in *Second Life* by setting up virtual branches or shops in the *virtual world* itself, even some universities are conducting classes and lectures within the *virtual world*, and things have even gone as far as foreign governments opening up their embassies in the *virtual world*. (Messinger et al. 2009; Kaplan and Haenlein 2009) This suggests that not only is individual digital representation of oneself of utmost importance in the *virtual world*, but real-world entities are starting to establish and propagate their presence in the *virtual world* in the hope of tapping into the immense potential and market of the *virtual communities* that exist in *Second Life*.



Messinger et al. (2009) and Kaplan and Haenlein (2009) also acknowledge that *Second Life* has opened up a new venue for companies to advertise their products to the masses. By allowing companies to set up virtual shops and selling virtual products as well as renting out virtual billboards, complemented by other various forms of advertising directly integrated within the game itself, companies are able to propagate their brands and reach out to a whole new niche market at a lower cost compared to advertising in other form of media. The advertisements and product placements interwoven into the fabric of the game, compounded with its exposures to an enormous congregation of users, have transformed *Second Life* into an immensely popular and highly profitable *virtual social world* segregating itself from its competitors that provide the same services and functionality within their *virtual social world*.

While Messinger et al. (2009) and Kaplan and Haenlain (2009) recognized that a number of universities have started conducting classes and lectures within the *virtual world*, Liccardi et al. (2007) proved that the concept might not be so far-fetched after all. *Second Life* promotes the formation of *virtual communities* by providing a virtual space where its occupants can communicate as well as collaborate with each other, making the online learning experience in a *virtual world* possible. Tinto (1997, 2000) affirms the fact that the social aspect of learning is of utmost importance and having a support community that promotes collaborative learning is vital in encouraging the students to maintain, if not improve, their level of engagement and participation.

It can be noticed that communities that are formed within the various forms of *Social Media*, shared some commonality. Whether it is using *asynchronous* type or *synchronous* type of communications, the ability for its members to communicate with each other is the main reason a community can be formed virtually. Hence the ability to send *affective* messages might improve the communication ability by allowing the expression of emotions within the members of the *virtual communities*.

### 2.1.6 Social Network Sites

Boyd and Ellison (2007, 211) define *Social Network Sites* as

*web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system. The nature and nomenclature of these connections may vary from site to site.*

This suggests that by joining *Social Network Sites*, people are able to create their own digital persona on the internet as a representation of themselves and seek other users that they share a connection with, creating a list of these users. In this way, they are able to connect with old friends or seek new ones via the connections that they share. This can be anything from going to the same school or university or by sharing the same interest in music or movies (Boyd 2011; Boyd and Ellison 2012; Ellison and Boyd 2013).

Boyd (2004) advised that carefully managing one's representation in a digital world is of utmost importance and is not something trivial as the whole world is literally watching.

## **Facebook**

Facebook is a social utility tool that helps people to communicate and keep in touch with their friends, family and co-workers. Facebook facilitates the sharing of information through the social graph and the digital mapping of people's real-world social connections. Anyone can sign up for Facebook and upload photos and videos, chat, form groups, organize events, re-connect with old friends, and interact with their friends within a user-friendly *Social Network Site*. Facebook allows other developers to create their own applications in their platform (Facebook 2010a, 2010b, 2010c, 2010d).

Lampe, Ellison, and Steinfield (2007) portray Facebook as a site which allows its users to create profiles and articulate their social networks through "friend" requests, wherein one user asks another to approve or verify the connection that they share. If the relationship is approved, the person appears on the users' friend list, and vice versa. Every friendship link in Facebook is mutual and has to be approved and verified by both parties before it can be formed and displayed publicly.

## **MySpace**

*MySpace* was a *Social Networking Service* that allowed its members to create a unique personal profile online through a fully customizable profile page in order to find and communicate with old and new friends. *MySpace* allowed their members to post pictures and videos as well as posting comments and messages. *MySpace* also facilitated third party applications for use within their site in order to complement other previously available features (MySpace 2010).

Boyd (2007) investigated the popularity of *MySpace* among youth in America and discovered that the main reason for its attractiveness to youth was due to the fact that *MySpace* was initially centred around music. Music proved to be a cultural glue among youth. Unlike any other *social network sites* around at that time, *MySpace* managed to attract the attention of indie musicians and bands which in turn attracted young music aficionados to visit the site, hence more and more indie bands began to advertise their presence in *MySpace*. A symbiotic relationship between bands and fans swiftly materialized within the site as it facilitates a way for bands to gather fans and for fans to be connected to their favourite bands.

## **Friendster**

*Friendster* is primarily aimed at helping people stay in touch with friends as well as discovering new people and things that are important to them by enabling their users to participate with others. *Friendster* is also able to facilitate a friendly and interactive environment where users can easily connect with anyone around the world by delivering an easy-to-use as well as user-friendly platform (Friendster 2010).

## **LinkedIn**

*LinkedIn* was created in a bid to help its users to make better use of their professional network and help the people they trust in return. It allows its users to connect with people who share the same profession as them, or people who the user has become acquainted with during the course of their professional lives. *LinkedIn* also allows its users to create a connection with companies that they are interested in working for, as well as broadening their professional network by allowing them access to their colleagues' professional network (LinkedIn 2010).

Figure 2 shows the history of Social Media and various forms of Social Networking Sites.



Apart from the *Social Network Sites* mentioned in the previous section, there is also *Cyworld* (<http://cyworld.co.kr/>) which is popular in South Korea, and *Orkut* (<https://orkut.com/>) which is widely adopted in Brazil and India. Although there are far too many *Social Network Sites* to be categorized and listed, one common trait they share is that they all require their users to fill out their personal information onto their profile page, hence making them identifiable to other users within the sites. This common trait has created a huge concern in regards to privacy as well as security issues associated with *Social Networking Sites*.

### 2.1.7 Privacy and Security Issues

Concerns in regards to privacy and security issues associated with *Social Networking Sites* have been raised by a number of researchers such as Acquisti and Gross (2006) which investigated the privacy concerns that different demographic of Facebook users have, and their online behaviour in regards to their concern in privacy. Preibusch et al. (2007) analysed the privacy requirements in a *social network* and produced a requirement analysis and conflict-resolution techniques that can contribute to privacy within such sites.

Krishnamurthy and Wills (2008, 2010) characterized potential privacy leakage within *Social Network Sites* in their earlier work and identified multiple ways a leakage could occur and its prevention in the latter. Felt and Evans (2008) along with Felt et al. (2008) are concerned with protecting user's privacy from third party applications within *Social Network Sites*.

Whereas Singel (2010) proposed a need for an open alternative for Facebook, Baden et al. (2009) predicted that notion by suggesting a need to give users full control on what they like to share, in addition to a new cryptographic mechanism that hides the users' data. Meanwhile, Bilge et al (2009) indicated the ease in which a potential attacker is able to launch automated crawling and identity theft attacks against a number of popular *Social Network Sites*.

All this research has subsequently implied that privacy and security issues are a major concern in *Social Network Sites* and after these findings are made public, users are becoming more and more informed and educated on the various dangers that they might encounter by putting their personal information online. As users of *Social Network Sites* become more vigilant and aware of whom they are willing to share their personal information with online, they might be a bit hesitant, if not reluctant, in using a third party application that has access to their personal information. Hence, protecting the users' privacy as well as re-assuring them that their personal information would not be misused will always have to be taken into consideration in the development of a third party application within the *Social Network Sites*.

Grimmelmann (2009) provided an analysis of the law and policy that governs *social network sites* and Facebook as its primary example. He suggested that users tend to misunderstand the risks that they are vulnerable to in these sites and how their privacy suffers as a result. Most *social network sites* actually have safeguards in place to protect its users' privacy and personal information. Unfortunately most users did not bother to make use of these safeguards. Although the *social network sites* have a responsibility to protect their users' privacy, the users themselves must also be held accountable as they should not knowingly post things that are meant to be private on a public domain which technically can be accessed by anyone on the Internet. It was noted that *social network sites* are immensely popular as they facilitate a socially compelling platform where the users are able to share information about themselves with their friends. On the other hand, they also facilitate peer-to-peer privacy violations: users harming each other's privacy interest. The article concluded that, while *social network sites* can implement a number of policies to protect their users, it would still not be completely safe as they can only strive to help people use it safely.

Findings based on a survey of MIT students and statistical analysis of Facebook data from MIT, Harvard, NYU, and the University of Oklahoma by Jones and Soltren (2005) shows that most of the students have a Facebook account and they have also invested significant time and effort in creating their profiles. While most users surveyed were somewhat concerned about their privacy, it did not stop them from sharing their personal information in their profiles. It was noted that most users tend to self-censor their personal information that was deemed too private to share with others such as their phone number. The surveyed students displayed some understanding of the privacy risks involved by putting their personal information on Facebook but the need to create a fair and informative digital representation of themselves in order to keep in touch with their old friends and the prospect of meeting new ones, eventually prevailed.

Snyder, Carpenter, and Slauson (2006) proposed that a "rules of engagement" should be put in place in formalized documents such as user agreements, terms of use or privacy statements within a *Social Network Sites*. These rules should define who can make use of the site, how the site is to be used and the consequences that one might incur should any of the rules be violated. By setting up a "rules of engagement", all the roles are identifiable and users are well informed as to what they can and must not do, as well as the punishment that they are liable for should any infractions occur.

Raynes-Goldie (2010) advised that young Facebook users are more concerned with their “social privacy” rather than their “institutional privacy”. In other words, managing who is able to view and access their private picture, data, information or interaction with other users within the site is significantly more important than having their private data or information used by Facebook or other third party that might or might not be affiliated with Facebook.

### 2.1.8 Previous Research in Social Media

In an effort to better understand the people involved as well as discovering the reason why people preferred to interact socially online instead of other method of interactions, Kumar, Novak, and Tomkins (2010) along with Wilson et al. (2009) and Mislove et al. (2007) have identified another area of research in *Social Media*. By quantifying and measuring the social interactions that occurred within *social network sites*, ways to optimize an applications’ design as well as the innovation of new *social networking* tools can be discovered.

Studies by Ellison, Steinfield, and Lampe (2006, 2007) conducted by surveying Michigan State University undergraduate students concluded that students primarily use Facebook in order to maintain their existing offline relationships or to solidify what would otherwise be ephemeral, temporary relationship. They also noticed that Facebook users tend to ‘search’ for people with whom they have an offline relationship, instead of “browsing” for complete strangers to meet. The study also unearthed a fascinating discovery as it revealed the difference between the *virtual communities* that exist in **internet message boards, chat rooms, or virtual game worlds**, and the *virtual communities* that exist in *social network sites*. The revelation showed that unlike other *virtual communities* where the relationships usually migrate from meeting each other online to meeting each other offline or in the real world, the *virtual communities* that exist in *social network sites* tends to form offline, in the real world before moving online.

Hence, by allowing its users to keep in touch with people they just met as well as providing the users with more information about them, *social network sites* are able to assist their users in maintaining their old existing friendship as well as transforming ‘latent’ or non-existing relationship into something more than just acquaintances. This highlighted the importance of *social network sites* and their ability to facilitate communication between members of their *virtual communities*.

Backstorm et al. (2006) affirmed the notion that the evolution of *virtual communities* relates to the structure of the underlying social networks among other things. An individual tends to

join certain group or community as most of their friends are already part of that particular community or group. The connection that an individual shares with their friends and members of the community is also a major influence on whether they want to be a member of the community. This implied that user do not join *social network sites* simply because most of their friends did, although it is a major contributing factor. Nevertheless, their interactions with their friends within the site will affect whether they will continue to use the site or not. Hence, the ability to convey emotions within their interactions, in *social network sites*, via an *affective* messaging application will be beneficial and improve their interactions. Any features provided by *social network sites* that would enabled the users to extract information easily from their *virtual communities*, will served as a social lubricant, enabling the conversion of latent to weak ties into a valuable source of information and support. Hence provide motivation for the users to grow their *virtual communities* and promote the *social network sites* as well (Ellison, Steinfield, and Lampe 2011; Smock et al. 2011; Lampe et al. 2012; Steinfield et al. 2012).

Cachia (2008) highlighted the fact that research in *social network sites* in a European context is still in its infancy stage compared to other countries such as the USA. However, the use of *social network sites* by Europeans proved to be quite popular albeit most preferred to use *social network sites* that are available in their native language even though an increasing number of European users are starting to use *social network sites* in English as well. *Social network sites* in Europe share similarities with other countries around the world in how they are used in order to maintain and manage social networks. It allows them to ‘social search’ people they have met offline, maintain contact as well as consolidate pre-existing relationships. They can also be used to extend one’s network, as well as enhancing their professional opportunities by using their online persona, and amplifying weak friendships.

Golder, Wilkinson, and Huberman (2007) has analysed 362 million messages exchanged by 4.2 million Facebook users during a 26 months interval and concluded that while Facebook users tend to exchange messages mostly with their friends, their message partners whom they regularly exchange messages with are fairly low. Facebook itself provides three ways for its users to communicate with each other:

1. “Wall Post” is a message written onto the recipient’s profile page and is visible to everybody else.
2. “Private Message” is an email like message, visible only to its recipient.
3. “Poke” is a content-less message and is usually used to get attention from its recipient.



User-user interaction in a *social network site* is a key factor that influences its popularity as the sites have become a popular way for users to keep in touch, express themselves, and share contents. Donath and Boyd (2004) along with Viswanath et al. (2009) examined user interactions in *social network sites* and learned that “Wall posts” or posting a message onto one’s profile which is usually viewable to other users, is the most popular way for users to interact with one another. The amount of “Wall posts” between two users usually reflects the strength of the ties that they share. Sporadic or close to none “Wall post” exchanges usually signify that their ties are quite weak, while a regular or intense rate of “Wall posts” exchanges usually indicates that they share much stronger ties between them.

Gjoka et al. (2008) on the other hand proposed that the ability to develop third party applications was a key feature that arguably contributed to the unprecedented success of Facebook. They classified and categorized seven of the most popular categories or types of application in Facebook:

1. **Friend comparison:** allows users to declare best friends and compare friend traits.
2. **Casual communication:** allow users to exchange messages and write on each other’s wall.
3. **Rating, Taste Matching and Recommendations:** enable users to review, compare and recommend items spanning from music to restaurants.
4. **Gestures:** allows users to perform virtual gestures.
5. **Self-Expression:** enables users to express moods, political opinions, etc.
6. **Gifting:** allows users to exchange virtual gifts.
7. **Meeting People:** allows users to find people of similar interests.

Data was collected over a 170 day period of the 100 most active applications on 03/05/2008. At that point in time, **friend comparison** and **casual communication** proved to be the most popular type of application. This indicates that Facebook users primarily use it as a means to declare how they feel as well as a means to communicate by exchanging messages.

After developing three third party applications in Facebook and collecting users’ interaction with the application, Nazir, Raza, and Chuah (2008) believed that a small number of ‘power users’ who dominate user interaction and generate the bulk of traffic or activities are the driving force for the success of an application. These ‘power users’ are also responsible for sustaining the application’s daily usage in the long run. They also discovered that the average turnaround time for a user to respond to a message or request sent by another user on average

is 16.5 hours. This suggests that the existences of active users are essential in perpetuating as well as maintaining the constant distribution and usage of an application to other users. Turnaround time for user to respond will have to take into consideration the fact that other users might be in a different time zone or have different schedules hence might not be able to respond instantaneously to any requests.

While Golder, Wilkinson, and Huberman (2007) has concluded that Facebook users communicate primarily with each other using features provided by Facebook, a study by Lange (2007) on YouTube, suggested that sending videos to one's friends and relatives allow their connections to deepen as well as re-affirming one's position in a familiar *social network*. This implied that there is room for an innovative messaging that allows users to send each other video messages as a mean to communicate as well as deepen and re-affirms one's relationship on Facebook.

### **2.1.9 Justification of Facebook as the Social Network**

Despite a lot of distress over Facebook's flaws in security and what some considered blatant disregard for its users privacy, Facebook has managed to gather more than 500 million users at the start of the research (Zuckerberg 2010), and as of 2013, there is more than 1.1 billion users (Facebook 2013). And as of November 2010, it was announced that MySpace will be collaborating with Facebook by sharing profile data and allowing login via Facebook, which in essence, lets MySpace users with Facebook accounts to port their Facebook interests and likes into their MySpace profiles, allowing for MySpace media streams. Mangalidan (2010) sees this collaboration as a sign of MySpace's inability to compete with Facebook as a *Social Network Site* and preferring to change its direction as an "entertainment hub", focused on providing social entertainment to its user whilst signalling the surrender of the *social network* space to its once closest rival, Facebook.

Kelleher (2010a) insinuates that Facebook was able to surpass the popularity of MySpace due to its ability to learn from MySpace's mistakes. MySpace originally found quick success facilitating an online venue where independent bands can interact with their fans, but in 2004, the company shifted its direction towards allowing their users to fully customize their pages. This suggested that MySpace was unsure what would make a *social network* tick and preferred to let its members to figure it out, by enabling them to design their own page. By allowing its users to add widgets, post songs and embed videos, MySpace gave their users an extensive freedom to modify their own page. Thus, creating a wasteland of clutter and

annoying pages that bear resemblance to its boorish predecessor, Geocities. Facebook, on the other hand opted for a cleaner and simpler, Google-like interface that fit well with wider audience in general. The predominantly blue and white design adorned with key features such as email, instant messaging and live feeds of its users' activities formed the foundation for an intuitive platform which reflects how people were already communicating online.

After MySpace was bought by News Corp, MySpace became essentially free and relied heavily on ad revenue. This caused further problems as only a few users actually clicked on MySpace ads. MySpace's response to the problem was to put multiple banner ads on the poorly designed pages making it even more unbearably cluttered. Meanwhile, Facebook only greeted its users with a single ad in the right hand column of the page when they checked their news feed. And unlike MySpace's ads which are large and animated, Facebook's ads are thumbnail-sized images next to text and Facebook's users are able to notify Facebook of ads that they find offensive or repetitive (Kelleher 2010a). Facebook's approach over MySpace's has provided an insight on users' inclination to adopt an intuitive and simple yet functional webpage, as well as their reluctance to being pelted with ads and having to navigate through a cluttered webpage.

Kelleher (2010b) discovered what can be best described as *social advertising*, where companies created their profile page in Facebook in a bid to propagate their brand. Starbucks and Coca-Cola, managed to acquire tens of millions of Facebook users pledging their allegiance and undying affection to the brand via the like button provided by Facebook. This populace is way ahead even of celebrities and other pop culture icons (Kelleher 2010b). The premise of *social advertising* is that people are more susceptible to purchasing goods or services endorsed by people they know.

By collecting its users' list of interests, Facebook is able to target an advertisement onto specific users whose interest resonates with the goods or services being promoted. A Japanese airline used Facebook to target their advertisement to people who like Japanese culture, in the assumption that people who are interested in Japanese culture would want to visit Japan and would be more inclined to click on the advertisement (Facebook 2010e). This method of advertising is a contributing reason to the popularity of Facebook, as it provided an enormous source of revenue for Facebook so it can remain free for its users, and it would not be obstructive for its users as well, since the advertisement will be on products that are relevant to their interest.

Fox and Naidu (2009) attest to the usability of Facebook due to its simplicity compared to other *Social Network Sites*. A usability test was performed on Facebook, MySpace and Orkut which was among the most popular *Social Network Sites* at the time their study was conducted. Ten participants who were all first time users of the three sites and who had little to no experience on using any *Social Network Sites*, were required to perform certain tasks commonly carried out by users of *Social Network Sites*. Tasks such as updating their profiles, uploading a picture, send messages, etc. The result of the usability test indicated that out of all the tasks that the participants are required to perform, tasks performed in Facebook have the highest rate of completion and required the shortest time and clicks to accomplish.

Facebook's ease of adoption might be one of the main reasons for its popularity. Its users spans from people all over the world comprising countries where English is not their primary language, encompassing different age groups as well including those who are not technology savvy let alone internet savvy (Vinhais 2010). By providing a simple, uncluttered and intuitive application, Facebook has made itself to be easily adopted by a wide range of users. Hence, any research that requires a wide range of demographics and a large quantity of participants should be able to garner such resources from Facebook.

Facebook introduced "Seamless Messaging", which allowed Facebook users to communicate with their friends via SMS, chat, email or Messages in Facebook through whatever medium or device is most convenient to the user, in the hope of replacing the use of arbitrary ten digit numbers and bizarre sequence of characters to contact each other (Seligstein 2010). This showed that Facebook understood that the ability for people to interact with each other on Facebook is very important. Therefore, by facilitating a better and easier as well as a more ubiquitous way for its users to communicate on Facebook, existing users will be more inclined to spend more time on Facebook while attracting new users to use Facebook as well.

In 2010, Facebook has become the top online destination surpassing even Google, comprising of more than 500 million active users, where people spent over 700 billion minutes per month (Vinhais 2010). As of 2013, there are 1.11 billion monthly active users, and 655 million daily active users on average (Facebook 2013). Due to Facebook's massive popularity, it has a great potential as an area of research especially in the development of an application capable of enhancing users' communication and interaction with each other within the *social network sites*.

### 2.1.10 Social Media Conclusion

There are different types of *Social Media*: ***Collaborative projects, blogs and micro-blogs, content communities, virtual game worlds, virtual communities, and social network sites***; each type has their own attractions and characteristics. However, they all share the same purpose: providing Internet users with a haven where they can communicate, discuss, share interests, play, socialize, confide, express themselves, and convey their thought with others.

<i>Social Media Type</i>	<i>Use of Avatar</i>	<i>Communication Type</i>	<i>Need for Affective Communication</i>
<b>Collaborative Projects</b>	No	Asynchronous	No
<b>Blogs and Micro-Blogs</b>	Yes	Asynchronous	No
<b>Content Communities</b>	Yes	Asynchronous	No
<b>Online Message Board</b>	Yes	Asynchronous	Yes
<b>Online Chat-Rooms</b>	Yes	Synchronous	Yes
<b>Virtual World</b>	Yes	Synchronous	Yes
<b>Social Network Sites</b>	Yes	Asynchronous	Yes

Table 1 Social Media Summary

Table 1 show that most facets of *Social Media* used *avatars* as a digital representation of their users. The *avatar* can be as simple as a graphical representation or as complex as a 3-Dimensional digital representation whose movement are fully controllable by their users. There are two types of communications in *Social Media*: *asynchronous* or *synchronous*. Most of the communications is *Social Media* is dominated by *asynchronous* communication.

*Social Media* can be further divided in regard to their need for affective communications. Typical *Social Media* types which require affective communications are those which are conversational based, ones that require messages to be exchanged back and forth, either *asynchronous* or *synchronous*, between multiple users. In this scenario, a need to convey emotions along with the exchange of messages emerged. Usually, most *Social Media* facilitated this need by using *emoticons* or ‘smilies’. Considering all these factors, it can be concluded that an *asynchronous* communication type service, which uses *avatar* as a digital representation of its user to relay *affective messages*, would be best suited to be implemented in the *Social Network Sites* branch of *Social Media*.

From the various types of *Social Media* that have been discussed, *social network sites* proved to be the most unique as they enable their users to maintain their existing relationships as well as find and build new ones easily without any cost. However, *social network sites* did not come without flaws; most of the flaws are associated with leakage of users’ privacy and other security issues. But the apparent advantages of using *social network sites* significantly outweighed its flaws as their popularity continues to soar as more and more people start adopting them each day. As discussed, there are various *social network sites* but Facebook is the most popular. Despite its flaws and users’ concerns with their privacy and private information being leaked, Facebook’s usability as well as the various features it provided managed to attract an enormous number of users, a testament of users’ believe that the benefits of using Facebook far outweigh the risk of using Facebook.

A brief outlook of the different facets of *Social Media* has been provided in the previous sections. However, it must be noted that this research is primarily concerned with *Social Network Sites*, and specifically Facebook as one of its main focus points. Hence Facebook and other focal points of this research will be discussed in the following sections.

## 2.2 Digital Representation

With the invention of Email, online forums, blogs, and Internet chat rooms, online communications have increased in popularity. More and more people began to adopt these forms of online media as their preferred communication methods. In its early stages, communications over the internet was primarily text based. However, as time went by, people who were engrossed in online communication felt the need to embed their personality in their message. This had been severely lacking from their typical textual conversation (Derks, Bos, and Grumbkow 2007). Several attempts have been made in order to embed one's personality into one's text based message: literal typing of gesture or emotions as well as using certain sequences or combinations of alphanumeric characters in order to depict gestures or emotions (Clubb 2007). The latter is now known as *Smilies* or *Emoticons* and has remained a popular way to imbue text messages with its author's feelings or intentions.

As people gradually became more entwined with the internet, new technologies emerged, giving rise to new ways for people to use it, such as instant messaging, web services, online gaming and *social media*. Imbuing text exchanges with one's personality was not sufficient any more as some sort of a **digital representation** of one's personality was required. Thus, the concepts of *agent* and *avatar* materialized in order to provide this **digital representation**. However, it must be noted that *agents* and *avatars* do not make *smilies* and *emoticons* obsolete as it is not unusual for them to be used in conjunction with each other in order to better manifest one's presence in the *virtual world*.

### 2.2.1 Smilies and Emoticons

In its inception, *smilies* or *emoticons* consisted merely of certain sequences or combinations of alphanumeric characters that depicted gestures or emotions. Subsequently, they have undergone a number of changes, as they have been integrated into various form of online messaging such as Short Messaging Service (SMS), Instant Messaging (IM), and Email.

Fahlman (2007) claimed to invent the first emoticon and is widely credited for popularizing the use of *emoticon* on the Carnegie Mellon University electronic bulletin board system in 1982 (Nuessel 2006; Clubb 2007). The first *emoticon* was a simple :-), used to mark the content of a post as a joke and should not be taken too seriously. While :-( was used to indicate that the message should be taken seriously, however it grew to be used as a sign of anger or discontent (Fahlman 2007).

From then on, *emoticons* have caught on and have been incorporated into various online communications such as instant messaging, online chat-rooms, emails, online messaging boards, etc. Fahlman (2007) noted that within months of the invention of the *emoticons*, new *emoticons* emerged and producing them has become a serious hobby for some people. Hence, tracking the evolution of *emoticons* from its conception till the various different forms that it exhibit nowadays and putting a date on them proves to be a challenge.

A study conducted by Derks, Bos, and Grumbkow (2007) on the use of *emoticons* in internet chats, concluded that participants were more inclined to use *emoticons* in socio-emotional contexts rather than in task-oriented contexts. Participants also used more positive *emoticons* in positive contexts and more negative *emoticons* in negative contexts. This suggested that people are predisposed to using *emoticons* as a means to convey their emotion whilst communicating between friends in a social setting rather than a co-worker in a work environment. People are also intuitively using positive *emoticons* to signify something positive and negative *emoticons* to emphasise something negative.

Instant Messaging (IM) has shown signs of becoming a mainstream communication method for Internet users at a similar level to email. IM applications have always facilitated *emoticon* usage in their applications regardless which company manufactured it. IM applications provide users with a *synchronous* one-to-one communication that is highly interactive hence requiring *emoticon* use (Huang, Yen, and Zhang 2008).

Huang, Yen, and Zhang (2008) investigated the effect of using *emoticons* in IM, and discovered that *emoticons* speed up communication and eliminate some difficulty in articulating feelings in a text message. By using *emoticons*, the process was easier, more interactive and more fun as most *emoticons* are aesthetically pleasant and looked amusing. Therefore it was concluded that *emoticons* directly affected enjoyment, and in turn, affected personal interaction.

Yuasa, Saito, and Mukawa (2006) argued that Japanese *emoticons* are more expressive than Western *emoticons* because the former are composed of a double-byte character set. As Japanese *emoticons* are vertically oriented and have more resemblance to real faces, they are better at representing human faces than Western *emoticons*, which are horizontally oriented. Table 2 shows the differences between Japanese *emoticons* and Western *emoticons* while trying to depict the same type of emotions.



	Japanese emoticons	Western Emoticons
<b>HAPPY</b>	(^o^)	:-D
	(^-^)	:-)
<b>SAD</b>	(T-T)	:-( (;_;
	(;_;	:'( :-@
<b>ANGRY</b>	(*` Q `)	:-@
	)` 3 `(`	:-
<b>SURPRISED</b>	w(*O*)w	:-o
	(*O*)	:-

Table 2 Japanese Emoticons and Western Emoticons adapted from Yuasa, Saito and Mukawa (2006)

Sánchez et al. (2006) acknowledges the fact that users typically experienced difficulties in articulating their emotions during IM conversations, mostly due to the text based nature of the communication. Thus, statements which are an attempt at humour or irony might be misconstrued and taken seriously which may lead to a break down in relationship. Even though many IM applications have resorted to using *emoticons* to overcome its deficit of expressiveness, the problem still persists.

Sánchez et al. (2006) combined Russell's "circumplex model of affect" (Russell 1980; Russell, Lewicka, and Niit 1989) with Ekman's Facial Action Coding System (FACS) (Ekman 1993) to create the set of *emoticons* depicted in Figure 3. The "circumplex model of affect" mapped words that are typically associated with emotions into quadrants that depicts mood. FACS identifies a very specific set of facial cues associated with a wide range of emotions. The *emoticons* are designed to convey instantaneous affective states with varying levels of intensity, in order to better represent and relay its user's emotion or intention.



Figure 3 Emoticons from Sánchez et al. (2006)

Apart from the typical use of *smilies* or *emoticons* as mentioned previously, Rebaza (2008) noticed that icons are also used as a signal for attention, for emphasis, or as acknowledgement of another person's conversation or mood. It is similar to how *emoticons* are used to denote mood and reaction. This highlights the importance of one's ability to relay their emotion and reactions whilst communicating online as well as the existence of an alternative that also aids and accommodates users' **online communication** by enabling them to better express themselves in the *virtual world*.

Upon concluding an experiment that sought to determine the effects of three common *emoticons* on message interpretations ( :-), :-(-, ;-), Walther and D'Addario (2001), discovered that in most cases, emoticons were overwhelmed by the valence of verbal statements that they accompanied. In almost all of the cases, e-mail messages containing *emoticons* did not alter their readers' interpretations of the same e-mail messages without the *emoticons*. The conclusion was, while the *emoticons* might at best serve in complementing verbal messages, they however did not contradict or enhance them. It was further deduced that by incorporating *emoticons* in one's message, it can reduce any tensions and hostilities that are present in one's message, and simultaneously prevent any 'flame wars' or other ill feelings that might arise from a badly articulated or ineloquently typed message.

### 2.2.2 Avatars

The word “avatar” is derived from the ancient Sanskrit language which refers to the embodiment of a deity on earth. Presently, an avatar refers to a representation of an entity which exists as a pictorial representation of a human in a chat environment or as a representation of the user as an animated character in virtual worlds. Generally, avatars are defined as graphic representations that are personified by means of computer technology (Holzwarth, Janiszewski, and Neumann 2006).

Nowak and Rauh (2005, 2008) explained that people’s perception of avatars may influence both self-perception and the perception of others who used a particular avatar. It also affects their message perception and retention. Hence, an understanding of the influence of avatars is of theoretical relevance to researchers. It is also of practical importance to users and designers of systems using avatars. Given that the avatar may be seen as the source of the message, understanding how people perceive them has important implications for the design of interfaces as well as for the selection of which avatars to use for different applications.

Vasalou et al. (2008) examined how users negotiate their self-presentation via an avatar used in *social media* and revealed three motivating factors that drive their digital self-representation.

1. Using the avatars to accurately reflect themselves in the real world as they chose to display stable self-attributes or idealised their avatars by concealing or emphasising attributes aligned to imagined social roles.
2. Using the appearance of the avatars to emotionally provoke and engage the avatar viewer by exploiting the diversity of the customisation options and breaking free from the social rules governing self-presentation offline.
3. Using avatars as proxies by designing their online self in order to convey a message to a significant other.

Persson (2003) experimented with the idea of using an animated avatar-based *asynchronous* messaging system for expressive peer communication. The idea was to assign each participant with their own avatar which is non-changeable and each avatar had their own set of animated emotions that its users could use to show their reaction or emotion by associating them with a text message. Basically the users will be able to compose a message that contained both text messages as well as animated clips in order to relay their emotion to the

message recipient. The results showed that users do attempt to make full use of the animated and avatar-based *asynchronous* messaging system, as 46% of the messages exchanged were conveyance of “Real” expression (expressing emotion, attitude, or opinion in relation to some phenomena). The conclusion was that users had used the application for light and playful communications. These communications sometimes reflected the real attitude of the users, but sometimes they were also for purely fictional expressions and stories.

### **2.2.3 Agent**

An agent is defined as an acting entity which possesses some kind of intelligence that renders the control by a human dispensable while digitally representing a perceptible entity. Its behaviour reflects a computational algorithm designed to accomplish a specific goal or set of goals (Putten et al. 2010). Interface Agent, Embodied Conversational Agent, Virtual Human represent a few types of *agent*.

#### **Interface Agent**

Zanbaka et al. (2007) refers to an *Interface Agent* also as a *Virtual Human*. It acts as a new medium to interact with system information replacing user-initiated interaction via commands and/or direct manipulation by engaging user in a co-operative process. Human and computer agents initiate communication, monitor events and perform tasks, akin to a personal assistant collaborating with the user in the same environment.

#### **Embodied Conversational Agent**

An Embodied Conversational Agent (ECA) normally has some sort of intelligence and an understanding in specific domain knowledge. It should also be capable of conversing as humans do albeit limited. As documented by Foner (1993), the agent would be able to accept input from external sources, such as questions and replies from human conversing with the ECA, and produce a response according to a pre-set value within its assigned domain knowledge. Most importantly the ECA should be completely autonomous in its operation.

Cavazza et al. (2008) and Cavazza, Camara, and Turunen (2010) investigated ECA use as a form of personal assistants, capable of playing the Companions role. These Companions require an appropriate understanding of user utterances in order to hold conversations so as to reassure, comfort or advise the user.

Hartmann et al. (2005) defined ECAs as virtual embodiment representations of humans that communicate multi-modally with the user through voice, facial expressions, gaze, gesture, and body movement. To increase an agents' believability and life-likeness, it must be able to express emotion and exhibit personality consistently.

Lee, Wang, and Marsella (2010) noted that simple gestures, such as head nods, do have significant effect on the users' perception of an ECA. Therefore the inclusion of non-verbal behaviours would enhance the believability and life-likeness of an ECA.

## **Virtual Human**

Holzwarth, Janiszewski, and Neumann (2006) suggested that using an *agent* as a substitute for sales assistants, which are typically non-existent in online shops, will help improve the customers' experience regardless of whether the *agent* has limited or extensive knowledge on shop items. The availability to provide assistance either from a real human or an *agent* is always welcomed by customers and their online shopping experience will retain the familiar feeling of shopping in the real world. These Virtual Humans can be implemented in various settings, such as Virtual Weather Man, Online Mentor all of which are used to provide or share its knowledge with users.

On the other hand, Kubera, Mathieu, and Picault (2010) suggested that instead of classifying *agents* into types, it might be more favourable to use it as a unified term. Consequentially, the design and implementation process will be made easier, since the designer no longer has to assign a fixed type to each entity.

Vilhjalmsson, Merchant, and Samtani (2007) argued that, while state-of-the-art computer graphics can give autonomous agents a compelling appearance as animated virtual characters, these agents could also be independent in controlling their own graphical representation. This consigned extra burden on the agents, already engrossed with difficult high-level tasks such as dialogue planning. The introduction of a social engine that generates socially appropriate non-verbal behaviour based on rules reflecting social norms should be able to heighten the believability of animated agents in games and simulations with relatively little effort.

Bickmore, Pfeifer, and Schulman (2011) created a virtual museum guide agent that uses human relationship-building behaviours to engage museum visitors. The agent was in the form of a human-sized anthropomorphic robot, and used non-verbal conversational

behaviour, empathy, social dialogue, reciprocal self-disclosure and other relational behaviour to establish social bonds with users. They concluded that the use of relational behaviour leads to significantly greater engagement by museum visitors, measured by session length, number of sessions, and self-reported attitude, as well as learning gains, as measured by a knowledge test, compared to the same agent that did not use relational behaviour.

Dias and Paiva (2013) addressed the issues involved in the creation of an autonomous virtual agents that are capable of intentionally establish and strengthen social relations with other agents and humans. The model was derived from the notion of emotional intelligence, which allowed agents to reason about the emotions of others, and perform Interpersonal Emotion Regulation (IER) in order to dynamically create the relations with others. The research was able to show that the agents that employed IER strategies were perceived to be friendlier.

Hanna and Richards (2013) noticed the challenges associated with designing a virtual agent architecture that involved collaborations between the agents and human users are due to differences in beliefs, ways of reasoning and the abilities used to achieve the common goal. By enabling the agent and human to communicate verbally and non-verbally while completing a collaborative task, further increases the difficulty of the challenge.

#### **2.2.4 Smiliemail**

Smiliemail is a web based application created by George Mutale in 2005. Mutale's (2005) aim was "to develop an online application that is easy to use for creating and communicating affective engaging content between internet users". Smiliemail is able to create, send and receive affective messages. These messages are able to convey the sender's feelings or intentions at the moment of message creation through an avatar that is capable of emulating various emotions by changes in its facial expression as well as the changes in the intonation of its voice whilst the avatar is articulating the sender's written text message.

### **Platforms for Smiliemail**

Nowadays, most people have migrated from conventional mobile phones into what is more commonly known and referred to as "Smart Phones". Apple's iPhone and Google's Android driven mobile phones falls into the category of "Smart Phones". Recently, the advent of multi-functional and multi-purpose PC-like portable devices such as the Apple's iPad, the Microsoft Surface and Android Tablets has become a welcomed addition to the world of ubiquitous computing.

All these, add to the growing list of platforms that might be suitable for the deployment of Smiliemail:

1. **Android Phone/Tablet**
2. **iPhone**
3. **iPad**
4. **Web Services**
5. **Social Network Sites**

## **Android Phone/Tablet**

Google's Android driven mobile phones have been competing fervently with Apple's iPhone ever since it broke into the mobile phones market. Zvonko (2009) and Hengky (2010) have implemented a Smiliemail client onto Google's Android driven mobile phones. The client also runs on an Android Tablet.

## **iPhone**

One of the leading brands of "Smart Phones", due to its ease of integration with other Apple products such as iTunes and Mac desktops and laptops combined with the convenient AppStore. The store enables iPhone's users to have access to millions of applications developed specifically for iPhone at minimal to no cost at all. As Apple's iPhone shares a number of similarities with Google's Android phone, it also shares the same potentials for implementing Smiliemail.

## **iPad**

Apple's new device is a multi-functional and multi-purpose PC-like portable device. Its considerably larger screen, more processing power, higher storage space and memory than your average "Smart Phone", gave it a significant advantage over both the iPhone and the Android phone. However, as it is considered quite a new technology, implementing Smiliemail in this platform proves to be prohibitive and out of the scope of this project. Although it does retain some potential for the implementation of Smiliemail on this platform.

## **Web Services**

The first implementation of Smiliemail by Mutale (2005) was as a Web Service. The decision was based on the flexibility afforded by a Web Service, as anyone, anywhere, with a computer and internet access can make use of the application.

## **Social Network Sites**

*Social Network Sites* share the same flexibility possessed by Web Services as anyone, anywhere, with a computer, internet access and an account on the *Social Network Site* upon which the Smiliemail application is implemented, can make use of the application. This should make the propagation of the Smiliemail application easier than with any other platform, including Web Services, since *Social Network Sites* allow the application to be exposed to a large number of potential users.

## **Smiliemail Components**

### **Video**

An historical approach to facial animation was to determine a set of parameters to control the animation of a face model. This approach is often called parameterized facial animation. Although many facial animation systems have been developed, most suffer from the same limitation: each of them uses a proprietary architecture and syntax for animating a synthetic face. A standard parameterization model is needed to make any standard compliant face model be animate-able by any standard compliant player. The ISO/IEC international standard of MPEG-4 overcomes the proprietary limitation by defining a standard for the efficient representation and transportation of face media. Basing facial animation on the MPEG-4 standard also allows different frameworks to work cohesively together.

The MetaFace Framework (Beard 2004) is based on an MPEG-4 facial animation system that uses the Facial Animation Engine. However, it is proposed that the personality model of this thesis does not control the low-level facial animation directly. The facial animation and text to emotional speech synthesiser is controlled by a higher level scripting language called VHML (VHML 2001).



## Audio

Stallo (2000) developed a system that could add simulated emotion effects to synthetic speech, and integrated the system within the text-to-speech (TTS) module of an ECA. The system proved to be effective based on an analysis of the perceived ECA emotions by listeners, and it is used in the MetaFace and subsequent ECA system as the text to emotional speech synthesiser.

This text to emotional speech synthesiser is controlled by the Speech Markup Language (SML), a sub language of VHML. The ECAs' are able to generate the desired emotional voice by associating the appropriate VHML tags according to the emotions that the user is trying to convey.

The TTS module is responsible for providing the visemes, the visual representations of the phonemes that will be animated by the lips in the animation, as well as producing the audio waveform used for speech. **Festival** forms the TTS synthesizer which is primarily responsible for generating a phoneme duration file for each utterance that is synthesized. However, Festival does not actually produce the synthesized audio file. **MBROLA** produces the synthesized audio file by taking a list of phonemes as input from the Festival Natural Language Parser, together with the duration of phonemes and a piecewise linear description of pitch, and produces a speech audio file (Huynh 2000).

## Emotion

The expressiveness of the emotion are usually limited to a small set of emotion, such as the “big six” (joy, sadness, anger, fear, disgust, and surprise) proposed by Ekman (1993) combined with varying degree of facial expressions, and intensity. Hence, Smiliemail provided emotion tags to emulate the “big six” emotions.

## Character

Chuang and Bregler (2005) addressed the importance of expressive facial emotions in emotion conveyance, by introducing methods for creating facial animation and retargeting it onto new characters with arbitrary appearance. This enabled the creation of a more expressive character.

A head motion synthesis algorithm has also been developed for producing a more expressive head motion that responds to an audio signal. Hence, the resulting facial animation is more lively and characteristics.

The Face Factory (Wijaya 2005) was able to construct 2D cartoon-like MPEG-4 compliant face models using the principles from the direct manipulation interaction style. The Face Factory generates face models which are compliant with the MetaFace framework (Beard 2004), which served as the basis for Smiliemail (Mutale 2005).

## **Markup Languages**

A number of scripting languages have been developed by Embodied Conversational Agent (ECA) researchers to achieve a higher level of control over an ECA (Arafa, Kamyab, and Mamdani 2003). Scripting language usage allows the ECA to be used in different information domains by altering scripts instead of the application code or framework. These Markup Languages have been specifically designed and used to control some part of the ECA. Whilst these Markup Languages do not normally follow any specific standards, some can be used in conjunction with each other.

As emotion oriented computing systems become a reality, Schroder et al. (2007) proposed the need for a standardised way to represent emotions and their related states. Currently, most Markup Languages for representing emotion are part of a more complex scenario such as Embodied Conversational Agents (ECAs).

Languages such as Facial Animation Markup Language (Huynh 2000), and Speech Markup Language (Stallo 2000) were developed at an early stage when there were only a few Markup Languages in existence, rendering the development of Talking Head application more difficult. Therefore, VHML aimed to connect these different languages used in developing different parts of the Talking Head and simplify other development of Talking Head applications in the future. By verifying, validating and evaluating the VHML, a more solid, homogeneous and complete language can be created.

By developing an interactive Talking Head Application: *The Mystery at West Bay Hospital*, Gustavsson, Strindlund, and Wiknertz (2001) verified, validated and evaluated the effectiveness of VHML in controlling Virtual Humans, in terms of speech, facial animation, facial gestures, and body animation.

## VHML

The Virtual Human Markup Language (VHML) is a language that was designed to accommodate the various aspects of Human Computer Interaction (HCI) with regards to facial animation, text to speech production, body animation, dialogue manager interactions, emotional representation in addition to hyper and multimedia information (VHML 2001).

VHML (2001) builds upon existing standards and incorporates new languages to accommodate various functionalities previously not catered for. The purpose of VHML is to facilitate the natural and realistic interaction of a Talking Head or a Virtual Human with a user via a web age or a stand-alone application.

As demonstrated by Marriott (2001, 2002) through the development of the Mentor System, the VHML can also serve as a Markup Language for a Dialogue Management system. The Mentor System is essentially a Talking Head application capable of interacting with its users in real time that utilizes VHML to increase its functionality, extensibility, and believability.

VHML is XML/XSL based that consists of the following sub languages.

- EML: Emotion Markup Language.
- GML: Gesture Markup Language.
- SML: Speech Markup Language.
- FAML: Facial Animation Markup Language.
- BAML: Body Animation Markup Language.
- XHTML: eXtensible Hyper Text Markup Language.
- DMML: Dialogue Manager Markup Language.

### **The Language Structure**

Essentially, VHML can be divided into 3 levels, where there are 5 elements that constitute the top level. At the middle level are the two sub languages that control emotions and gestures, EML and GML. Their elements are inherited to 3 of the low level languages, SML, FAML, and BAML. Apart from these 3, there are 2 additional sub languages at the low level, DMML, and XHTML. As shown in Figure 4, the dotted lines imply that the language on the lower level inherits the elements from the language on the upper level.

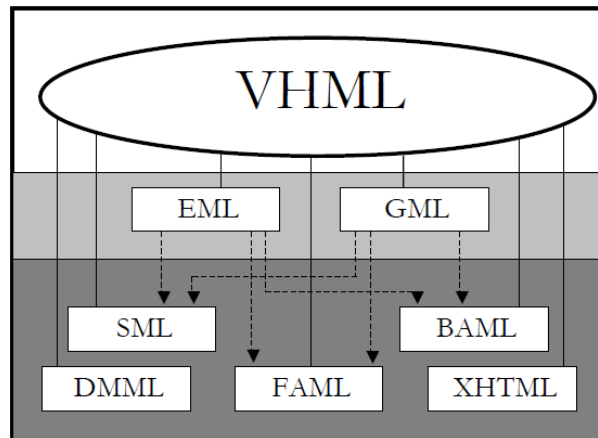


Figure 4 VHML Structure (VHML 2001)

VHML is an XML based language, it uses Document Type Definition (DTD) to describe the rules of the structure of the language. As with XML elements, all VHML elements are case sensitive. When creating a VHML document, the first line must contain an XML declaration followed by a DTD specification.

Example: `<?xml version="1.0">`

`<!DOCTYPE vhtml SYSTEM http://www.vhtml.org/vhtml.dtd>`

#### Top Level Elements:

`<vhtml>`: Root element that encapsulates all other elements.

`<person>`: Specifies the speaker of the text. Gender, age and category along with a default emotion can be specified.

`<paragraph>`: Element used to divide text into paragraphs.

`<mark>`: Places a marker into the output stream for asynchronous notification. When the output of the VHML document reaches the mark, an event is issued that includes the name attribute. The platform defines the destination of the event. The mark element does not affect the speech or facial animation output process.

`<embed>`: Gives the ability to embed foreign file types within a VHML document and for them to be processed appropriately.

#### Mid Level Elements:

**Emotion Markup Language (EML)**: The elements in EML will affect the emotion shown by the Virtual Human. These elements will affect the voice, face, and body. All emotions will be inherited by SML, FAML, and BAML.

**Gestures Markup Language (GML):** The elements in GML will accommodate well-known human gestures. These will affect the voice, face, and body of the Virtual Human. All gestures will be inherited by SML, FAML, and BAML.

**Low Level Elements:**

**Speech Markup Language (SML):** The elements in SML affect the voice of the Virtual Human. The face and body will not be affected. The emotions will be inherited from EML and the gestures from GML.

**Facial Animation Markup Language (FAML):** The elements in FAML affect the facial animation performed by the Virtual Human. These elements will only make changes to the face. The voice and body will not be affected.

**Body Animation Markup Language (BAML):** The elements in BAML will affect the body animation performed by the Virtual Human. These elements will only make changes to the body. The voice and face will not be affected. The emotions will be inherited from EML and the gestures from GML.

**eXtensible Hyper Text Markup Language(XHTML):** The elements in XHTML affect the output text from the application. Only a very limited subset of the XHTML is used in VHML.

**Dialogue Manager Markup Language (DMML):** The elements in DMML are used to create a question and answer conversation between Virtual Humans.

Marriott and Stallo (2002) have assessed and discussed the problems, inconsistencies, and deficiencies of the VHML before it can be considered a stable Markup Language intended as a standard for defining emotions. Even after considering all these shortcomings, the introduction of VHML served as a foundation that drove numerous research projects. Among them are Beard's (2004) MetaFace, Wijaya's (2005) FaceFactory, Mutale's (2005) Smiliemail, and Xiao's (2007) affective personality for an ECA as well as the current research. However, this research still has to consider the availability and the emergence of other Emotion Markup Languages vying to be a standard for Emotion Markup Language.

## EmotionML

Baggia et al. (2011) noticed that as the web becomes ubiquitous, interactive, and multi-modal, technology needs to deal increasingly with human factors, including emotions. Hence, the specification of Emotion Markup Language (EmotionML) was designed and developed to strike a balance between practical ability and scientific well-foundedness. The language is conceived as a “plug-in” language suitable for use in three different areas: (1) manual annotation of data; (2) automatic recognition of emotion-related states from user behaviour; and (3) generation of emotion-related system behaviour. The Emotion Markup Language (EmotionML) is a Markup Language designed to be usable in a broad variety of technological contexts while reflecting concepts from the affective sciences.

The first and main goal of EmotionML is to allow a technological component to represent and process data, whilst enabling interoperability between different technological components processing the data. EmotionML also attempts to fix the mistake associated with many pre-conceived notions in dealing with. Baggia et al. (2011) suggested that the most typical mistake being made is to model emotions as a small number of intense states such as anger, fear, joy, and sadness such as VHML; this choice is often made regardless of the question as to whether or not these states are the most appropriate for the intended application. Hence, a well-defined markup language that has carefully considered the states to study and represent in the affective science literature, such as EmotionML would help in avoiding such mistakes.

Baggia et al. (2011) in describing the challenge of defining a generally usable Emotion Markup Language, suggested that any attempt to standardize the description of emotions using a finite set of fixed descriptors is doomed to fail, especially when scientists are unable to agree on the number of relevant emotions or how they should be labelled. Essentially, the list of distinguishable emotion-related states varies according to the application domain and the aspects of emotions to be focused. In essence, the vocabulary must correspond to the context in which it is used. The existing notions that emotions involved triggers, appraisals, feelings, expressive behaviour including physiological changes, and action tendencies are generally agreed upon. Hence, the entirety of the emotions can be divided into different categories or in a small number of dimensions such as the intensity of the emotions.

It was eventually concluded that due to the lack of agreement in the descriptors for the emotions, the best way to define an EmotionML was by defining possible structural elements and their valid child elements and attributes whilst also allowing the users to “plug in” vocabularies previously undefined that they considered appropriate for their work. Hence, EmotionML can be used as a plug-in for existing markup languages such as EMMA (Extensible MultiModal Annotation Markup Language), SSML (Speech Synthesizer Markup Language), and SMIL (Synchronized Multimedia Integration Language), which are existing W3C Markup Languages. While EmotionML is still a working specification and is yet to be a standard for Emotion Markup Language, BML is also a candidate vying to become the standard for defining emotions in the field of Human Computer Interactions.

## **BML**

The Behaviour Markup Language (BML) is an XML description language for controlling the verbal and non-verbal behaviour of an Embodied Conversational Agent (ECA). It is used to describe the physical realization of behaviours (speech and gesture) and the synchronization constraints between these behaviours. BML is not concerned with the communicative intent underlying the requested behaviours. The module that executes behaviours specified in BML on the embodiment of the ECA is called a *BML Realizer*. BML provides several standardized mechanisms for extension. The user is able to define new behaviours, or extend existing ones by adding custom attributes. *Description extensions* provide a standardized manner for a user to customize a behaviour, while allowing a fallback to a default specification when the BML Realizer does not support the extension (SAIBA 2012).

According to the SAIBA (2012) specification, BML is part of the SAIBA Multimodal Behaviour Generation Framework. The framework consists of the *Intent Planner* (where the intention for the ECA to express something arises), the *Behaviour Planner* (responsible for deciding which multi-modal behaviour to choose for expressing the communicative intent and specifying proper synchronisation between various modalities), and a *BML Realizer* (responsible for realizing the specified BML message through sound and motion).

Vilhjalmsson et al. (2007) underlined that the goal of the SAIBA effort was to unify key interfaces in the multi-modal behaviour generation process through the development of BML. The potential of BML was also demonstrated through a range of projects shown below:

### 1. Full ECA Systems

- **RVT: The Reactive Virtual Trainer.** This is an ECA capable of presenting physical exercises that are to be performed by a human, while monitoring the user and providing feedback. The reactivity of the RVT is manifested in the natural language comments, readjusting the tempo, pointing out mistakes or rescheduling the exercise.
- **Ambulation Agents.** An additional feature to EVE-Online, a massively multiplayer online role playing game (MMORPG). BML allowed a more believable interaction between characters by automating the coordination of non-verbal social behaviour.
- **SuperRadioHost.** It is an autonomous radio show host designed to create a radio program from scratch and execute it in real-time- on the air – including creating song introductions and conducting interviews with real people.

### 2. Behaviour Planners

- **NVB: Non-verbal Behaviour Generator.** This is a rule-based behaviour planner that analyses a virtual human's communicative intent, emotional state, and text and generates appropriate non-verbal behaviours.
- **NOVA: Nonverbal Action Generator.** It is a system able to recreate the gesture behaviour of a specific human performer using statistical models, a fixed repertoire of gestures and procedural animation.

### 3. Behaviour Realizers

- **ACE: The Articulated Communicator Engine.** This is a behaviour realization engine that allows the modelling of virtual animated agents, independent of a graphics platform, and to synthesize multi-modal utterances with prosodic speech, body and hand gesture, or facial expressions.
- **SmartBody.** It is an open source modular framework for animating embodied characters, based on motion controllers that can be hierarchically interconnected in real-time in order to achieve continuous motion.



#### 4. **Repositories and Tools**

- **The Expressive Gesture Repository.** This work aims to help ECAs produce various gestures from a single representation, based on the agent's expressivity and the relevant semantic dimensions of those gestures.
- **ECAT: The ECA Toolkit.** The toolkit aims to allow ECA developers to easily connect any BML behaviour-generating system to any behaviour realization system.
- **BCBM Behaviour Rule Builder.** This is a graphical user interface that allows a user without knowledge in programming or animation, to link communicative intent of an animated character to its non-verbal expression of that intent, given a certain context.

While there have been numerous research and applications that used BML as the Markup Language to define and control emotions in a HCI environment, it has yet to become a W3C standard in Emotion Markup Language. Hence other Markup Languages capable of defining and controlling emotions in the context of HCI must also be considered.

### **Other Emotion Markup Languages**

The Emotion Annotation and Representation Language (EARL) (Schröder, Pirker, and Lamolle 2006), developed in the HUMAINE (Human-Machine Interaction Network on Emotion) network on emotion oriented computing, attempts to widen the representation of emotion related information. The EARL is a syntactically simple XML language specifically designed to represent emotions and related information in technological contexts. It represents emotions as categories, dimensions, and/or sets of appraisal scales. A set of attribute representing intensity and regulation related information such as the suppression or simulation also exist. Complex emotion or a combination of more than one "simple" emotion can also be represented.

Heylen et al. (2008) introduces Behavior Markup Language (BML) as a representations languages in the SAIBA (Situation, Agent, Intention, Behavior, Animation, Effort). While Functional Markup Language (FML), represents what an agent wants to achieve: its intentions, goals, and plans. The terms FML and BML were first used to describe the tags set used in the BEAT (Behavior Expression

Animation Toolkits) system (Cassell, Vilhjálmsón, and Bickmore 2004), where FML was used as a Markup language for texts describing several discourse phenomena related to content and information structure and interaction process.

There are various other Markup Languages such as Emotional Eye Movement Markup Language (EEMML) developed by Li and Mao (2010), capable of describing and generating both basic eye movement and emotional eye movement, including primary (joy, sadness, anger, fear, disgust, and surprise) and intermediate (emotions that can be represented as a mixture of two primary emotions) emotions for Virtual Agents.

## **Markup Language Conclusion**

It was shown that there existed various Markup Language that can be used to control and enable a Talking Head (Virtual Human) or ECA to convey emotions. Among these Markup Languages, EmotionML and BML are vying to become the standard Markup Language for an ECA to convey its emotions. However, this research has decided to continue the usage of VHML as the Markup Language that enable the *avatars* in the SmilieFace videos to convey its sender's emotions. This decision was taken due to the time constraints imposed upon this research that required it to focus on the development of SmilieFace: an innovative affective messaging application on the Facebook Platform whilst also building upon the existing Smiliemail server to be able to handle and process requests from SmilieFace. The use of VHML would not require a major overhaul of the existing Smiliemail system. Although as part of future work, the existing Smiliemail System can be revamped, deprecating the use of VHML and upgrading to a W3C standard Emotion Markup Language, whether it will be EmotionML or BML or other Emotion Markup Language yet to emerge.

### 2.2.5 Digital Representation Conclusion

Currently there are numerous types of **Digital Representation** and most can be categorized by how they are used. An *Avatar* refers to the **digital representation** of a human entity where digital existence corresponds to the existence of a human in the real world who controls the actions undertaken by its *avatar*. An *Agent* normally refers to the **digital representation** of an entity that is fully controlled by artificial intelligence independent of a human in deciding any of its actions. While, an *avatar* and an *agent* can both be considered as a digital entity in a *virtual world*, they are distinguishable from one another simply by the fact that an *agent* is capable of performing actions that are autonomous and free from human interference.

Hancock, Landrigan, and Silver (2007) highlighted the difficulties that people encountered in expressing and detecting emotions during text-based communications, and indicated that it is mainly due to the absence of non-verbal cues, which are typically associated with emotion. Non-verbal behaviours such as facial expressions, gestures, and acoustic features are very important when expressing a range of emotions during face to face communications. Hence, an *avatar* capable of emulating these non-verbal behaviours may help with the expression of emotions, and in return enhance any text-based communications that utilize it.

There has been extensive use (Yahoo! Avatars, Windows Live Messenger, V-Chat (Vasalou et al. 2008)) and research (Comic Chat (Kurlander, Skelly, and Salesin 1996)) on *synchronous* computer-mediated communication systems using *avatars*. However, most have failed to encourage users to make use of the expressive capabilities of their *avatars*. Persson (2003) suggested that *asynchronous* systems may be better at allowing users to make full use of an expressive *avatar*. Hence, the idea of using an avatar to convey *affective* messages will prove to be an area of research that is worth investigating. While avatars have already been widely used as a **digital representation** of one's self in the *virtual world*, the use of an avatar as a medium to convey *asynchronous* affective messages has not been seen at this point of time.

## **2.3 Computer Mediated Communication**

### **2.3.1 CMC and its implications**

After witnessing an enormous increase in computer mediated communication (CMC), which encompass a variety of online communication system, and can be *synchronous* (e.g., chat and instant messaging) or *asynchronous* (e.g., email), all of which are predominantly typewritten, Derks, Fischer, and Bos (2008) attempted to resolve an ongoing argument which suggested that communication of emotions is more difficult in computer mediated communication (CMC) than in face-to-face (F2F) communication.

Upon reviewing various literatures pertaining to this issue, there are 2 general opinions:

1. CMC is a cold and impersonal medium
2. The differences between CMC and F2F are not that large and will even dissolve over time.

Derks, Fischer, and Bos (2008) defined emotion communication as the recognition, expression and sharing of emotions or moods between two or more individuals. People have coped with the restrictions of CMC through the use of *emoticons*, as it facilitated a pleasing way for them to express, share and communicate emotions. It is possible to give support, express dissatisfaction, to show fear and convey love towards others through *emoticons*. However, the most obvious difference between online and offline emotion communication is the absence of emotional embodiment, which decrease the intensity of the emotional experience. Hence, a way to preserve and embody these emotional responses will be necessary in order to fill this void and help alleviate the restrictions of CMC and in return enhance future CMC.

Due to the advancement of computer technology and mobile technology, combined with the ubiquitous nature of text based messaging, a new and unique form of language used in various forms of CMC, such as emails, instant messaging and Short Messaging Service (SMS), referred to txt-speak, or chat-speak, or txt was formed (Deumert 2006).

Berger and Coch (2010) noted that both instant messaging and text messaging started to streamline communication, in an informal setting, by using shorthand conventions that have evolved from a need to efficiently exchange messages between users. Due to the informal nature of instant messages, combined with the need to promptly transmit messages, the use of text to simulate spoken discourse has arisen. And this hybridization of speech and writing has

fostered the development of NetSpeak, which is essentially a language comprised of acronyms, differing cases, and the use of symbols and digits to represent syllables of words, in a bid to achieve greater swiftness during the exchanges of instant messages.

Deumert (2006), Berger and Coch (2010), and Holtgraves (2010), attributed the frequent use of abbreviations, acronyms, emoticons, misspellings, and omission of vowels, subject pronouns, and punctuations in order to conform to the restrictions in the length of text messages (140~160 characters), along with the awkwardness of using a mobile phone keyboard to text messages that needed to be sent swiftly, TxtSpeak or txt or texting was born.

As Berger and Coch (2010) realized, a high degree of overlap between the language used in texting and instant messaging, combined with their informal conventions, caused these languages to merge, resulting in a hybrid form of communication which they referred to as Texted English. Texted English represents a bridge between NetSpeak and TxtSpeak, enabling individuals to communicate via CMC, either through text or instant messaging in a concise manner while preserving semantic content.

Holtgraves (2010) attempted to find a correlation between how the language is used in text messaging, and its various functions as personality traits in an interpersonal context. After the conclusion of the experiment, it was noted that most of the messages sent by participants in the experiment were short, simple, intimate, and affective. The messages were clearly far more relational and served as a mechanism to maintain social connections rather than an informational tool. Most of the messages contained some linguistic alterations of various sorts, especially the shortening of words and phrases in various ways. It was concluded that, although there was no doubt that the language used in the text message was designed for communicative efficiency; their use is also clearly a marker of relationship status.

### **2.3.2 Computer Mediated Communication Conclusion**

While some considered CMC to be cold and impersonal, it is possible to express, share and communicate emotions in a pleasant manner through the use of *emoticons*. It is also possible to give support, express dissatisfaction, to show fear and convey love towards others through *emoticons*. However, the absence of emotional embodiment within CMC caused the intensity of the emotional experience during message exchanges to deteriorate. Hence, future CMC might be improved, if this void can be filled by preserving the intensity of these emotional responses through the use of an *avatar* as an embodiment of these emotions.

New and unique languages (NetSpeak, TxtSpeak, Texted English) spawned in various forms of CMC, also served to enhance online communication. Albeit the main mitigating factor for these languages might be just to conform to the limitations imposed by the technology, it can also be used to convey one's *affective*-ness whilst also serve as a marker of one's relationship with its recipients in a Computer Mediated Communication.

## 2.4 Conclusion

Since the introduction of social media, different forms of social media have emerged, but none can compare to the meteoric rise of Social Network Sites, specifically Facebook. As of March 2013 Facebook reportedly has 751 million monthly active mobile users products, 655 million daily active users on average, and 1.11 billion monthly active users (Facebook 2013).

Due to the popularity of Facebook (Martell 2010), a significant amount of research on Facebook has been done, but most of the research involved the security or privacy flaws associated with Facebook (Acquisti and Gross 2006) as well as demographic data collection of Facebook users (Ellison, Steinfield, and Lampe 2006). Research on Facebook users' experience is limited. By developing an application in Facebook which is capable of enhancing the users' experience through either enjoyment or usefulness, the question can be asked "**how to create a well-received social media application**".

Apart from the literature provided by Facebook (2010a) for third party developers to develop and release their third party applications, there are also a number of resources in the internet similar to the one provided by Adams (2007) and Rushgrove (2008), which provided some simple guidelines on how to create a Facebook Application.

After considering the massive popularity of Facebook combined with the lack of research on Facebook users' experience, it was deemed that Social Network Sites are an excellent type of Social Media to focus on and Facebook is the Social Network Site to experiment upon.

Therefore, this research aimed to develop an *affective* messaging application for use inside Facebook capable of resolving some issues pertaining to CMC, such as its facade as a cold and impersonal medium which is lacking in emotional embodiment. Emotion can be simulated through the use of an *avatar*, articulating the sender's text based message via a Text to Speech voice synthesizer, and with the help of changes in the intonation of the avatar's voice and changes in its facial expressions, controllable through the use of Markup Language. The video *avatar* should be able to denote the emotions associated with the text message that the senders wishes to convey. The application should also be able to fulfil two essential users' expectations associated with Social Network Site, which are privacy as well as ease of use.

This application will be based on Mutale's Smiliemail (2005). The Facebook application will also incorporate the research previously done by Zvonko (2009) and Hengky (2010) which is a mobile phone application capable of emulating Smiliemail on an Android platform.

Before a Facebook application which incorporates Smiliemail can be built, it is necessary to develop a robust environment for the Smiliemail, which has the main responsibility of producing recorded videos to serve as a Smiliemail Message, as well as delivering that said message to its intended recipient in a timely manner. This will require the knowledge of VHML (VHML 2001) as well as the research previously done by Stallo (2000), Beard (2004), as well as Gustavsson, Strindlund and Wiknertz (2001).

A significant number of users will need to be recruited in the evaluation process in order to test the effectiveness of the *affective* messaging application.



## Chapter 3

# Research and Design Methodology

In the previous chapter, it was concluded that an *asynchronous* communication type service, which uses an *avatar* as a digital representation of its user to relay *affective messages*, would be well suited to be implemented in the *Social Network Sites* branch of *Social Media*. Due to its enormous popularity and the vast exposure that Facebook is able to grant, it was determined to be the preferred social environment in which an innovative application could be developed.

The innovative application will be used as a means to relay *asynchronous affective messages*, through the use of an *avatar*, capable of expressing and articulating emotions associated with a text based message created by its sender, through changes in the *avatar's* facial expressions and intonation of voice conveying the sender's emotion.

Hence by analysing the research where *avatars* are used to relay *affective messages*, coupled with the massive potential of *Social Network Sites*, specifically Facebook, several questions arise which serve as the basis for synthesizing the hypotheses essential to this research:

- Can an innovative and engaging Facebook application capable of enhancing Social Networking be created?
- Can a robust and scalable environment for SmilieFace be created?
- Can a Smiliemail client be integrated into Facebook as an application, will it be able to attract users and become popular, and will it prove to be useful and engaging?
- Will the Facebook application be able to adhere to users' expectation of privacy?

In order to test these questions, an appropriate Research Methodology (RM) had to be applied, to ensure that a robust environment for Smiliemail could be produced, as well as the development and evaluation of an innovative and engaging Facebook application. A suitable Design Methodology (DeM) will also be required in order to ascertain that the proper "software design, implement, test, improve cycle" could be accomplished during development.

Nevertheless, the understanding of the limitations as well as the delimitations of the research is also of utmost importance, and will be necessary to ensure that the results generated by undertaking this research is comprehensive and understandable in their appropriate context. Given that the research involved the generation of statistical data as well as qualitative data from users of the Facebook application, caution is needed in order to affirm that any data produced is processed correctly and ethically and made available to other researchers.

### **3.1 Research Methodology**

Appropriate Research Methodologies will be required to be implemented in order to develop and evaluate a robust environment for Smiliemail as well as the Facebook application. Mauch and Park (2003) had identified several RMs, and those that are relevant to the research will be followed, and are listed as follows:

#### **Action Research / Design and Demonstration**

Action Research (AR) was developed as a new mode of investigation in order to accommodate the need for pragmatic research. Action Research is a group of Research Methodologies that concentrates on accomplishing both the requirements as well as the outcomes of both ‘action’ and ‘research’. Action Research (AR) will be used explicitly for the Computer Science aspects of the research especially in the software design and implementation.

Action Research is the preferred paradigm in the design, implementation and evaluation of software systems, where cycles of iterative software design and maintenance are utilized in the development of the system, and which also includes the formative evaluation of the design as well as the operations carried out at the end of each cycle as illustrated in Figure 5. Action Research Methodologies are based on cycles of designs, development and evaluations, which are quite common within the Computer Science domain. The cyclic nature of the Action Research suggests that only through iteration, will the solutions be manifested. Evaluation of the solutions will both improve the system design and effectiveness as well as increased the understanding of the problem domain.

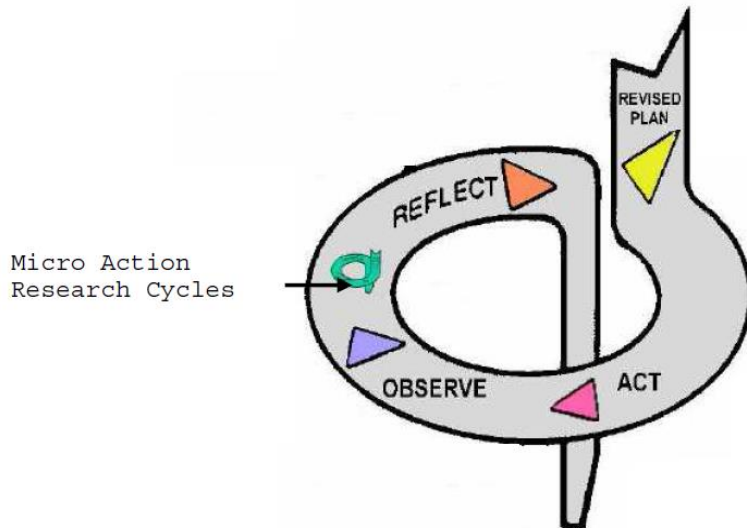


Figure 5 Action Research Spiral (adapted from (Kemmis and McTaggart 1988))

## Evaluation

In order to answer the questions previously revealed and consequently to confirm or deny the hypotheses presented in the next section, an evaluation of the Facebook application will be necessary. Hence an evaluation research methodology also has to be implemented.

The Evaluation Methodology enabled the researcher to assess the effectiveness of the application and appraise the level of users' enjoyment after using the application. This evaluation will be integral in answering the questions posed within the research. The evaluation itself will be conducted through online questionnaires after the application is successfully developed and released on Facebook. The aim of the questionnaires will be to determine whether the application managed to fulfil the requirements in the hypotheses.

The questionnaires will be designed to record anonymous user information such as age, gender, and location, as well as other demographic questions in order to have a better understanding of the users' basis for using the application. The questionnaires will further enquire about the users' attitude after using the application in order to assess the effectiveness of the application and appraise the level of users' enjoyment. Responding to the questionnaires will be purely voluntary.

The questionnaires will be comprised of fixed-alternative 5 point Likert scale questions, as well as open-ended questions in an effort to avoid compelling the users into adopting pre-

conceived answers/notions. The questionnaires will most likely reflect the users' attitudes instead of the absolute truth. Attitudes are composed of feelings, beliefs and the enactment of these attitudes. The evaluation of users' **attitude** in regards to the effectiveness and enjoyment factor of the application rather than the **truth** about its effectiveness and enjoyment factor will not detract from the study.

In order to realise the utmost important issues that surround the transcription of internally held attitudes onto an externally consistent representation, Likert scales were used to represent a range of attitudes states. By indicating a users' range of agreement or disagreement on an N-point integer scale, a generalization of the overall attitude of users towards the recorded issue can be obtained.

Responses on a 5 point Likert scale might be shown as:

1. = strongly disagree
2. = somewhat disagree
3. = neutral / undecided
4. = Somewhat agree
5. = Strongly agree

The questions and responses will be phrased in such a way as to reduce any bias and prevent the respondent from being coaxed into saying or believing something that they disagree with. In this evaluation, it was assumed that participant's attitudes can be discrete and quantifiable. At worst, participants may express a neutral position in an odd numbered scale.

The evaluation of the SmilieFace application will be made available to every user who has agreed to provide us with their feedback upon using the application and viewing of the SmilieFace video. For every evaluation form that the user filled out, they will be granted access to additional features and privileges. These features and privileges include additional avatars, voices, the ability to send more SmilieFace videos, and the privilege of using SmilieFace beyond the evaluation period.

The SmilieFace application will be first released to people within the Curtin University network via Facebook. It should eventually propagate to include people outside of the Curtin network as well. A widespread adoption of the SmilieFace application coupled with rapid requests for SmilieFace videos will cause a substantial strain on the server that produces the videos. Therefore an important precaution was considered necessary since this is a private

server owned and maintained by one of the researchers). The precautionary measure taken involved the application being first released to a small cohort of Curtin students before gradually introduced to a wider range of users.

### **Meta-Analysis**

This research includes the amalgamation of two very diverse fields of research, namely *Social Media* and **Digital Representation** which are further divided into various different sub groups. With that said, the primary focal point of the research will be to investigate the use of *avatars* as a mean to relay *affective messages* in a *Social Network Sites* specifically Facebook. Meta-Analysis research methodology will be employed in order to determine the suitability or the effectiveness of using *avatars* to convey *affective messages* in the context of a *Social Network Site*.

## **3.2 Design Methodology**

### **3.2.1 Design Development**

The Spiral Model defined by Boehm (1986), as shown in Figure 6, will be used in conjunction with Action Research throughout the development of this application. The Software Development Life Cycle is first started by determining the objectives, identifying and resolving risks followed by development and testing. Upon success, the next iteration is planned. The similar nature of the Spiral Model and the Action Research, which relies on iterations, is the main reason for its adoption for the Design Methodology.

The Design Phase is started by analysing the pre-existing Smiliemail environment (Mutale 2005), identifying any flaws and resolving any issues that emerged, implementing the resolution for the flaws, and testing the new implementation. Keep re-iterating the process until a robust Smiliemail environment suitable for the SmilieFace application is developed.

After the successful development of a robust environment for Smiliemail, Smiliemail will be integrated into Facebook. This can be accomplished by developing a third party application in Facebook which utilizes the robust environment previously developed.

The Second Design Phase is started by analysing the Facebook Platform, in order to determine the requirements as well as all the necessary steps that must be undertaken in order

to develop a third party application in Facebook. It is also necessary to identify all the core components in Smiliemail that have to be developed as a third party application in Facebook, develop and test the third party application in Facebook and keep re-iterating until the SmilieFace application is capable of interfacing to Smiliemail and can be implemented and released in Facebook.

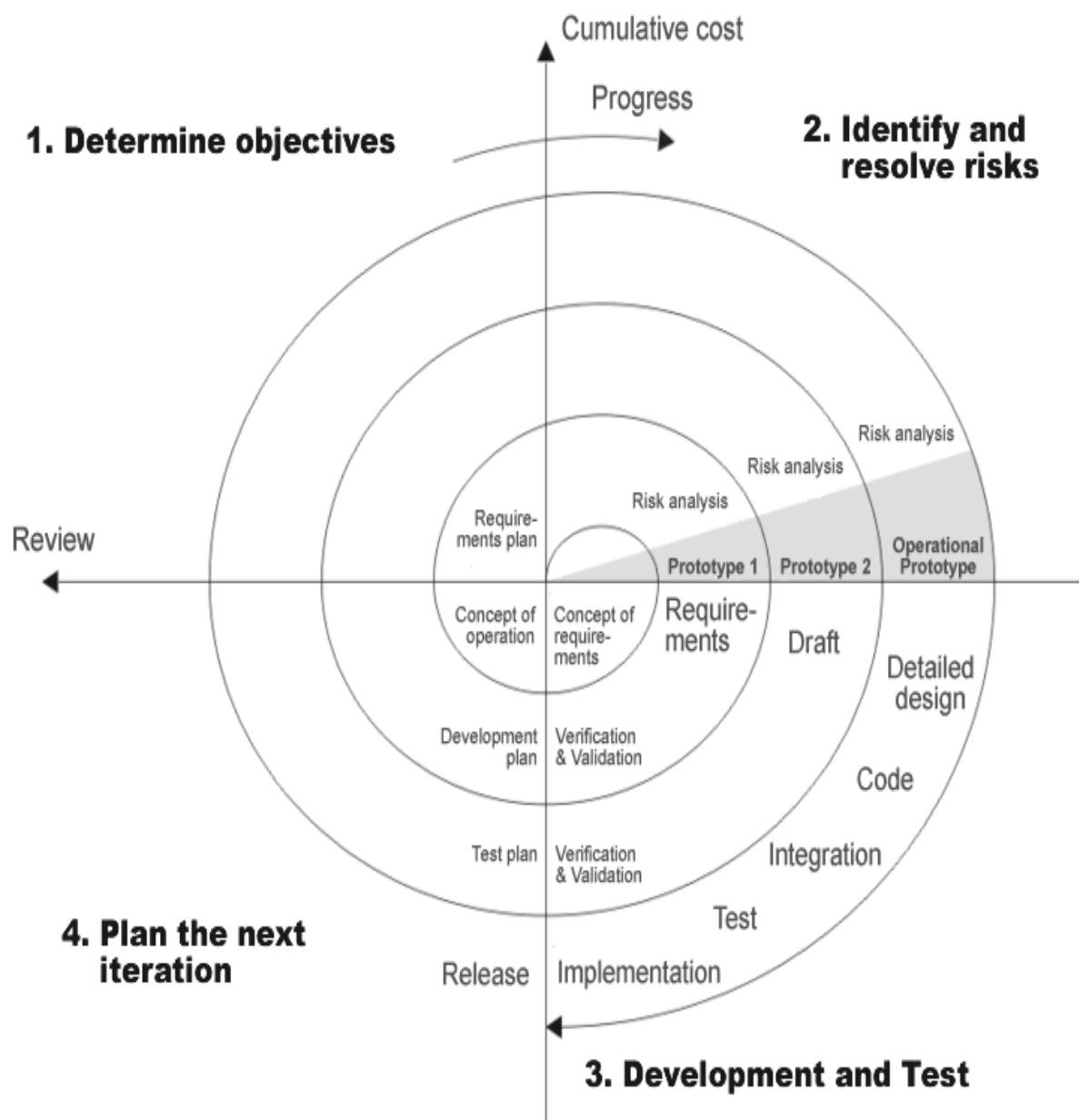


Figure 6 Spiral Model Software Development Life Cycles (Boehm 1986)

### 3.2.2 Design Implementation

The benefits of the Spiral Model of Software Development become apparent during the mid-development of SmilieFace when Armbrust (2011) announced that the developers will be required to migrate from the old deprecated Application Programmer Interfaces into newer versions. Facebook also encourages that any application should be tested against their Beta Tier before it can be officially released on its full web tier (Bowen 2010; Larkin 2011).

As the SmilieFace application involves the sending and receiving as well as the viewing of *affective* messages in the form of a video, a method to distribute a SmilieFace video from a SmilieFace user to their friends on Facebook has to be considered. Investigation showed that Facebook has provided two ways of posting videos onto someone's profile page.

1. Manually uploading the video to Facebook and sharing a link to the intended recipient's wall, or by tagging the recipient's name to the video. There are however some limitations imposed by Facebook: the size of the video must be less than 1 GB and the length of the video must be under 20 minutes.

Upon the successful uploading of the video, Facebook will provide the user with "embedded code" that can be posted in any web page. The privacy setting to determine who has access to the video can be set during the upload.

2. Facebook also provides mobile upload, where users can upload photos and videos to their Facebook profile page via "upload email" – a unique email address linked to the user's profile page. The feature only supports .mp4 files that are less than 15 MB. By sending an email with the video file as an attachment to the "upload email", the video will appear in the users' profile page.

Based on these facts, using Facebook to post videos on someone's profile page is not very effective due to all the restrictions and the complex process involved. Hence, a new method of letting a SmilieFace user to view and share their SmilieFace videos must be devised. The solution for easy viewing and sharing was akin to an Email Inbox, where a SmilieFace user can go to the Inbox tab of their SmilieFace interface. Within the Inbox tab, there will be a list of links to all the users' SmilieFace Videos. The links will direct them to a page where they can view their SmilieFace videos and by copying the links, they can share the videos easily. There is also a mechanism that prevents any unauthorized viewing or sharing of the videos based on the privacy setting employed by the user.

Upon successful development of the SmilieFace application and its integration to the Facebook platform as a third party application, SmilieFace will be released and available for use by the Facebook users. The SmilieFace application will be available throughout the Evaluation period, where users can assess the effectiveness of the application.

The Evaluation Period will allow Facebook users to use the application, and quantitative, qualitative and formative data will be collected from the users whilst using the application. Upon the end of the Evaluation Period, the application will halt its operation and will be unavailable for use, so the data gathered during the Evaluation Period can be analysed.

### 3.2.3 Research Outcomes

This research hopes to achieve the following outcomes:

- Integrate Smiliemail, a web based application, onto Facebook by developing a third party application - SmilieFace.
- Develop a robust and scalable SmilieFace environment, capable of creating and viewing Smiliemail messages or *affective* videos in a timely manner. Upon the accomplishment of this outcome, it is not inconceivable that more applications which revolve around the creation and exchange of Smiliemail message can be developed.
- Attract a substantial number of SmilieFace users and become a popular application. The users will evaluate the application.
- Enhance the communications between Facebook users' through the exchange of *affective* messages. As not only can the application be implemented in Facebook, it is also possible to be implemented in other types of *Social Networking*.



### 3.3 Hypotheses

The hypothesis that has steered the research and that will lead the thesis is:

**SmilieFace will be an innovative and engaging Facebook application which will enhance its users' experience in Social Networking**

Sub-hypothesis 1

**A robust SmilieFace client for creating and viewing *affective* videos as an alternative Facebook messaging service can be designed, developed and implemented**

Sub-hypothesis 2

**A robust and scalable SmilieFace server for producing *affective videos* can be developed and implemented**

Sub-hypothesis 3

**SmilieFace will be easy to use and engaging for its users, capable of attracting a substantial number of users, and become a popular application**

The first sub-hypothesis can be proven through the successful design, development and implementation of the SmilieFace application as a third party application on Facebook. The SmilieFace application must also be able to enhance the interactions between Facebook users through the exchange of SmilieFace videos between users of the application.

In order to prove the second sub-hypothesis, the SmilieFace server must be able to produce *affective videos* without fail upon request, in a timely manner. The SmilieFace server itself must also be scalable, which means it must be able to handle the gradual growth of users over time, and it must not be overwhelmed by the number of users using the application at the same time.

The third sub-hypothesis can be proven by gathering and analysing the quantitative, qualitative, formative, and statistical data from the SmilieFace application and its users. This will be done through a series of web questionnaires that the users voluntarily choose to

be a part of, as well as the usage data of the SmilieFace application itself. The application must be installed and used by a substantial number of Facebook users and established itself as a popular application.

Only after the sub-hypotheses are proven or disproven, will the primary hypothesis of this research can be established.

### **3.4 Limitations and Delimitations**

The following describe the limitations and delimitations associated with the research.

#### **3.4.1 Limitations**

1. Cater mainly for messages written in plain English. As the application is primarily released in Australia, a population which use English as its principal language.
2. The available emotions are limited to Sad, Angry, Happy, Neutral and Disgust. These are considered the most primarily used emotions.
3. *Avatars* are unable to perform any gestures. Only the head of the *Avatars* are shown, hence its inability to perform any gestures.
4. *Avatars* are limited to changes in its facial expressions and the intonation of its voice. As only the head of the *Avatars* are shown, emotions are conveyed only through the medium of sound and the *Avatar's* face.
5. Emotional Text to Speech is reliant on the previous work by Stallo (2000), which is caused by the research's time constraints and the complexity of building an Emotional Text to Speech from scratch.
6. The size of the message will be constrained in order to maximize application's performance. Without this restriction, an excessively large message will required a significant amount of time to be processed, causing severe delays in processing other messages in the queue.
7. The use of VHML as the driving Markup Language instead of other Emotion defining Markup Languages.

### 3.4.2 Delimitations

1. Application's use is limited only to Facebook. The application required access to its user's information, available and obtainable only through Facebook.
2. The research does not attempt to define emotions. The research focused on facilitating the conveyance of predetermined sets of emotions through an avatar.

## 3.5 Data Collection and Analysis

### 3.5.1 Data Collection

The data collected were from two sources:

(1) Users interaction with the SmilieFace application as well as their interactions with other users through the SmilieFace application.

(2) The qualitative and quantitative data from the user questionnaires.

The first was mainly used for **formative** evaluation - focussing on the *process*. The second was concerned with **summative** evaluation - focussing on the *outcome*.

The data needed to support the hypotheses were of three types:

(1) Electronic Data obtained from participants using the SmilieFace application.

As participants used the application, they provided implicit and explicit information. The implicit information such as installation rate, usage frequency, duration of use, number of recipients, etc was stored in data files. Data from this ongoing usage were used to perform formative evaluation of SmilieFace, especially the effectiveness or enjoyment of the application and its ability to enhance Social Networking.

(2) Qualitative data from the questionnaires designed to provide both formative and summative evaluation of the SmilieFace application.

(3) Quantitative data from the questionnaires designed to provide both formative and summative evaluation of the SmilieFace application.

### 3.5.2 Data Analysis

The data were analysed to see whether they confirmed or denied the hypotheses.

(1) **Electronic Usage Data:** the formative evaluation determined if the users were installing and then using the application, and whether it was recommended to other users. Measuring usage frequency and rate of adoption by other users over time provided data that were evaluated to determine the success of the application.

(2) **Questionnaire Data:** the qualitative and quantitative data collected were analysed to determine if the users felt that the system was effective and enjoyable. This summative evaluation was also used to determine the areas of success and failure in the application.

### 3.5.3 Admissibility of Data

The previous data sets were screened to ensure that only valid data were analysed. For example a common problem with questionnaire replies is in providing ambiguous, wrong or inconsistent answers or not answering all questions. One issue with the data collection was that it required a detailed questionnaire to record all necessary information over the range of variables. A user may simply tick boxes if the procedure becomes tiresome or uninteresting, and this would compromise the data set. Questions with known responses as well as double-check questions were used to detect or reduce this problem.

## 3.6 Ethical Considerations

The users of the Facebook applications will be required to fill out a consent form before they are able to take part in the evaluating the application. Stringent guidelines will be used to ensure participant confidentiality. The original questionnaires, and data collected during evaluation, will be stored securely for a period of time in accordance with Curtin University Guidelines from the Human Research Ethics Committee (HREC).

The Facebook application will store information about a user in order to make the user identifiable as well as other information associating them with Facebook. Privacy is one of the main concerns as the data collected by the Facebook application will not only contain the users' personal information but also their friends' personal information necessary in order to facilitate the purpose of the application itself.

### 3.7 Conceptual Solution

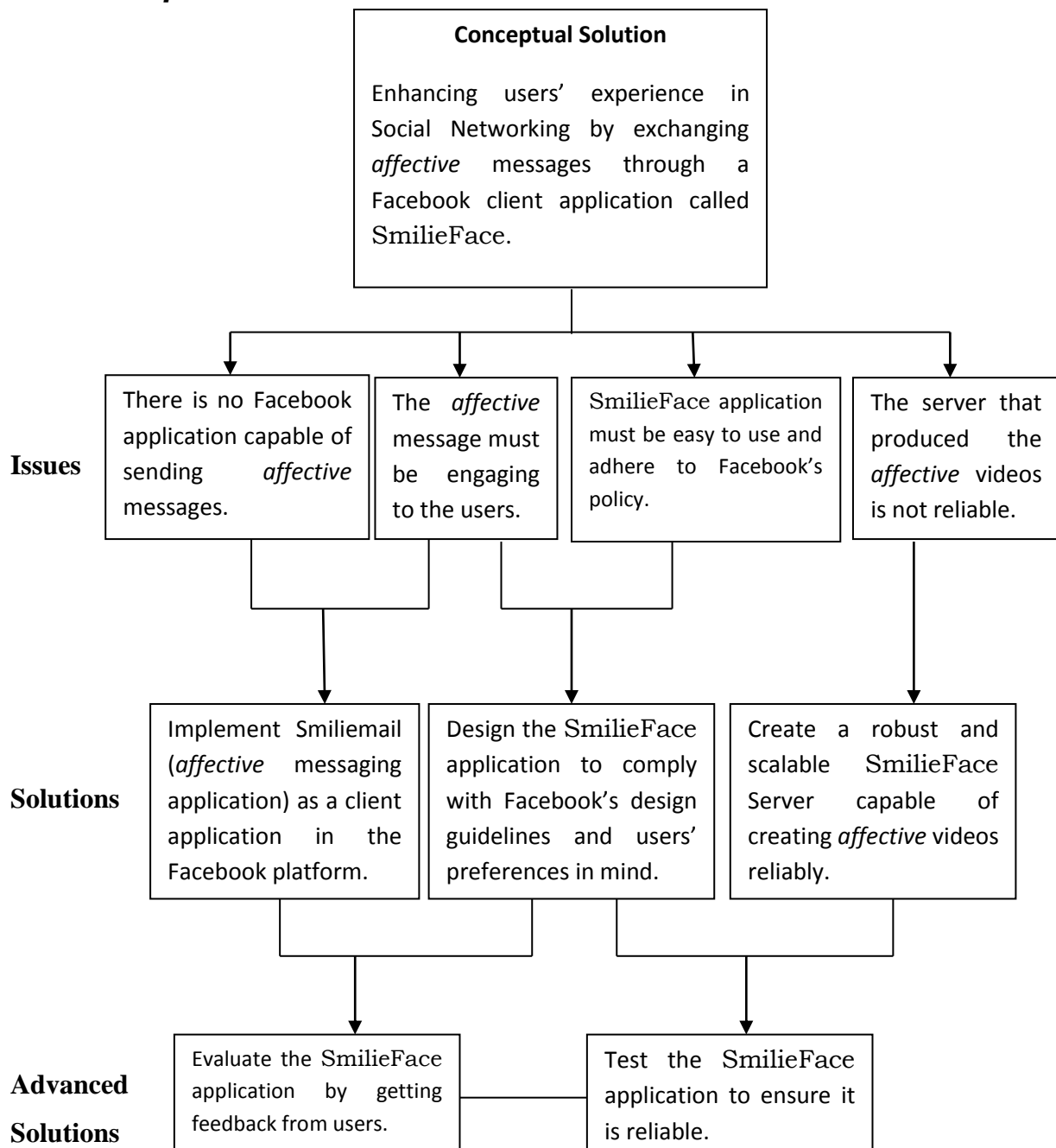


Figure 7 Conceptual Solution Diagram

The conceptual solution for the issues faced by the research is shown in Figure 7. The goal of the research is to enhance users' experience in Social Networking by facilitating the exchange of affective messages through SmilieFace. The goal cannot be achieved unless the research is able to solve the issues listed in Figure 7. Solutions for these issues will be discussed in Chapter 4, and 5. The Advanced Solutions will be discussed in Chapter 6 and 7.

### **3.8 Conclusion**

This chapter outlined and substantiated the suitable research and design methodologies chosen in order to conduct the research and verify the hypotheses inferred by the research issues provided in Chapter Two.

This chapter identified questions that arose from reflecting upon the issues and research discussed in the Literature Review, and these spawned the hypotheses that this research expects to answer. The limitations and delimitations which constrain the research are also acknowledged. Ethical issues associated with the evaluation process of the research were also discussed.

The Conceptual Solution diagram shown in Figure 7 summarized the primary goal of the research, issues that prevent the achievement of said goal, as well as solutions and advanced solution for said issues. The diagram served as milestones indicating the obstacles that needed to be overcome before the objective can be achieved as well as the how to overcome the obstacles.

## Chapter 4

# SmilieFace Facebook Client Application

In the previous chapter, the research and design methodologies for this research were outlined and substantiated. The hypotheses that drive this research had been identified along with the limitations and delimitations that bind this research. This chapter will discuss the SmilieFace Facebook Client Application and how its development and implementation will accept or reject this research's hypotheses. The SmilieFace Facebook Client Application was built upon the Smiliemail System (Mutale 2005), an *affective* messaging web application. SmilieFace acts as a client application by replacing Smiliemail's web interface with a specifically designed interface that enables the SmilieFace user to create and send *affective* video messages to their Facebook friends, as well as view the affective videos sent to them.

When a Facebook user installs SmilieFace for the first time, the application will prompt them for permission to access their personal details, list of friends, and make posts on the behalf of the user. Facebook's policy dictates that without explicit permission from the user, a third party application such as SmilieFace, will not be allowed access to the Facebook user's personal data nor is it permitted to do any actions on behalf of that user. Therefore, without specific permission from the user, the SmilieFace Client Application will not be installed and the user would not be able to use the application. Without the Facebook access capabilities, SmilieFace would not be able to function.

If permissions are granted, the SmilieFace Client Application will be installed and an account for the user will be created in the SmilieFace Database. The Database entry will contain the users' Facebook username, their Facebook ID collected from Facebook, and a unique SessionID will be assigned to the user. The user will then have the option to compose a SmilieFace message or view a SmilieFace message. They will also be asked for their willingness to partake in the evaluation of SmilieFace, by filling out some demographic questions as well as other evaluation forms available once they have used certain features of SmilieFace. Users can choose not to partake in the evaluation of SmilieFace and their use of SmilieFace will not be affected. However, if the user chooses to partake in the evaluation, additional previously unavailable features are provided.

To prove the first sub-hypothesis which states that “*A robust SmilieFace client for creating and viewing affective videos as an alternative Facebook messaging service can be designed, developed and implemented*”, the SmilieFace Facebook Client Application has to be successfully deployed and implemented, while conforming to Facebook’s strict policy for third party applications. This will signify the successful integration of SmilieFace into the Facebook platform as the SmilieFace Client Application.

To prove the third sub-hypothesis which states that “*SmilieFace will be easy to use and engaging for its users, capable of attracting a substantial number of users, and become a popular application*”, a series of voluntary web questionnaires, as well as the usage data of the SmilieFace application itself, will be gathered and analysed. By gathering and analysing the quantitative, qualitative, formative, and statistical data from the SmilieFace application and its users, a conclusion will be obtained to prove or disprove the final part of the second sub-hypothesis and the third sub-hypothesis.

#### 4.1 Design Concept

The strict Facebook design guidelines dictate that a third party Facebook applications such as SmilieFace can only make use of a partial space on the Facebook webpage, commonly referred to as the “Canvas” page, shown in Figure 8. However during the course of this research, Facebook updated their design guidelines by introducing the “Fluid Canvas”, whereby the “Canvas” page can now occupy the entire Facebook webpage (Rogers 2011; Koumouzelis 2011). This was done to make Facebook application more engaging and social.

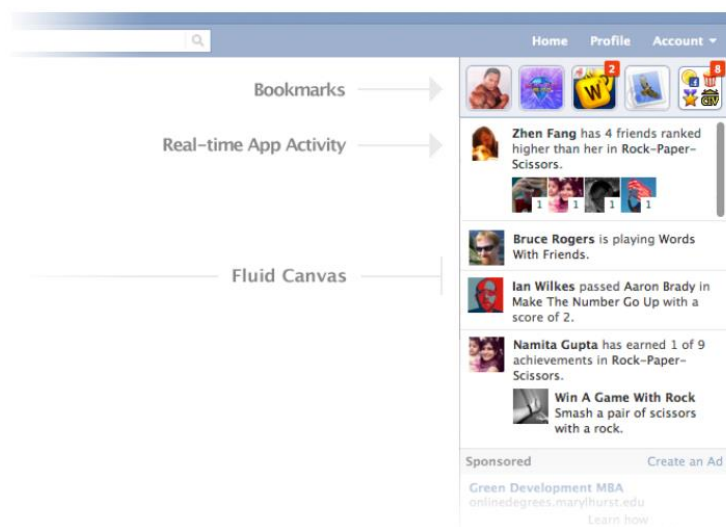


Figure 8 Facebook Canvas (Facebook 2010f)



SmilieFace's design concept adopted Smiliemail's general design and was also modified to adapt to the Facebook Platform. The original Smiliemail web interface was a single monolithic "slab" that was developed iteratively, built on the assumption that a naïve user should be able to do things quickly and easily, while an expert user should also be able to do complex things quickly and easily. Hence the Smiliemail web interface provided two views, one for a naïve user and another for an expert user. A naïve user is able to access a much simpler web interface while an expert user is given a web interface that provided them with more functionality and details.

As Smiliemail has a web-based scrolling screen, a page with different functionality based upon the user's experience can be dynamically presented to them. Figure 9 displays Smiliemail's expert user web interface.

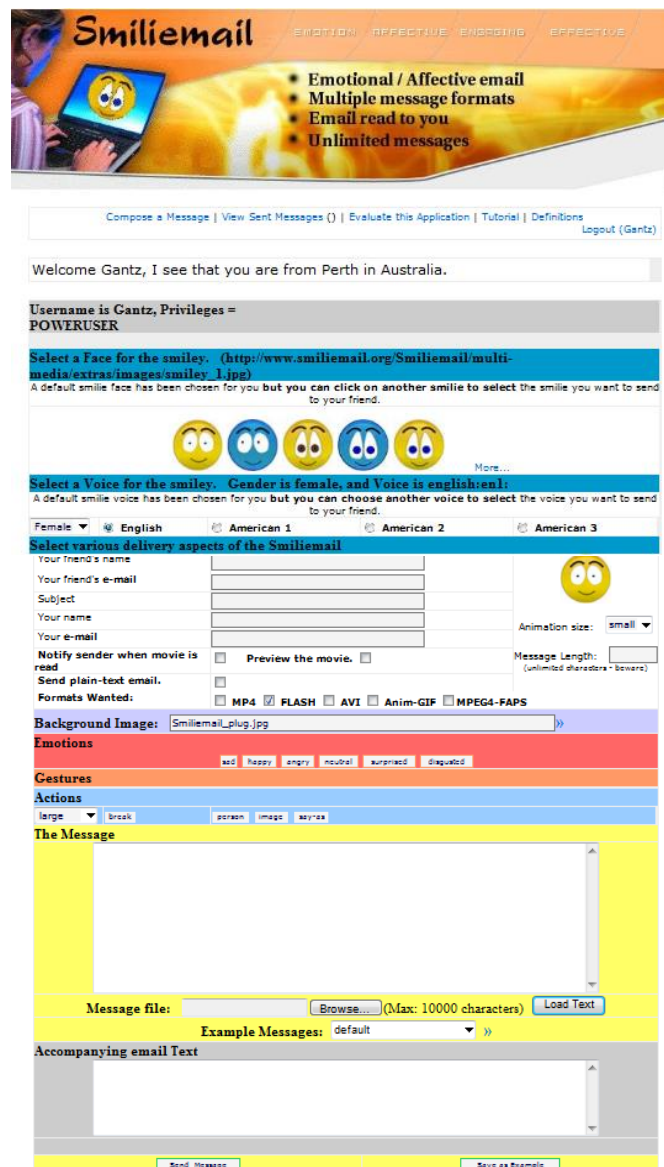


Figure 9 Smiliemail Web Interface

Facebook itself is accessible from various platforms and hence SmilieFace attempts to accommodate this accessibility. The original Smiliemail was a web application that catered only to Personal Computers (desktops, laptops). The underlying assumption was that a user was accessing the web application through a relatively powerful device with high computational ability, large storage space, high connection speed, and a large screen size.

Taking into consideration the strict design guidelines imposed by Facebook, coupled with the need to make the application more engaging to the user and more “Facebook like”, certain modifications were made to the monolithic “slab” employed by Smiliemail. These modifications include the use of “tabs” instead of links to other pages, hence reducing the overhead of having to reload a webpage.



Figure 10 **SmilieFace** Tabs (images are blurred to protect user privacy)

Figure 10 is the compose page for the SmilieFace Facebook Client Application. There are 6 tabs available. These are:

- **Compose:** This default tab allows the user to compose and send a SmilieFace message.
- **Inbox:** This tab contains all the SmilieFace videos that the user has received.
- **Sent Message:** This tab contains all the SmilieFace videos that the user has sent.
- **Preferences:** This tab enables the user to set their preferred settings for SmilieFace.
- **Evaluate:** This tab contains links to the evaluation forms that the user can partake in.
- **Tutorial:** This tab contains a How-To guide for using SmilieFace.

While it can be argued that the time taken and data transferred while loading the contents of a web page all at once is similar to a web page that reloads an entire page upon request, it is noticeable whilst using SmilieFace that the former offered a much smoother web browsing and message composing experience to the user.

When using SmilieFace, the first tab a user sees is the Compose tab. Here they can compose a SmilieFace message. Whilst composing a SmilieFace message, they can seamlessly switch between viewing their Inbox and Sent Message, setting their preferences, evaluating the application or read the Tutorial. Tabs are also used to display a list of possible recipients. The first tab contains a short list of possible recipients while the second tab contains a list of all possible recipients. The user can move through this list instead of reloading the entire list every time a user navigates through the application.

Through its simplicity in design and clutter-free interface, as well as a likeness to Facebook's own design and interface, users should effortlessly adapt to and find SmilieFace easy to use. The SmilieFace interface was designed to be "Facebook-like" whilst providing the user with a simple, easy to use, and intuitive interface where they can utilize all the features of SmilieFace in a few clicks.

Some features are also streamlined and removed from Smiliemail such as the requirement for the user to fill in the sender and receiver details. This is due to the ability of SmilieFace to take advantage of the Facebook platform by accessing the sender's data from the information that they provided in their Facebook profile page.

A good user interface requires a good design, since having a concrete representation of the user interface reduces the mental burden on interface designers (Cardelli 1988; Myers, Hudson, and Pausch 2000). Hence, the design of the SmilieFace Interface was first conceived through a pen and paper design, and is depicted in Figure 11. As can be seen in Figure 11, the top of the page is the Facebook banner. The banner contains icons informing the user of incoming friend requests (people icon), private message (text-cloud icon) and general notification (world icon). There are also links to the user's profile page, news feed and account management pages.

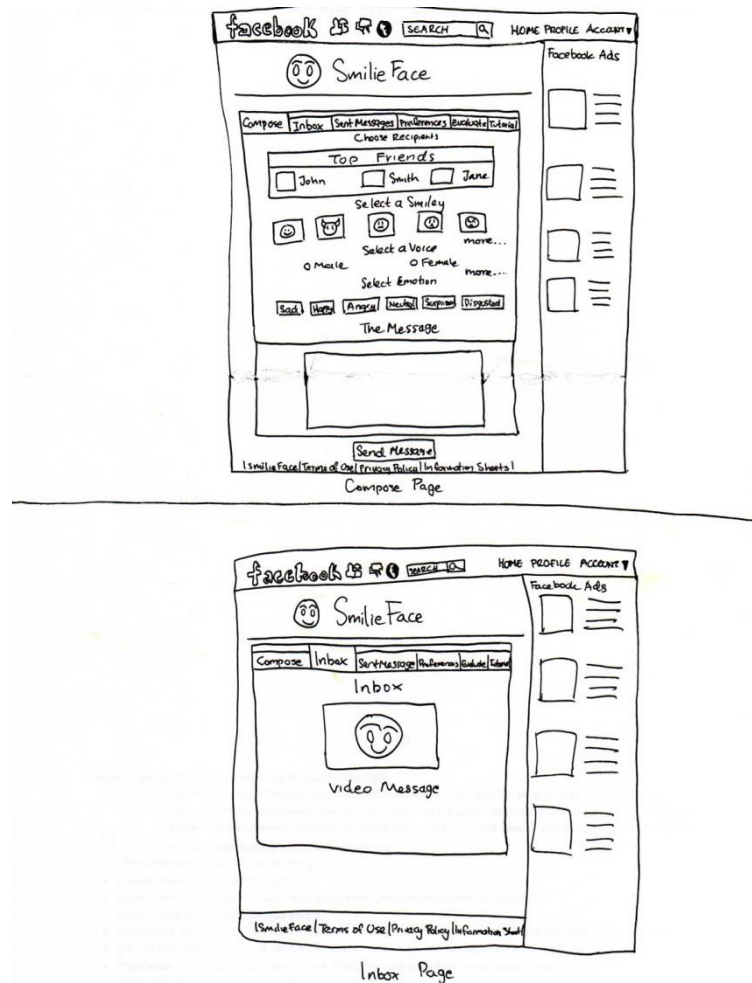


Figure 11 SmilieFace Interface Design

Beneath the Facebook banner are the Canvas page (left side) and the Facebook Ads page (right side). The SmilieFace application is displayed in the Canvas Page. SmilieFace was designed to conform to Facebook’s existing “look and feel”. The standard Facebook user’s profile page contains self-provided user information, the user’s friend list as well as the user’s “wall”, where public communication between the user and their friends along with messages from the applications that they use, are displayed. The news feed page contains a list of updates from the user’s friends as well as bookmarks to the user’s favourite groups, apps and friend list.

A list of possible SmilieFace recipients is generated from the user’s friend list on Facebook. As there is the possibility for a user to possess a large number of friends (250+), which will cause some latency when generating a full list of possible recipients, a smaller list containing 12 random friends is generated instead. As the friend list contains user’s picture (2kb~3kb), a larger friend list will take more time to load. Hence, having a smaller list of potential recipients will make SmilieFace message composition faster.

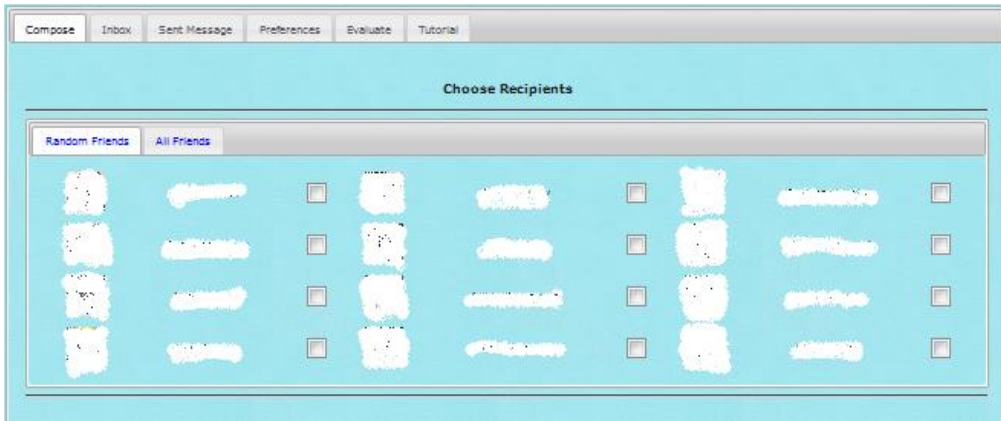


Figure 12 Recipient List (images are blurred to protect user privacy)

Figure 12 shows the “Choose Recipients” component of SmilieFace. In this component, two lists of possible recipients are displayed in two different “tabs”. The “Random Friends” tab displays a list of 12 possible SmilieFace recipients selected at random in the beginning. The “All Friends” tab displays a list of all possible SmilieFace recipients populated from the user’s Facebook friend list. However, after multiple and continued use by the user, the “Random Friends” will eventually display the 12 most active SmilieFace users from their Facebook friend list.

A faster and more efficient message composition can be better accommodated if SmilieFace is able to generate a smaller list of “most active” recipients that the user will most likely send to. This enhancement is done by monitoring previous messaging activity and updating a usage count in the SmilieFace database. However this requires multiple and continued use of SmilieFace before an accurate list can be constructed.

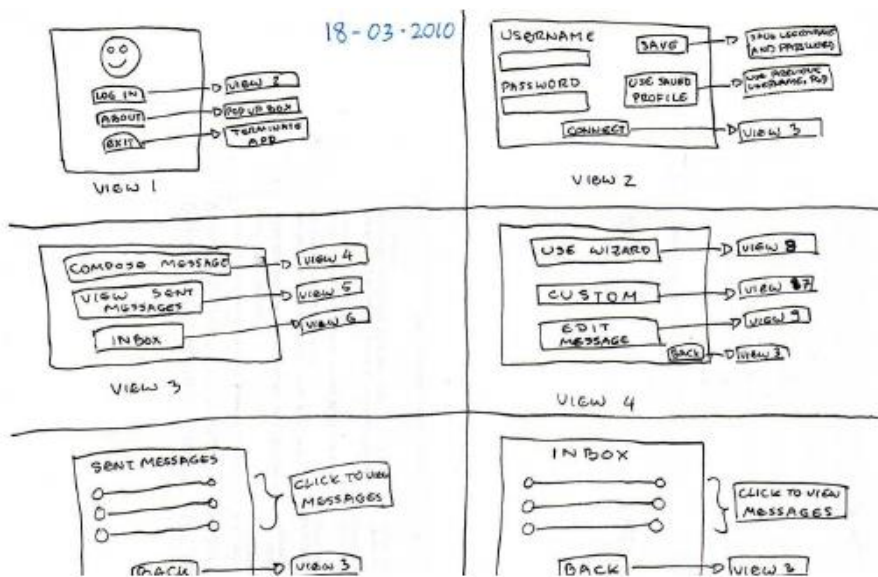


Figure 13 Design Concepts for Android Smiliemail (Hengky 2010)

There is already an implementation of Smiliemail on the Android Platform called Android Smile (Hengky 2010). Figure 13 is a design concept for Android Smile. From the design, it can be seen that the application is separated into a number of views, each with its own task and responsibility. The segregation of the application into multiple views was done to accommodate the relatively small screen sizes of Android smartphone. Users can navigate back and forth between each view as well as forwards or backwards to another view to accomplish the required task of composing or viewing a Smiliemail video. The multiple views concept can also be used in most mobile phone platforms including iPhones.

The design concept featured in Figure 13 was coded and the user interface for Android Smile can be seen in Figure 14. By navigating through each of the views, a user is able to compose, view, and send a Smiliemail video. The viewing of a Smiliemail video does not require the video to be downloaded in advance. Android Smile is able to facilitate its user with the ability to watch a Smiliemail video “on the fly” or streaming.



Figure 14 Android Smile Interface (Hengky 2010)

Currently, SmilieFace assumes that users access it through a device that has a suitably sized “Canvas”. However, the design of SmilieFace has taken into consideration that users might access the application from different devices (desktop computers, laptops, smartphones, tablet PCs) and platforms (Windows, iOS). By providing an ease of navigation for its features in a single page, users can still easily use SmilieFace regardless of the type of platform they use, or the size of the screen that their device has.

As part of future work, it is possible to create a dedicated mobile implementation of SmilieFace accessible via <https://m.SmilieFace.Smiliemail.org/>. A dedicated mobile implementation will better accommodate users that access SmilieFace using their smartphones. By reducing the screen size and adapting its functionality accordingly, SmilieFace will be able to embrace users that access it through a mobile device.

As depicted in Figure 15, SmilieFace employs the same principle as Smiliemail’s monolithic “slab” design whereby a user can easily compose or view a SmilieFace message just by navigating within a single page. This principle is similar to how Email is composed, whereby a user can select a sender from their contact list, enter the subject of the email, type in their message and send it to the recipient. The design enhances Facebook’s users experience by removing unnecessary items such as manually entering the sender’s and recipient’s details (name, Email addresses), as well as simplifying the message composition.

The viewing of a SmilieFace message is also as easy as viewing any incoming Email, as users just have to navigate themselves to their SmilieFace Inbox and click on the video message that they want to view. As most Internet users are well adapted to and experienced in using Email, modelling SmilieFace’s user interface after the typical Email service will give its users a more intuitive feel hence making it more user friendly and easy to use.

However it must be made clear that whilst this research has concentrated on the deployment of SmilieFace as a Facebook Client Application in multiple platforms, it is more specifically intended for desktops or laptops devices. Although every effort has been made to cater for other types of devices such as smartphones (iPhone, Android phones) and tablet PCs (iPad), deploying SmilieFace on these devices will require further design additions, using their specific SDKs (Software Development Kits) before it can exhibit the full capabilities of SmilieFace. Although this can serve as a basis for future work, it is however beyond the scope of the current research.

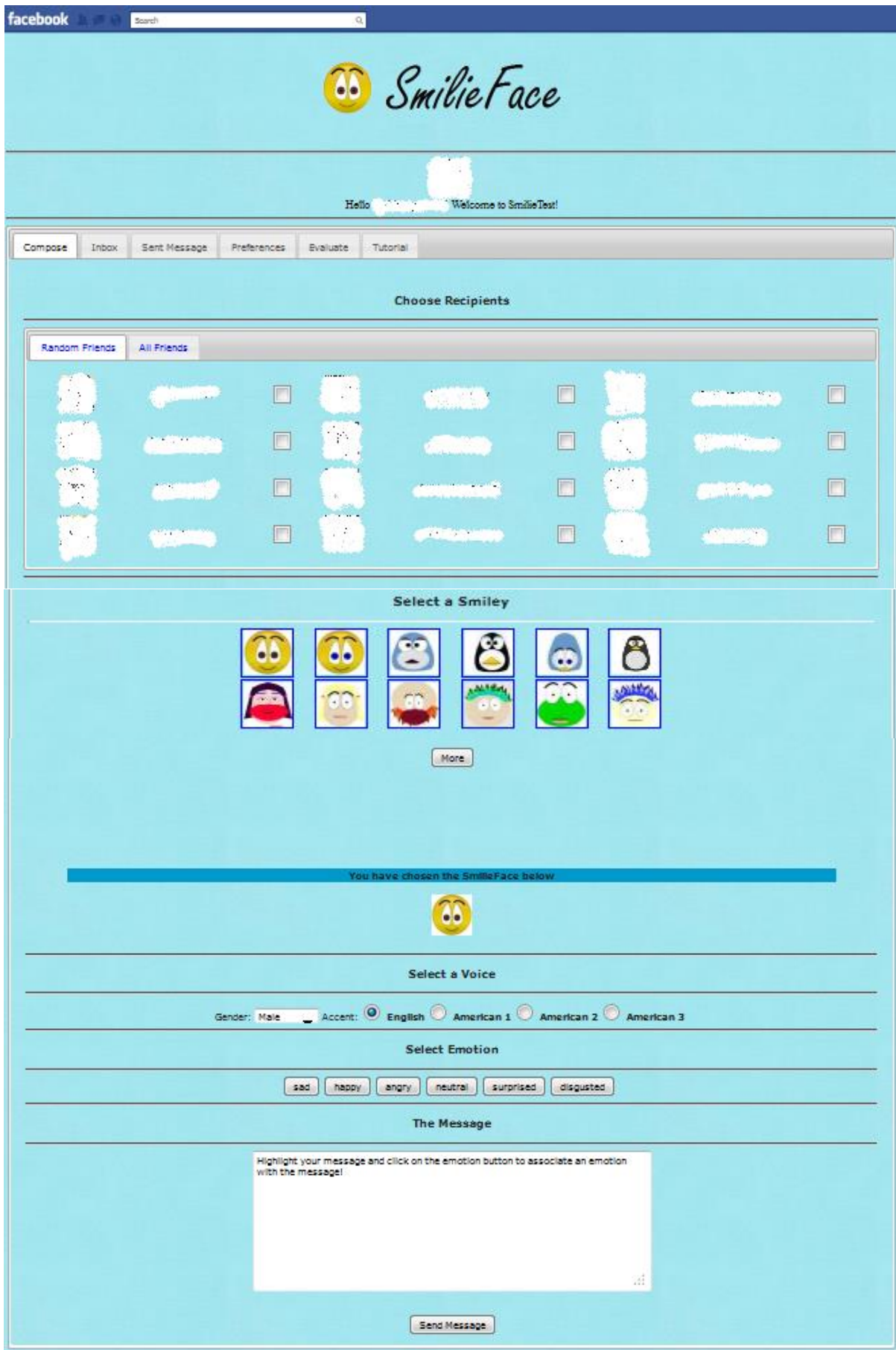
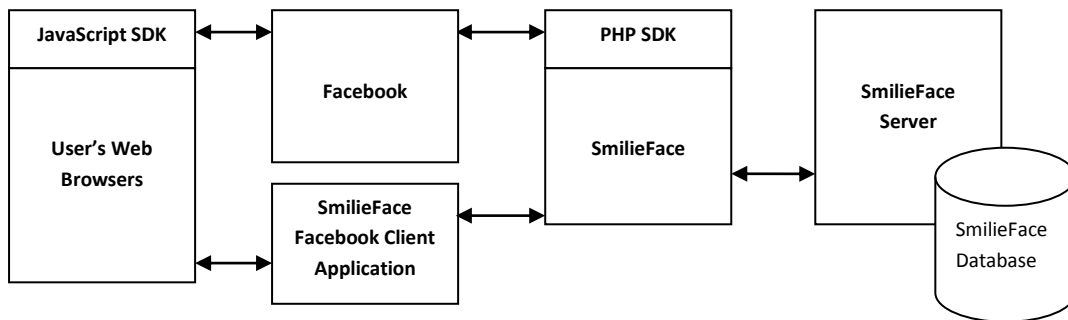




Figure 15 SmilieFace Interface

## 4.2 SmilieFace Architecture



### SmilieFace Architecture

There are 8 primary components that constitute the SmilieFace system. The diagram above, depicts all the major components of the SmilieFace Architecture. These major components are:

- **JavaScript SDK.** The JavaScript SDK sits on the client side and is responsible for updating and retrieving Facebook user's information on the Facebook Platform. More information on the JavaScript SDK is available in a subsequent section.
- **User's Web Browsers.** The web browsers enable Facebook users to install, access and use the SmilieFace Facebook Client Application, regardless of the types and versions of the browser, as well as the platforms and devices used to access the SmilieFace Facebook Client Application.
- **Facebook.** The Facebook platform is where the SmilieFace Facebook Client Application can be found and used to send and view *affective* messages to/from the users' Facebook friends. Once authorized, Facebook provides the SmilieFace Facebook Client Application with information about the users and their friends as well as other information necessary for the running of the application. The Facebook platform also provides a way for the application users to share the SmilieFace Facebook Client Application and the SmilieFace video message with their friends on Facebook.
- **SmilieFace Facebook Client Application.** The SmilieFace Facebook Client Application is a third part application on the Facebook Platform. Facebook users are able to send, receive and view *affective* messages through the SmilieFace Facebook Client Application.

- **PHP SDK.** The PHP SDK sits on the server side and similar to the Javascript SDK is responsible for updating and retrieving Facebook user's information from the Facebook Platform. The PHP SDK will be elaborated in the subsequent section.
- **SmilieFace.** Builds upon Smiliemail and is responsible for collecting data and information from the SmilieFace Facebook Client Application and sending them to the SmilieFace server to be processed into a SmilieFace video.
- **SmilieFace Server.** The main responsibility of the SmilieFace Server is to process all the data collected by SmilieFace and produced a corresponding SmilieFace video and send it back to SmilieFace. The data collected by the SmilieFace server are SmilieFace users' information (username, sessionID) and the raw or text form SmilieFace message. These data are stored in the database located within the SmilieFace server. The database also stored all the SmilieFace videos as well as a list of SmilieFace users and their preferences. The SmilieFace Server will be elaborated in Chapter 5.

The SmilieFace system is comprised of 8 major components working in conjunction with each other. The SmilieFace system enables an authenticated Facebook user who has installed the SmilieFace Facebook client application to compose, send and view *affective* messages in the form of a SmilieFace video.

In brief, when a Facebook user opens up the SmilieFace Facebook Client Application, an "Access Token" is sent from Facebook to the SmilieFace Facebook Client Application which would later pass it to SmilieFace, and subsequently to the SmilieFace server. The "Access Token" contained information about the user that authenticate the user as a legitimate Facebook users as well as a legitimate SmilieFace user. Once the user is authenticated, the SmilieFace server sends a unique SessionID back to SmilieFace and which eventually reaches the SmilieFace Facebook Client.

Once authentication is finished, the SmilieFace user is able to compose, send and view a SmilieFace message. Each request sent from the SmilieFace Facebook Client Application will have to pass through SmilieFace before reaching the SmilieFace server and vice versa. The SmilieFace Facebook Client Application does not communicate directly with the SmilieFace server. It serves as an intermediary between the Facebook Platform and SmilieFace, while SmilieFace is an intermediary between the SmilieFace Facebook

Client Application and the SmilieFace server. The Facebook Platform is segregated and does not have any direct interaction with the SmilieFace server. A detailed description on the inner working of the SmilieFace Server will be covered in the next section.

### 4.3 How to compose a SmilieFace video message

Figure 15 shows the SmilieFace Interface. This appears every time a user opens the SmilieFace Facebook Client Application. A welcoming message is displayed upon successful user authentication. The message consists of the user's name and profile picture as displayed on their Facebook profile page. There are 6 main components in this page that are separated into 6 tabs. As mentioned previously, the 6 main tabs are:

- **Compose Tab:** Allows users to compose and send a SmilieFace message.
- **Inbox Tab:** Contains all the SmilieFace videos received by the user.
- **Sent Message Tab:** Contains all the SmilieFace videos sent by the user.
- **Preferences Tab:** Enables the user to modify their preferred settings.
- **Evaluate Tab:** Contains links to the evaluation forms.
- **Tutorial Tab:** Contains a How-To guide for SmilieFace.

Users only need to navigate through the **Compose Tab** in order to compose and send a SmilieFace video message to their Facebook friends. The steps to compose a SmilieFace video message are as follows:

1. **Choose Recipients.** Users are able to choose a recipient for the SmilieFace video message from 2 lists of possible recipients: the Random Friends list and the All Friends list. As mentioned in the earlier section, the Random Friends list will display a list of 12 possible SmilieFace recipients selected at random from the user's Facebook friend list. Through multiple and continued usage, the Random Friends List will instead contain the 12 most active SmilieFace users from their Facebook friend list. The All Friends List is a list of all possible SmilieFace recipients that are populated from the user's friend list on Facebook.

Users are initially limited to sending a SmilieFace video message only to three users at a time. However, if they filled in the evaluation form, they will be able to send to up to six Facebook friends at the same time. The decision to limit the number of possible recipients for a SmilieFace video message at the same time is taken to conform to Facebook's "Don't Spam" policy (Facebook 2010). Sending a

SmilieFace video to multiple recipients at the same time would not cause any additional workload for the SmilieFace server, since only one SmilieFace video is actually produced. Allowing users to send a SmilieFace video message to their entire Facebook friend list at the same time would help propagate the SmilieFace Facebook Client Application to a wide range of Facebook users. However, this would certainly violate Facebook's "Don't Spam" policy. Hence, a number that represents a balance between not spamming and acceptable SmilieFace usage must be found. Users start with 3 recipients and will be able to send to 6 recipients after evaluating. Most third party application on the Facebook platform became popular through friend referrals, hence getting friend referrals will be crucial for SmilieFace to become popular.

- 2. Select a Smiley.** The user can click on any of the 12 available Smiley Faces (as shown in Figure 16) that they want to use as an *avatar* for their SmilieFace video. Once selected, the chosen Smiley Face will replace the default Smiley Face image.



Figure 16 Default Smiley Faces

Only 12 Smiley Faces will be available for selection in the beginning. However, by choosing to partake in the evaluation and filling in the evaluation form, the SmilieFace user will be granted access to a larger selection of Smiley Faces, as depicted in Figure 17. Some of the Smiley Faces are created by visitors on OpenDay in Curtin University. The entire collection of the Smiley Faces can be found in <http://www.smiliemail.org/faces/>.



Figure 17 More Smiley Faces

3. **Select a Voice.** The SmilieFace user will be able to select either a Male or Female voice for the *avatar*'s voice. In addition to selecting the gender for the *avatar*'s voice, they will also be able to choose the *avatar*'s accent. At the moment, there are only 4 available accents, English and 3 different types of American accents. The default setting for the *avatar*'s voice is a Male voice with an English accent. Examples of the voices can be found in <http://www.smiliemail.org/examples/multi-media/audio/> and they are also available on the CD ROM accompanying this thesis.
4. **Select the Emotion.** There are 6 emotions to choose from: sad, happy, angry, neutral, surprised, and disgusted. These are based on Ekman(1993)'s concept of 6 primary emotions. SmilieFace users will be able to associate their text message with any one of these emotions. Through the changes in the intonation of the *avatar*'s voice and facial expressions, the sender's emotion will be conveyed to the recipient of the SmilieFace video message.

5. **The Message Box.** SmilieFace users will have to type their message in this box, highlight part of the message that they want to imbue with emotion, and then click on the emotion button that best represents the text's emotion. Users are able to associate more than one emotion within the message. However, each part of the message can only be associated with one specific emotion.
6. **Send Message.** After completing every steps mentioned above, by clicking the Send Message button, all the information necessary to produce a SmilieFace video message is sent to the server. Upon receiving this information, the SmilieFace server will produce a SmilieFace video message and make it available for viewing in the recipient's SmilieFace Inbox. An application request will also be sent by the SmilieFace Facebook Client Application to the recipient, notifying them that there is a SmilieFace video message sent to them by their friend. SmilieFace user will also have the option of posting this notification message on the recipient's wall.

All of the 6 steps can be completed within one page without navigating away from the primary SmilieFace interface. Each step is designed to be intuitive and user-friendly making the SmilieFace Facebook Client Application easy to use. The overall experience of composing a SmilieFace video message should be akin to composing an Email message and the time needed to compose a video message will be relatively short.

Through the simplicity of the SmilieFace design combined with a clutter-free interface, the Smiliemail system is seamlessly integrated into the Facebook platform as an intuitive, user-friendly and easy to use SmilieFace Facebook Client Application. The likeness of the SmilieFace design and interface to Facebook itself enables Facebook users to effortlessly adapt to the application. Through its ability to harness users' information from the Facebook Platform, the process of composing a SmilieFace video message can be streamlined enabling the user to utilize all the features of SmilieFace in just a few clicks.

#### **4.4 Implementation Issues**

During the development stage of the SmilieFace Application, several implementation issues were encountered that needed to be solved. These implementation issues ranged from learning and developing in the programming languages and methods unique to Facebook, through catering to different web browsers, platforms and devices, to adapting and migrating to the

ever evolving Facebook SDKs and updated policies, as well as the general running mechanisms for the SmilieFace Facebook Client Application.

The implementation issues encountered whilst developing SmilieFace are listed as follow:

1. **Getting Started.**
2. **Utilizing the SDKs.**
3. **Adapting to Facebook changes.**
4. **Migrating to HTTPS.**
5. **Viewing SmilieFace via different browsers and platforms.**
6. **Accessing SmilieFace in different devices.**
7. **Notifying user of incoming SmilieFace message.**
8. **Displaying a SmilieFace message.**
9. **Sharing a SmilieFace message.**

#### 4.4.1 Getting Started.

When this research started, there was little information available on how to develop a third party application on the Facebook platform. This was due to the Facebook Platform's newness, coupled with Facebook's rapid evolution, making many of the tutorials and examples on the Internet obsolete. Hence a great deal of time was spent on building SmilieFace Interface prototypes. Through understanding the concept of "Canvas" (Facebook 2010f) and following a basic tutorial (Facebook 2010g), an initial simple third party application on the Facebook Platform was created. The Graph API (Facebook 2010h) is essential in enabling the application to obtain information from the Facebook Platform.

According to the Facebook Tutorial (Facebook 2010g), the key steps to create a basic third party application on the Facebook Platform are listed below:

1. **Installing the Developer App.** All third party application developers on the Facebook Platform are required to install the **Developer App**. The developer's Facebook account must be verified before they can start creating apps. Verification can be done by adding or associating a credit card to the developer's Facebook Account as well as through cell phone verification. Facebook will send an SMS which contains a verification code to the cell phone number provided by the developer. Once the verification code is received, the code must be entered into the Facebook's

verification page. Upon successful verification of the developer's Facebook Account, they will be able to start creating a third party application on the Facebook Platform.



Figure 18 Developer App authorization box (Facebook 2010g)

Figure 18 appear during the installation of the **Developer App**. The app requires the developer to authorize access to their basic information. The developer then has a choice whether to allow or deny the **Developer App** access to their basic information. If access is denied then the **Developer App** would not be installed and they would not be able to create a third party application on the Facebook Platform. Granting the **Developer App** access to the developer's basic information will install the app and they can proceed to step 2: **Configuring the Developer App**.

2. **Configuring the Developer App.** Third party applications on the Facebook Platform are loaded into the Canvas section of the Canvas Page. As shown earlier in Figure 8, the Canvas is a space provided within the Facebook page on which the third party applications are displayed. The Canvas can be populated by providing a Canvas URL that contains the HTML, JavaScript and CSS that constitute the application.

When a user opens up the third party application, a request for the Canvas Page is sent, and as a response, the Canvas URL within the Canvas section on that page is loaded. This results in the third party application being displayed within the standard Facebook page.



When a third party application is set up on the Facebook Platform, a Canvas Page name must be specified. The name will be appended to <https://apps.facebook.com/>. As an example, **test\_app** is the Canvas Page name. When a user navigates to [https://apps.facebook.com/test\\_app](https://apps.facebook.com/test_app) in their browser, they will see the contents of [http://www.example.com/canvas\\_loaded\\_inside\\_of\\_Facebook.com](http://www.example.com/canvas_loaded_inside_of_Facebook.com). Note that <http://www.example.com/canvas> cannot forward to another URL via HTTP redirect responses, e.g. response code 301, but has to return the response directly.

Once a third party application is created on the Facebook Platform, a Canvas and Secure Canvas URL must be specified on the “App on Facebook” section:

The screenshot shows the configuration page for a Facebook Developer App. At the top, there is a header for 'Sample App For Tutorial' with an app icon, App ID (8d60), App Secret (8d60926c78497e5d0a59), and an 'edit icon' link. Below this is the 'Basic Info' section with fields for App Display Name (Sample App For Tutorial), App Namespace, Contact Email, and Category (Other). The 'Select how your app integrates with Facebook' section is expanded to show the 'App on Facebook' option, which includes fields for Canvas URL and Secure Canvas URL. Other integration options like Website, Mobile, Mobile Web, and Page Tab are also visible but not expanded.

Figure 19 Developer App (Facebook 2010g)

Figure 19 is an example of a Sample App in the **Developer App**. When a third party application is created, it will be assigned a unique **App ID** and **App Secret**. These serve as a specific identifier to the third party application and must not be shared with anyone else.

The developer can fill out the Basic Information for the application. However, the most important thing to fill out in the **Developer App** is the Canvas URL. An empty Canvas URL would mean an empty Canvas page. Once it is filled in, every time a user opens up the third party application, they will see the content of the Canvas URL.

3. **Authorization.** In order to create a personalized user experience, Facebook sends the third party application information about the user that uses the application. For a third party application to be able to gain access to all the user information available by default (like the user's Facebook ID, user's friend list), the user must authorize the app. A user's authorization can be requested by invoking the OAuth Dialog for Apps on Facebook.com. The unique and specific **App ID** and the Canvas URL for the third party application is required.

By default, the third party application's user will be asked to authorize the app, before the app is allowed to access basic information that is available publicly or by default on Facebook. If the app needs more than this basic information to function, specific permissions must be requested from the user. This is accomplished by adding a scope parameter to the OAuth Dialog request followed by comma separated list of the required permissions.

Figure 20 shows an OAuth Dialog Box that request permission to access the user's basic information, authorization to send the user's email, and to access to the user's posts in their News Feed. Users will not have the option to allow and disallow parts of the OAuth Dialog Box. Permission must be given to every part of the OAuth Dialog Box before the third party application can be installed and used.



Figure 20 OAuth Dialog Box (Facebook 2010g)

According to Facebook (Facebook 2010g), there is a strong inverse correlation between the number of permissions a third party application can request and the number of users that will allow those permissions. The greater the number of permissions asked, the lower the number of users that will grant them. Hence it is recommended that a third party application only request the permissions that are absolutely paramount for the app to function.

After completing the 3 key steps mentioned above, a simple and basic prototype of the SmilieFace Facebook Client Application was created. However, this prototype had yet to make any use of the features afforded by the Facebook Platform. It was only a third party application that pointed to a Canvas URL. While the prototype has requested access to the user's information, it has yet to make any use of it. For that, SmilieFace has to utilize the SDKs.

#### **4.4.2 Utilizing the SDKs.**

As the SmilieFace Facebook Client Application is coded in PHP and JavaScript, Facebook requires the use of their PHP and JavaScript SDKs. Knowledge of these SDKs is important in order to utilize all the features that the Facebook Platform provides.

According to Facebook's documentation (Facebook 2010i), the PHP SDK provides a rich set of server-side functionality for accessing Facebook's server-side API calls. These include all of the Graph API, and the FQL (Facebook Query Language) features. The PHP SDK can be utilized to perform operations as an app administrator as well as operations on behalf of the current session user. By removing the need to manually manage access tokens, the PHP SDK greatly simplifies the process of authentication and authorizing users in a third party application. The previously mentioned **App ID** is needed to initialize the SDK. The PHP SDK can work in conjunction with the JavaScript SDK to provide seamless session management across both the client-side and server-side of an app.

Facebook's documentation (Facebook 2010j) revealed how the JavaScript SDK provides a rich set of client-side functionality for accessing Facebook's server-side API calls. These include all of the features of the Graph API, as well as Dialogs: a simple and consistent interface to display dialogs to users. It also provides a mechanism for the rendering of the XFBML versions of Social Plugins (a way to access the data on what the users' friends have liked, commented on or shared on sites across the web), as well as a way for Canvas pages to

communicate with Facebook. An **App ID** is also necessary to initialize the JavaScript SDK. The JavaScript SDK is necessary to support OAuth 2.0, which provides a more secure way for a user to authenticate in the Facebook Platform.

The SmilieFace Facebook Client Application utilized both the PHP SDK on the server-side as well as the JavaScript SDK on the client-side to provide its users with a secure third party application that is able to make use of a rich set of server-side and client-side functionality for accessing all the features afforded by the Facebook Platforms through its server-side API calls. By utilizing these SDKs, SmilieFace is also able to access the user's basic information as well as their friend's information, assuming it is set to be available for public viewing or SmilieFace is authorized to access that information.

The SmilieFace Facebook Client Application is able to facilitate a seamless session management across both the client-side and server-side of the application by using the JavaScript SDKs in conjunction with the PHP SDKs.

Over the course of this research, Facebook has been constantly evolving. The evolution involved a number of features being added to the Facebook Platform, the introduction of new standards and SDKs as well as the deprecation of a pre-existing standard and the SDKs. Hence, this research had to continuously adapt to Facebook's changes.

#### **4.4.3 Adapting to Facebook changes.**

Midway through this research, Facebook decided to move to a Modern Platform, and this involved the deprecation of FBML (Facebook Markup Language), the implementation of a new authentication system (OAuth 2.0 (Facebook 2010k)), and updating their PHP SDK and JavaScript SDK (Purdy 2011). The migration to a Modern Facebook Platform required a number of changes to be made to the original implementation of the SmilieFace Facebook Client Application.

One serious issue associated with the SDKs occurred when Facebook decided to update their PHP SDK and JavaScript SDK in order to accommodate the introductions of new features and platform upgrades. The issue was caused due to the 2 month time discrepancy between the released of the JavaScript SDK and the PHP SDK.

Developers were required to upgrade and use the latest SDKs, since the old SDKs would soon be deprecated. However the updated JavaScript SDK which was released earlier was

incompatible with the older version of the PHP SDK. As SmilieFace uses the PHP SDK in conjunction with the JavaScript SDK, the construction of SmilieFace was delayed until all of the updated SDKs were released.

The deprecation of FBML required all of SmilieFace components to be revised and any implementation of FBML had to be recoded. However, owing to the modular nature of how SmilieFace was designed and constructed, the revision process and the recoding of components that used FBML was not as time consuming as first anticipated.

Facebook's decision to move to a Modern Platform introduced the need to implement a more secure authentication method, called OAuth 2.0. The implementation of the OAuth 2.0 involved three different steps (Facebook 2010k):

- **User Authentication.** This ensures that the user is who they say they are.
- **App Authorization.** This ensures that the user knows exactly what data and capabilities they are providing to a third party app on the Facebook Platform.
- **App Authentication.** This ensures that the user is giving their information to an authorized app and not someone else.

Once these steps are complete, the third party app is issued a user access token that enables that app to access the user's information and take actions on their behalf.

According to Facebook Documentation (Facebook 2010k), Facebook Platform supports two different OAuth 2.0 flows for user login: server-side (known as the authentication code flow in the specification) and client-side (known as the implicit flow). The server-side flow is used whenever a third party application needs to call the Graph API from the web server. The client-side flow is used when the application need to make calls to the Graph API from a client, such as JavaScript running in a Web browser or from a native mobile or desktop app. The SmilieFace Facebook Client Application is currently using the server-side flow OAuth 2.0 to securely authenticate its users on the Facebook Platform.

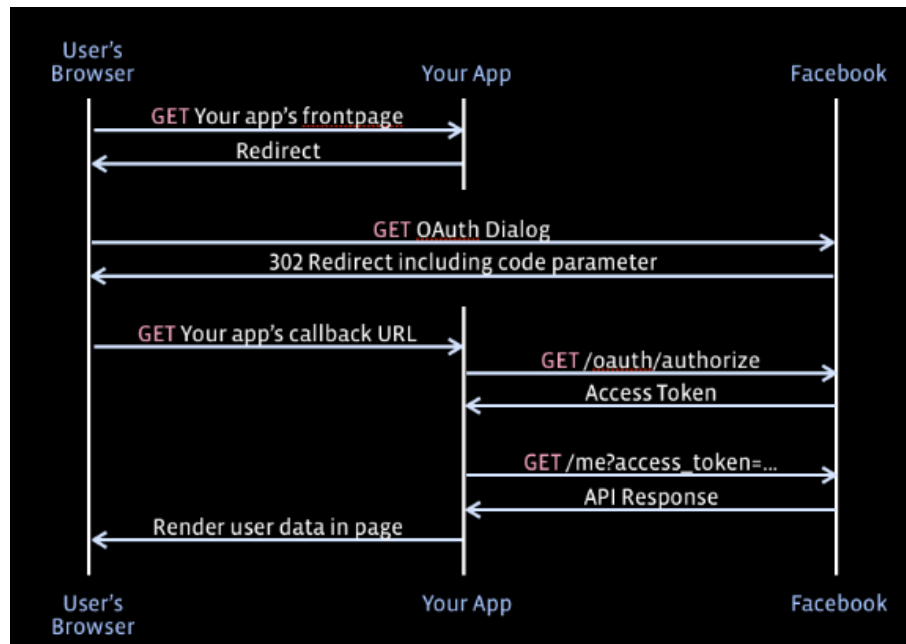


Figure 21 Server-side Flow Authentication (Facebook 2010k)

Figure 21 is a visualization of a Server-side Flow Authentication for a third party application on the Facebook Platform such as the SmilieFace Facebook Client Application. Figure 21 showed that when a user opened the SmilieFace Facebook Client Application via their web browser, a request to the application front page will be made. Upon receiving the request from the user for the first time, the application will redirect the request back to the browser along with its **App ID** and **redirect\_uri** (Canvas URL). This redirect occurred because the app requires the users to be authenticated on the Facebook Platform as well as giving the app the proper authorization before the user can use it. Authenticating the user and app authorization can be done at the same time by invoking the OAuth Dialog and passing it the **App ID** and **redirect\_uri** (Canvas URL).

Once the OAuth Dialog is invoked, the Facebook Platform will try to authenticate the user. If the user is already logged in, the login cookie that is stored in the user's browser will be validated and the user automatically authenticated. If not, the user will be prompted to enter their Facebook credentials (email address and password). Once the user is successfully authenticated, the OAuth Dialog will prompt the user to authorize the app. By default, the app will request access to the user's basic information that is available publicly or by default on Facebook. If the app needs more than this basic information to function, the app must request for specific permissions from the user. If the user chose not to authorize the app, the OAuth Dialog will redirect (via HTTP 302) the user's browser to the **redirect\_uri** with an error

message. If the user authorized the app, the OAuth Dialog will redirect (via HTTP 302) the user's browser to the **redirect\_uri** with an **authorization code**.

Once the **authorization code** is received, the app will need to be authenticated before it can receive an "Access Token", which is required to make API calls. In order to authenticate the app, the **authorization code** and the **App Secret** must be passed to the Graph API **token endpoint** along with the **redirect\_uri**. Upon successful app authentication and a valid authorization code from the user, the authorization server will return the "Access Token".

The "Access Token" will enable the SmilieFace Facebook Client Application to make API calls on the Facebook Platform, and hence get access to the user's basic information as well as any additional authorized permission that the application needs to function. Without the "Access Token" the user would not be able to use the third party application. Hence, obtaining the "Access Token" is of utmost importance for a third party to function.

Facebook's decision to implement OAuth 2.0 was an unexpected but welcomed development in the evolution of Facebook. This platform upgrade was beneficial from the point of view of both users and developers. The new authentication method improves the platform's security and helps protect users' privacy. While the updated JavaScript SDKs working in conjunction with the updated PHP SDKs made the OAuth 2.0 easy for the developers to implement.

The JavaScript SDK enabled the use of OAuth 2.0 to authenticate the user and sets a cookie that identifies the connected user (if the cookie parameter is set to true). The PHP SDK can easily access this cookie when used in the same domain. This allows the user to connect and authenticate to a third party application by using the JavaScript SDK (FB.login) and then call Platform APIs from server-side PHP without doing additional work (Cain 2011).

Facebook's decision to move to a Modern Platform required that the updated SDKs (JavaScript and PHP) had to be understood and implemented, and that certain parts of the SmilieFace Facebook Client Application, such as the new authentication standard (OAuth 2.0) had to be re-coded. The impact of this decision for the user is improved security whilst using a third party application such as the SmilieFace Facebook Client Application. The impact on the developer is the availability of a more powerful tool for harnessing information and other features afforded by the Facebook Platform. The impact of Facebook's decision to move to a Modern Platform for this research also involved a migration to HTTPS.

#### 4.4.4 Migrating to HTTPS.

Following the introduction of OAuth 2.0, Facebook required all third party applications to obtain an SSL certificate by 1<sup>st</sup> of October 2011 (Shah 2011). Facebook has taken these measures to improve the security and privacy issues that have always been a main concern for Facebook users. In order to comply with this new security policy, SmilieFace has to implement OAuth 2.0 when authenticating its users and the hosting server for SmilieFace has to be able to communicate securely with Facebook via HTTPS. Hence the hosting server is obligated to obtain SSL certification to facilitate a secure communication between SmilieFace and the Facebook Platform.

Curtin University, where this research took place, is able to provide a secure hosting server. However it is unreliable and a number of restrictions have been put in place that made it difficult to modify or alter any settings in the hosting server. The development of SmilieFace was unable to progress with these restrictions and it was decided that SmilieFace would be hosted on an external server, separate from the Curtin University's web server. SmilieFace is hosted on <http://smiliemail.org>, which is owned and maintained by one of the researchers. It is also where Smiliemail is hosted.

By hosting SmilieFace on <http://smiliemail.org>, there is a dedicated web hosting server that can be easily altered and maintained as it is fully under the control of the researchers. Although bandwidth might be an issue in a production environment when there are a large number of users using SmilieFace at the same time. The freedom and reliability afforded by hosting it on <http://smiliemail.org> for this research environment made it a better choice than hosting it at Curtin University.

Using a self-signed SSL Certificate in order to comply with Facebook requirement for third party app such as SmilieFace is not the perfect solution. Although it is free, popular web browsers such as Fire Fox and Internet Explorer will display a warning page whenever a user tries to access SmilieFace. As shown in Figure 22, the page informs the user that they might be accessing an insecure connection and asked confirmation for opening the page. Due to Chrome's built in security feature, it is unable to display pages that are hosted on a web server that uses a self-signed SSL Certificate.



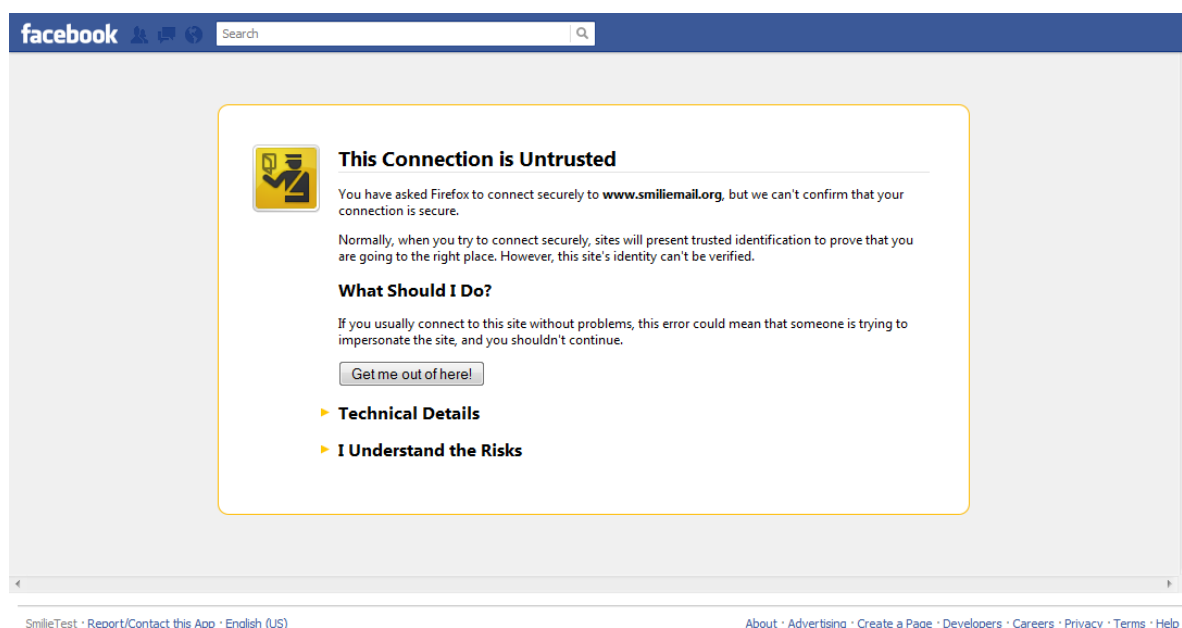


Figure 22 Security Warning for FireFox users

While Internet Explorer and FireFox users are still able to use the SmilieFace Facebook Client Application, Chrome users would not be able to. However, the warning messages displayed every time IE and FF users opens up the SmilieFace Facebook Client Application might deter people from using the application. Security and privacy issues have always been a primary concern for Facebook users. Hence users might be reluctant to use the SmilieFace Facebook Client Application, especially when they are being warned that they are accessing a web page over an untrusted connection due to the Self-Signed SSL Certificate. The Self-Signed SSL certificate also caused the application to be inaccessible via a Chrome browser or an older version of FF. This might cause significant issue in getting people to use the SmilieFace Facebook Client Application. To remedy this, this research had decided to sign up for a trial SSL certificate which last for 90 days hence eliminating all the issues associated with the Self-Signed SSL certificate. Apart from this issue, the research will discuss SmilieFace in different browsers and platforms.

#### 4.4.5 SmilieFace in different browsers and platforms.

As there exist several web browsers (IE, FF, Chrome, Safari) with different versions and different platforms (Windows, iOS), users have a number of ways to view and use the SmilieFace Facebook Client Application. However, as different web browsers have different standards and implementations, some compatibility issues arise whilst viewing SmilieFace in certain web browsers.

A compatibility issue exists when viewing SmilieFace in IE9. Instead of displaying parts of the web page in different tabs, IE9 appends all the different parts and display them together in the same page. This is caused by a standard being implemented by IE9 that is different from all the previous IE. A solution for this would be to specify a document compatibility mode by including an X-UA-Compatible header in the **meta** element in the web page (Morciniec 2011).

```
<html>
<head>
  <!-- Mimic Internet Explorer 7 -->
  <meta http-equiv="X-UA-Compatible" content="IE=EmulateIE7" >
  <title>My webpage</title>
</head>
<body>
  <p>Content goes here.</p>
</body>
</html>
```

Figure 23 Compatibility Tag (Morciniec 2011)

The code snippet in Figure 23, caused the X-UA-Compatible header to make Internet Explorer mimic the behaviour of Internet Explorer 7 when determining how to display the webpage. This means that Internet Explorer will use the `<!doctype>` directive to choose the appropriate document type. If the page does not contain a `<!doctype>` directive, it would be displayed in IE5 (Quirks) mode instead.

The content attribute specifies the mode for the page. By specifying `IE=EmulateIE7`, IE will mimic the behaviour of Internet Explorer 7, while specifying `IE=5`, `IE=7`, or `IE=8`, will select one of those compatibility modes. The X-UA-Compatible header is not case sensitive; however, it must appear in the header of the webpage (the HEAD section) before all other elements except for the title element and other meta elements.

Another solution for this compatibility issue would be to configure the web servers so as to specify a default compatibility mode. Site administrators can configure their sites to default to a specific document compatibility mode by defining a custom header for the site. The specific process depends on individual web server. For example, the following web.config file enables Microsoft Internet Information Services (IIS) to define a custom header that automatically renders all pages in IE7 mode. By specifying a default document compatibility mode on the web server, settings that specified a different document compatibility mode in a specific webpage cannot be overridden. The mode specified within the webpage takes precedence over the mode specified by the server.

The solutions above solved the compatibility issues when accessing SmilieFace directly on <http://smiliemail.org/~12989735> using IE9. However the compatibility issue persisted when SmilieFace is accessed via Facebook. This is due to the fact that the Canvas Page that displays SmilieFace is still using IE9 standards even though we have specified that SmilieFace has to use IE8 standards or emulate IE8. The SmilieFace Facebook Client Application appeared inside the Canvas Page, which is an iframe. And in this instance, the compatibility features are inherited from the top window, which in this case is owned by Facebook. Hence, the header information returned from the Smiliemail Server is not passed onto the browser and the Canvas Page standards cannot be changed as Facebook would not allow it. Another solution would be for IE9 users that access SmilieFace via Facebook to use their developer tools and manually change their compatibility mode themselves. Although this compatibility issue is not disastrous, it is an issue nonetheless.

Another compatibility issue occurred when users tried to access SmilieFace using Chrome (Chromium 2011). As mentioned previously, Facebook required a third party app such as SmilieFace to use OAuth 2.0 and obtain an SSL Certificate. As mentioned, initially a self-signed SSL certificate was used. Chrome's built in security features prevented the web browser from displaying web pages that used a self-signed SSL certificate, as Chrome is unable to verify the security of the web page or the connection. Unless Chrome softened their stance on displaying web pages that are using a self-signed SSL certificate, the only option left is to use a Certified SSL certificate. Hence the research decided to sign up for a trial SSL certificate users which last for 90 days.

There is no known compatibility issue whilst viewing SmilieFace in different Operating System. The compatibility issues with viewing SmilieFace on different web browsers and platforms have been listed. While all these compatibility issues are identified and their causes are known, and all measures have been taken to resolve them, these compatibility issues within IE9 and Chrome still persisted.

In order to understand the gravity of this issue on this research, knowledge about popular web browsers would be required. By learning how popular various web browsers are, estimations can be made on the number of potential users that this issue might affect. Pachal (2011) and StatCounter (2011) announced that Chrome 15 (24.55%) tops the worldwide market edging out IE8 (22.16%) while FireFox (15.53 %) is third. However, by taking all the versions of the web browsers under considerations, IE remained the most popular web browser (38.5%)

while Chrome is second (27.08%) followed by FireFox (25.55%). From these statistics, a deduction can be made that IE9 compatibility issue would not affect that many users since IE8 is the most popular version of the web browsers. The statistics have shown that there are a large number of Chrome users that are unable to use the SmilieFace Facebook Client Application due to the Self-Signed SSL Certification issue. However, after looking at the bigger picture where 60+% of web users used either IE or FF and only 27% is using Chrome, the SmilieFace Facebook Client Application can still be used by the majority of web users. The use of a trial SSL certificate has eliminated all the issues associated with the Self-Signed SSL certificate. The next section will discuss the issue with accessing SmilieFace in different devices.

#### **4.4.6 Accessing SmilieFace in different devices.**

Nowadays, people are able to access Facebook through various communication devices such as desktops, laptops, mobile phones, smartphones (iPhones, Android Phones), and tablet PCs (iPads). With access from these devices, there are a number of issues that have to be considered such as screen size, processing power, video display capabilities, storage space and connection speed. All these factors, if not specifically catered for, will severely hinder the users' ability to make full use of the SmilieFace Facebook Client Application.

The ubiquitous usage of smartphones coupled with the emergence and rising popularity of tablet PCs, facilitated a more convenient way for users to access Facebook. Hence SmilieFace should also be accessible from these devices. Through its monolithic design, SmilieFace users are able to compose, send and view SmilieFace messages on a single page. Images are made smaller and the need to reload a page is minimized so as to reduce the bandwidth overhead.

Due care has been taken both in the visual design and operational design of SmilieFace. However, due to the inherent limitations of smartphones and tablet PCs, such as screen size, processing power, video display capabilities, storage space and connection speed, users accessing the SmilieFace Facebook Client Application from these devices will always have difficulties from utilizing the application. A solution for this would be to re-code SmilieFace using Android SDK and iOS SDK. This will allow users to have a better experience whilst using a mobile version of SmilieFace since it should be able to fully harness all the features afforded by the mobile Facebook Platform.

According to Facebook (2013), there are reportedly over 751 million monthly active users who used Facebook mobile products on a regular basis. In order to properly provide all these mobile users with seamless social experiences, the Facebook Platform enables the development of third party applications across a large variety of devices: Mobile Web Apps, iOS Native Apps, and Android Native Apps.

Mobile Web Apps (Facebook 2010n) are built using web technologies including HTML5, JavaScript and CSS. Once the third party application is built, it can be deployed everywhere, including on iPhone, iPad and Android. The three key steps to building a Mobile Web App are similar to a normal third party application on the Facebook Platform. Even the concept of how to use the Graph API and how to integrate with Social Channels are also quite similar. This is because the Mobile Web App is using the same JavaScript SDK as apps on Facebook.com on the desktop. However there are certain features that are currently unavailable for mobile users. Hence, it is quite feasible that the SmilieFace Facebook Client Application might progress to a SmilieFace Mobile Web Apps.

Building an iOS Native App (Facebook 2010o) or an Android Native App (Facebook 2010p) is quite different from building a third party application on the Facebook Platform or via Mobile Web Apps. This is because building a native app for iOS and Android requires the use of their own specific SDKs. Hence the syntax, flow of events, and concepts are different.

#### **4.4.7 Notifying users of an incoming SmilieFace message.**

Issues about security and users' privacy have always been a cause of concern for Facebook users and hence of concern to our research. Whilst Facebook has implemented certain measures to improve their security, such as the implementation of OAuth 2.0 as well as the need to migrate to HTTPS and obtained a SSL Certificate, a third party app such as SmilieFace also has the responsibility to protect its users' security and privacy.

As mentioned, SmilieFace protects its users' security by implementing OAuth 2.0. SmilieFace also only requests access to information that is crucial to the running of the application. SmilieFace also provides a clear and concise Terms of Use and Privacy Policy so its users can have a better understanding on what information is collected, and how it is used as well as what authorization that they allowed SmilieFace to take. The Terms of Use and Privacy Policy can be found in the appendix section of this thesis.

SmilieFace understand the importance of users' need for privacy whilst using the application. Like any other messaging application, some message might be private while others might be suitable for public consumption. Some SmilieFace users might use the application for one on one communication while others might use it for mass communication with their friends. Hence SmilieFace should have the ability to allow its users to choose who can view the message as well as who knows that a message exchange has taken place.

SmilieFace accommodates this need for users' privacy by providing its users with options on how recipients of the SmilieFace message are notified of an incoming message. SmilieFace also ensures that only intended recipients will have access to the SmilieFace message unless the recipient specifically decided to share it with their friends. Through flags in the SmilieFace database fields, SmilieFace is able to control that only a particular recipient is able to view SmilieFace message intended to them. However, once that particular recipient decides to share their SmilieFace message with their friends, SmilieFace no longer retains control on who has access to the message.

This is similar to the problem of "forwarding a message" where once a message is received by the recipient, the message can be forwarded to other people without the consent of the original sender. After a message is sent, the original sender cannot control who has access to the message if the recipient decides to forward it to other people.

SmilieFace is able to restrict access and control who is able to view a particular SmilieFace video message, by creating a database entry in the Smiliemail database that records who have access to the video message. However, this could be counter-productive as it severely limits the ability of SmilieFace users to share the application with their friends. Hence, the possible exposure for the SmilieFace Facebook Application will be greatly diminished.

There are essentially two ways of notifying SmilieFace users that there is a message waiting for them: "Application Request" and "Wall Post". An "Application Request" is the less invasive option whereby a user is notified of the availability of a SmilieFace message privately while a Wall Post, as depicted in Figure 24, can be used to announce publicly of an incoming SmilieFace message.

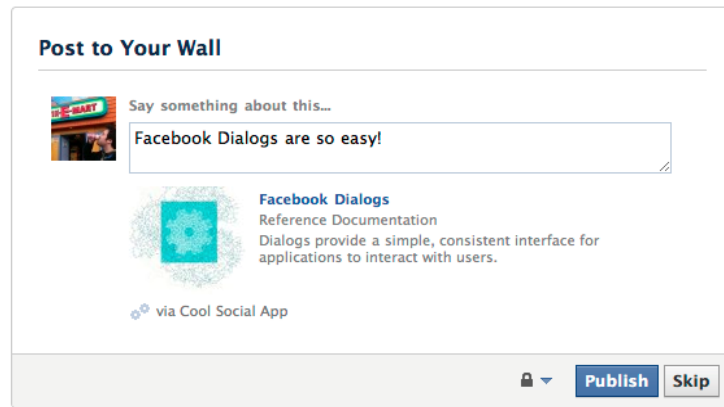


Figure 24 Dialog Box for a Wall Post (Facebook 2010q)

User will have full control on which of the two is preferable to them. However the default setting will be an “Application Request”. This takes the users’ privacy into consideration. While it will help the propagation of SmilieFace if its usage is broadcasted to all the users’ friends, some users might not appreciate that their interactions with their friends are made public. Figure 25 is an example of the notification box which notifies Facebook users of incoming Wall Post and Application Request.

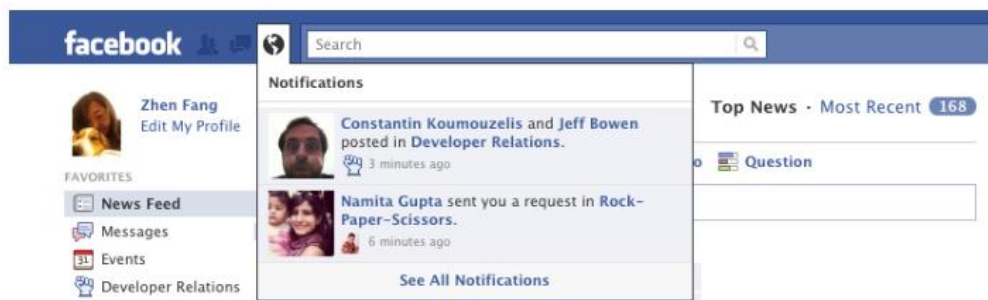


Figure 25 Notification Box (Facebook 2010g)

As mentioned earlier, most third party applications on the Facebook Platform became popular through friend referrals by the application users themselves. It is quite rare for a user to manually find and use a certain third party application. What typically happens is that the user has found out about the third party application from their friends’ discussion, seeing their friend use the application on their news feed or being invited by their friend to use the application. Hence, in order for SmilieFace to be a successful and popular third party application on the Facebook Platform, the application must facilitate a way for its users to refer the SmilieFace Facebook Client Application to their friends.

SmilieFace provides a number of ways for this referral to happen. A user is able to send a SmilieFace video message to their friends and post the notification message to the

recipient's wall and make it visible to the sender's and recipient's friend. Allowing users to share their SmilieFace video message with their friends via a download link is also a way to refer the users' friends to use the application.

Getting as much exposure to the existence of the application is of utmost importance in making a third party application such as SmilieFace successful and popular. However, overexposing the application will also cause some issues. The issues can be a violation of Facebook's "Don't Spam" policy or causing annoyance to potential users causing them to block the application without even using it. Hence, certain limitations have been put in place both to protect the users' privacy as well as conforming to Facebook's "Don't Spam" policy. This limitation involved limiting the number of users that can receive a SmilieFace video message at one time, hence limiting the number of potential "Wall Post" and "Application Request" sent out at the same time.

While an "Application Request" is only visible to the recipient of the SmilieFace video message, a "Wall Post" is visible to the recipient and the recipient's friends. If there is no limitation on the number of recipient that a user is able send at a time, a user with 250+ friends might send a SmilieFace video message to all of them, while this does not affect the Smiliemail Server's workload, Facebook and the recipient's friends will consider this as Spamming. That is the same SmilieFace notification message will appear multiple times in the recipient's friend's newsfeed, especially when the recipients' friend shares the same circle of friends. Hence, the limitation was put in place to prevent this "Spamming Behaviour".

As previously mentioned, the issue of how to notify SmilieFace users of an incoming SmilieFace video message was solved by coding and implementing two notification methods: "Application Request" and "Wall Post". They can be used in conjunction with each other if the user preferred it. They are coded in separate modules and can be used independently from each other. However, the default setting is an "Application Request" which is always sent to notify the recipient of incoming SmilieFace video message. Displaying a SmilieFace video message was the next issue that needed to be solved.

#### **4.4.8 Displaying a SmilieFace message.**

Taking into considerations that SmilieFace might be accessed via different web browsers, on different platforms and through various devices, how to display a SmilieFace video proved to be a challenge. A SmilieFace message is essentially a recorded video with



pictures and sounds. Hence the devices must have a video card and a sound card as well as the necessary software to play the SmilieFace video. The software needed to view the video should be already installed on the device itself or the users should be able to download the necessary software at no cost.

In previous sections, this thesis has acknowledged and solved the issue on how to access the SmilieFace Facebook Client Application via different web browsers, across different platforms and through various devices. This section will discuss the issue of the best way to display the SmilieFace video message via the different medium mentioned above. The main considerations are the availability and cost of the necessary software to view the video, compression rate, and portability. The video must be in a format that is playable by a freely available video player. The video must also be able to be compressed to a small size whilst maintaining its quality.

In order to accommodate different web browsers, it was decided that the SmilieFace video will be in Flash format. This is due to its relatively small sized player, its high compression rate as well as its ability to be played in almost every web browser, platform and device. Only iPads are unable to play any flash videos since it is a video format that the device did not support. Hence the SmilieFace video is also converted into MP4 format to accommodate SmilieFace users that view their SmilieFace video on their iPads.

The SmilieFace Facebook Client Application used Header Information to detect which web browser, platform and Operating System that the user used to accessed the application. This and other information can be displayed via the phpinfo library call. This information consist of PHP compilation options and extensions, the PHP version, server information and environment the PHP environment, OS version information, paths, master and local values of configuration options, HTTP headers, and the PHP License (ThePHPGroup). If the SmilieFace PHP code identifies the web browser as “Safari”, SmilieFace will assume that the user is accessing the application from Apple or Macintosh devices. Hence, the SmilieFace Facebook Client Application will display the SmilieFace video message in an MP4 format, which is playable by a QuickTime Player on any Apple or Macintosh devices such as iPhones and iPads. Other Operating Systems and Platform will display the SmilieFace video message in a Flash format playable via any available Flash Video Player.

---

After solving the video format issue, another issue associated with displaying a SmilieFace video was to determine the best way for the user to view the video itself. There are two ways to display SmilieFace video to the user:

- **Download Link.** SmilieFace provides a link for the SmilieFace video that a user receives. By clicking on the link, users are able to download the video. After the download is completed, users can view it at their own convenience using their favourite video player. Users are also able to easily share the SmilieFace video with their friends by sending them the download link. The flaw of this method is its inability to accommodate users who want to view the SmilieFace video immediately. Users have to go through all the motions of downloading the video, wait for it to finish and only then will they be able to view their SmilieFace message. While this might be acceptable for most users since SmilieFace would not be used to transmit critical and time sensitive messages, this might cause a problem for users who access their SmilieFace messages using mobile devices, such as smartphones and tablet PCs where storage space is more limited. Hence this might not be the best option. However, it is possible to use archiving to compress the SmilieFace video message and make the size of the file to be transmitted smaller. It also enabled more SmilieFace video message to be stored for future viewing.
- **Embedding the video.** SmilieFace is able to make use of the in-built video player available in most web browsers simply by embedding a video on the web page. Most web browsers across different platforms have an in-built video player such as Windows Media Player, Quick Time and Flash Player. This in-built video player normally comes installed with the web browser or is free to install and upgrade. Hence the only other concern is using the right video format. Since SmilieFace videos are in both Flash and MP4 format, it will not have any issue playing on different in-built video player on different web browsers across different platforms. By embedding the video on the web page itself using HTML5 technology, SmilieFace users that access the application via their mobile devices are well catered for. Since they can view their SmilieFace videos just like a YouTube video and do not have to worry about storage space. However this method does not allowed the users to easily share their SmilieFace videos with their friends. Since a download link for the message is not provided, users are unable to download the video or send a link for the video to their friends.

Each of the methods mentioned above have their own advantages and disadvantages. After careful considerations, it was deemed best to embed the video on the webpage in conjunction with providing the user with a download link. Facebook is a *Social Network Site* which emphasizes its users' social experiences by enabling them to connect and share. The ability for users to share their experiences socially with their friends is what made Facebook popular. This also affects the popularity of a third party application in the Facebook Platform where most application becomes popular by being used and referred to other users by their friends. Hence, in order for the SmilieFace Facebook Client Application to become popular, it must be referred and shared to other users as much as possible by their friends. These referrals and shares will be how the SmilieFace Facebook Client is introduced to new users. The next issue is how to share a SmilieFace video message.

#### **4.4.9 Sharing a SmilieFace message.**

As Facebook emphasizes on being social, it was deemed necessary that SmilieFace users are able to share their SmilieFace videos with their friends as well. Facebook continually expands its services in an effort to maintain their user base as well as gain new users. A large number of users used Facebook to store and share their photos with their friends. Facebook allowed its users to upload an unlimited number of photos as well as to set permissions on who is authorized to view these photos. Facebook also allows its users to share videos albeit, Facebook requires the aspect ratio of the video to be between 9x16 and 16x9, and the video cannot exceed 1024MB or 180 minutes in length (Facebook 2010r). Facebook users mainly shares photos, video links, and news links. From this trend, it can be observed that Facebook can act as a photo sharing site (similar to picasa, flickr), while complementing video sharing sites (such as YouTube, DailyMotion) and news aggregating sites (such as reddit, digg).

Sharing a SmilieFace video message can be achieved through the following:

- 1. Sharing via a download link.** Providing a user with a link where their SmilieFace videos can be downloaded. However, privacy might be an issue since anybody with access to the link can have access to the videos, this might be undesirable.
- 2. Uploading the SmilieFace videos onto Facebook.** While this allowed the users better control over who is permitted to view the videos, Facebook itself imposed a 1GB limit for each Facebook user. While these might not be a problem in the short run, it would be a problem in the long run when the videos started to accumulate. The

existence of a pre-existing user video library in their Facebook account further limits the number of SmilieFace videos that they store in their Facebook account.

- 3. Uploading the SmilieFace videos onto a third party video site (YouTube, Dailymotion).** This solved the issue with Facebook's limitation; however uploading the videos to a third party video site might prove to be a very tedious and overwhelming task especially when there are a large number of users. This also retains the same privacy issue associated with sharing via a download link.

Looking forward based on current trends and the expansion of Facebook, the emerging popularity of Cloud Computing can be seen. Facebook itself has partnered up with Heroku to make it even easier to get started building apps on the Facebook Platform (Facebook 2010s). Heroku is a cloud service provider that is able to provide a place to host third party application. Heroku automatically support SSL hence the SmilieFace would not have to use a Self-Signed SSL Certificate or purchase a validated one. If the SmilieFace Facebook Client Application becomes very popular, it would be best to host it under a cloud service. This will remove any issue of scalability, as the cloud service provider will automatically scale the size of the host accordingly to handle the web requests, albeit at a monetary cost.

By utilizing a Cloud Service, it is also possible to create a SmilieFace video cloud, where the Cloud Service stores SmilieFace video messages from all its users for future viewing. Advancing from just storing SmilieFace video messages, it is also possible to allow SmilieFace user to upload their videos for storage and sharing with other users. Similar to how YouTube is, SmilieFace users would be able to create their own SmilieFace video message, share SmilieFace message with their friends, view SmilieFace message from various devices and platforms, as well as upload any videos they wished to share with other SmilieFace users that are not necessarily SmilieFace related.

If Facebook remove their self-imposed limitations on the size and length of videos that the users can upload to their profile and allowed Facebook users the same flexibility to upload videos as the flexibility they have to upload photos, Facebook could potentially replace YouTube as a popular video sharing site, as they have been replacing Picasa and Flickr as a popular photo sharing site. By providing a one stop video and photo sharing site for their users, Facebook could potentially increase their user base as well as getting their current users to spend more time in the site.

Most videos in YouTube are created and uploaded by the users themselves and are released for public viewing, while in Facebook, the links being shared are usually not created by the users themselves but are links to external video sharing sites (YouTube, DailyMotion). If a Facebook user does share a video that they created themselves, the nature of the videos tends to be private, which is shareable but intended only for their Facebook friends.

How a user searches for a video on YouTube and Facebook might be a little different. In YouTube, user can search for the name of a video or keywords for videos that are relevant to their interest. While in Facebook, it is quite possible to add a social element in the search mechanism. This can be done by allowing Facebook users to search for videos that their friends liked or search for videos that their circle of friends find interesting. However, the ability or the number of videos that a Facebook users has access to might depend on the size of their Friend List. A Facebook user with limited friends will have access to a limited number of videos while a Facebook user with a large and diversified number of friends will have access to larger and more diversified videos as well. Searching for a SmilieFace video message can be made easier by including video tags that identified and describe the video message in the Smiliemail Database.

#### **4.4.10 Implementation Issues Conclusion.**

After solving the issues encountered during the implementation stage, the SmilieFace Facebook Client Application was successfully designed, developed and deployed on the Facebook platform. Its intuitive design made it more user-friendly and its ability to be accessed via different web browsers, in different platforms and through various devices made it more engaging to its users.

Considering the social nature of Facebook combined with SmilieFace's ability to send *affective* messages, the aim of the application will be to enhance users' interaction in Facebook. Figure 26 is an example of a SmilieFace video message where an avatar is able to convey the emotion of its sender through changes in the intonation of its voice and its facial expressions. More examples on SmilieFace video messages can be found in <http://www.smiliemail.org/examples/?movies> and in the attached CD ROM.

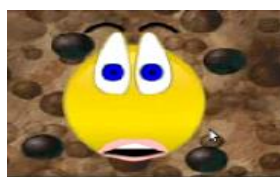


Figure 26 **SmilieFace** Message

## 4.5 The Evolution of SmilieFace User Interface

The SmilieFace User Interface (UI) had undergone several modifications as described in the previous section. As described in Chapter 6, this research had experienced severe difficulties in getting users and evaluators. Based on the comments and feedback from existing users, as can be seen in Chapter 7, SmilieFace UI had undergone another modification to improve the existing User Interface and attract more users. The new UI is as shown in Figure 27.

The screenshot displays the SmilieFace User Interface for composing a message. At the top, there are navigation tabs: Compose, Inbox, Sent Message, Evaluate, and Tutorial. The main content area is divided into several sections:

- Choose friends to write to:** A grid of 24 empty boxes for selecting friends. Navigation buttons for "Prev" and "Next" are present above and below the grid. A red tip reads: "Use Ctrl + F : To quickly find your friend from the list."
- Select a Smiley:** A grid of 24 different smiley faces for selection.
- You have chosen the SmilieFace below:** A single smiley face is displayed.
- Select a Voice:** A dropdown menu for "Gender" (set to "Male") and radio buttons for "Accent" (English, American 1, American 2, American 3).
- Message Options:** Radio buttons for "Set this message as: Private (selected) / Public", "Send a preview of this message to: Yes / No (selected)", and "Notify me when message is read: Yes / No (selected)". A "Message Subject:" input field and a "Video Examples" link are also present.
- The Message:** A red warning: "Please do not include emoticons in the message box." and a "Message Template" dropdown menu (set to "Welcome Message").
- Select Emotion:** A row of buttons for "sad", "happy", "angry", "neutral", "surprised", and "disgusted".
- Character Count:** A text box for the message with a character count: "(Maximum characters: 220) You have 220 characters left." Below it, a tip says: "You can increase your message characters limit by completing all of our Evaluation Form(s)".
- Send Message:** A button at the bottom to submit the message.

Figure 27 SmilieFace UI

The changes in the UI are as follow:

1. The colour scheme was changed from blue colour to white colour so as to match the colour scheme in Facebook. This is an attempt to make the application more similar to how Facebook look and feel.
2. Selecting a recipient from a list of friends is made easier and simpler. Previously there are two tabs, which featured a tab that contained a list of 12 random friends and another tab which contained a full list of all the user's friends. From the comment and feedback received, this caused some inconvenience and difficulties for users with a long list of friends to navigate through the list to select a particular friend. Hence, in order to solve this predicament, a new way to select recipients was implemented. Instead of 2 tabs which contained the user's friend list, the user's friend list is now separated into different traversable pages of friends. Each page contained 30 friends. The number of traversable pages of friends depends on the size of the user's friend list and its contents are alphabetically sorted. This made the user's friend list more manageable as well as more traversable.
3. The numbers of selectable avatars are increased from the initial 12 avatars to 40 avatars. A wider selection of avatars is implemented in order to encourage users to send more SmilieFace messages as well as attracting new users.
4. The new UI was made more compact than previous UI so the user can compose their SmilieFace message in one go without any scrolling. Although users who accessed SmilieFace via their mobile devices might experience some difficulties, this was implemented to appease the majority of SmilieFace users, who used their computer to access SmilieFace and are peeved by the need to scroll to compose a SmilieFace message.

The modifications to the existing SmilieFace UI were made after considering the suggestions and feedback from existing SmilieFace users as well as the advice of a professional web developer. The SmilieFace UI was modified not only to appease existing users but also as part of the Action Research Methodology and Spiral Model Software Development Life Cycles, as described in Chapter 3, employed by this research to prove Sub-hypothesis 3: *“SmilieFace will be easy to use and engaging for its users, capable of attracting a substantial number of users, and become a popular application”*.

## 4.6 Conclusion

After careful design with an emphasis on being intuitive and user friendly, while conforming to the strict Facebook design guidelines, as well as solving all the implementation issues that arises, the SmilieFace Facebook Client Application was deployed on the Facebook platform, as an easy to use third party application capable of creating, sending and receiving *affective* messages that are engaging to the users.

Users of the application will have the options to partake in the evaluation of SmilieFace by providing their demographic informations, filling out evaluation forms for each component of SmilieFace as well as giving a general comment on their overall experiences whilst using SmilieFace. Through these evaluations and comments, a better understanding on how users with different demographics (age group, tech savvy-ness, etc.) perceived and responded to the *affective* nature of the application can be obtained.

A successful deployment and implementation of the SmilieFace Facebook Client Application will signified the successfully integration of Smiliemail into the Facebook platform. Once Smiliemail is integrated in the Facebook platform as a Client Application, the first sub-hypothesis which states that “*A robust SmilieFace client for creating and viewing affective videos as an alternative Facebook messaging service can be designed, developed and implemented*”, is proven.

The third sub-hypothesis which states that “*SmilieFace will be easy to use and engaging for its users, capable of attracting a substantial number of users, and become a popular application*” can be proven by gathering and analysing the quantitative, qualitative, formative, and statistical data from the SmilieFace application and its users. Through a series of web questionnaires that the users voluntarily filled as well as the usage data of the SmilieFace application itself, a conclusion can be obtained to prove or disprove the third sub-hypothesis.



## Chapter 5

### SmilieFace Server

The previous chapter has discussed the SmilieFace Facebook Client Application and how its development and implementation will confirm or deny this research's hypotheses. A detailed inner working of the SmilieFace Facebook Client Application and its design concept which served as a foundation for SmilieFace was also given.

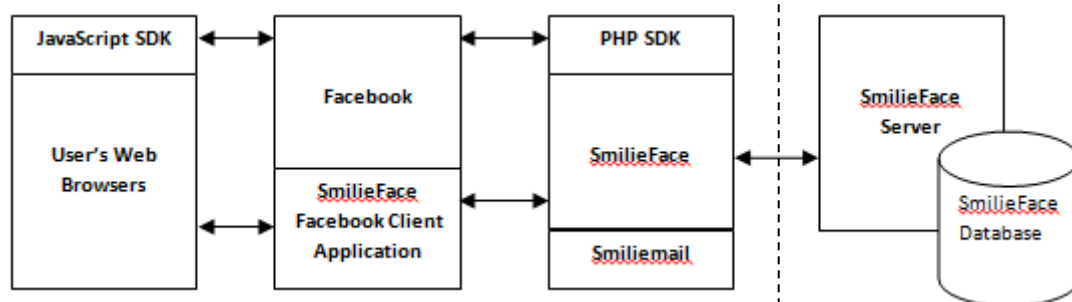


Figure 28 SmilieFace Architecture

The SmilieFace Architecture as depicted in Figure 28, shows the 9 primary components that constitute the SmilieFace system. This chapter will focus on the SmilieFace Server. It is responsible for processing all the data collected by SmilieFace, producing a corresponding SmilieFace video and sending it back to the SmilieFace Facebook Client Application. The data collected by the SmilieFace Server are the SmilieFace users' information (username, sessionID) and the raw or text form SmilieFace message. These data are stored in the database located within the SmilieFace Server. The database also stored all the SmilieFace videos information as well as a list of SmilieFace users and their preferences. The videos produced were stored on the server's file system.

The SmilieFace Server has been developed on top of the existing Smiliemail Server. As the functions of the servers are roughly the same, only minor adjustments are made. These adjustments include the installation of the Facebook PHP SDK. The Facebook PHP SDK is used in conjunction with the Facebook JavaScript SDK to provide seamless session management across both the client and server-sides of the SmilieFace Facebook Client Application. The JavaScript SDK provides a rich set of client-side functionality for making API calls whilst the PHP SDK provides a rich set of server-side functionality for accessing Facebook's server-side API calls.

The SmilieFace Server is a collection of modules that transform the SmilieFace messages into the spoken and acted message referred to as a SmilieFace video. The recipient of the SmilieFace video will then be able to retrieve and view it via a download link or a web page. The SmilieFace server is very similar to the Smiliemail Server and shared a number of similar modules which are responsible to do similar things.

## 5.1 SmilieFace Server Processes

The SmilieFace Server is driven by a simple Perl program that repetitively queries the database to see if any new SmilieFace messages are waiting to be processed. This top level process can be run from a cron job (a time-based job scheduler) if necessary. The *start\_smiliemail\_server.pl* process will sleep for 15 seconds between checking the database, and calls the Perl program *Smiliemail\_process\_next\_message.pl* if a message exists. This program drives the entire conversion process by calling appropriate modules on the system.

By default, the system queries the database to sequentially check the availability of a SmilieFace message to process. However, it is possible to specify a filename that contains a marked up SmilieFace message and process only that specific file. It is also possible to specify a series of database ids and process only the specified list of database ids. This was implemented to aid in systems maintenance and debugging.

### 5.1.1 Database Message Format

The SmilieFace message is stored in the database as various fields and these are returned as an XML-like message for processing. An example of a SmilieFace message follows:

```
<smiley>
<message>
<?xml version="1.0"?>
<!DOCTYPE vhtml SYSTEM "http://www.smiliemail.org/DTD/vhtml_t.dtd">
<vhtml>
<person name="smiliemail_penguin_mermaid" gender="female" voice="english:en1">
<p>
<happy>
Hi <say-as sub="yasinta">Jacinta</say-as><break size="large" />
<break size="large" /> How are you?
</happy>
</p>
```

```

</person>
</vhtml>
</message>
<id>221</id>
<voice>female/english:en1</voice>
<linkid>smile46e0dbcb943ca</linkid>
<video>3</video>
<fmt>af</fmt>
<facename>smiliemail_penguin_mermaid</facename>
<filename>AA-xmas.jpg</filename>
<processed>0</processed>
<from>raytrace@cs.curtin.edu.au</from>
<to>raytrace@cs.curtin.edu.au</to>
<fromName>andrew</fromName>
<toName>Jacinta</toName>
<subject>say-as</subject>
</smiley>

```

A simplified version of the information of this SmilieFace message is shown below:

```

Processing Request: 221
To : Jacinta:raytrace@cs.curtin.edu.au
From : andrew:raytrace@cs.curtin.edu.au
Subject : say-as
Face : smiliemail_penguin_mermaid
BG Filename : [BASE]/images/patterns/AA-xmas.jpg
Voice : female/english:en1
Format : af
Size : 288x216
LinkID : smile46e0dbcb943ca

```

The SmilieFace message is copied into the Temp Folder Name folder with a name “message.txt”, for post mortem debugging purposes. Due to the complexity of the conversion process, and the number of distinct processes called, copious amounts of debugging information can be generated from the various stages. This debugging information can be quickly enabled or disabled.

### 5.1.2 Server Processing

At a high level, the SmilieFace Server obtains input from the SmilieFace Facebook Client Application and returns the SmilieFace video it produced. It also stores the information it obtained in a MySQL database, referred to in Figure 28 as the SmilieFace Database.

At a more detailed level, the first part of the server code reads in configuration files and processes the command line arguments to set various configuration parameters before checking what else needs to be done. The server environment and the command line arguments are used to drive the conversion process – the Message Production Pipeline.

Then the database is queried for the next SmilieFace message to be processed. The database information is parsed to extract information such as recipient, voice or face style and the message marked with the VHML tags. This data is used by the various modules that are invoked within the Message Production Pipeline.

Finally the video is produced and stored on the server, and the recipient is notified of the availability of the SmilieFace video message for viewing. The SmilieFace Server then immediately queries the database for the next message to be processed so as to start the Message Production process again if needed. If not, the system returns to sleep again. Figure 29 depicts the flow diagram for the SmilieFace Server process referred to as the Message Production Pipeline.

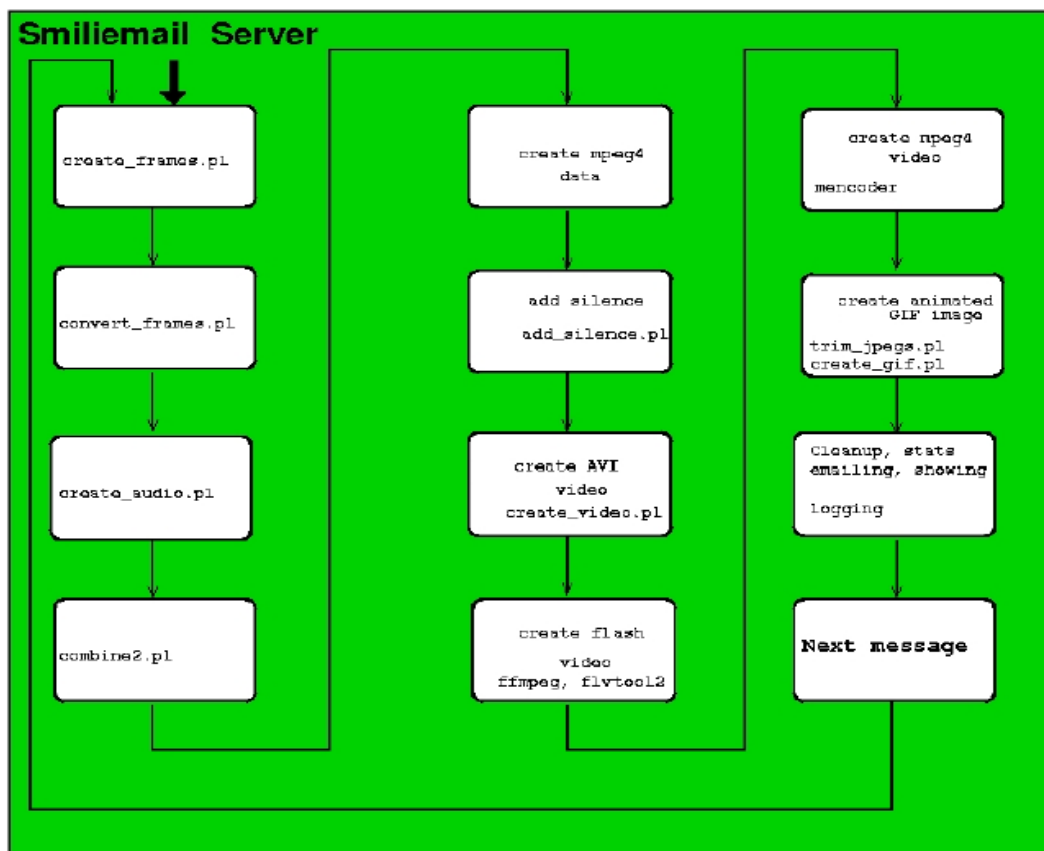


Figure 29 SmilieFace Server Flow Diagram

## **5.2 SmilieFace Message Production Pipeline Modules**

The modules that constitute the SmilieFace Server process also referred to as the Message Production Pipeline as depicted in Figure 29 are elaborated below.

### ***create\_frames.pl***

This Perl module picks up its parameters from the command line or from a pre-defined config file. This Perl script will work out which host the server resides on (smiliemail.org or another domain), create the necessary temporary directories then later set up and execute a hugely parameterised Java program – TalkingHeads.java, which creates the image frames. Once this Java program has finish, either failing or succeeding, the return status is returned. Hence, the top level script can indicate success or failure to the SmilieFace maintainers/debuggers.

### ***convert\_frames.pl***

This Perl module picks up its parameters from the command line or from a pre-defined config file. This Perl script will open the *Frames* sub-directory (where the image frames are kept), and convert (via the Imagick convert program) all the PNG image files into 100% quality JPG files. The PNG files are removed after the conversion. A list of the image names is also produced. The exit status of the conversion is also produced so as to notify the calling Top Level script that the frames conversion is successful. At the Top Level, if it discovered that there are no JPG images, the process ends and an email notification is sent indicating the error. If there is no error, then the length of the video produced will be in the debug file.

### ***create\_audio.pl***

This Perl module picks up its parameters from the command line or from a pre-defined config file. This Perl script will work out which host the server resides on (smiliemail.org or another domain), and then set up and execute a parameterised Java program – CreateAudio.java. This creates Facial Animation Parameters (FAP files) and Waveform Audio File Format (WAV) files from the SmilieFace text. Once this Java program has finish, its exit status is checked. Whether it failed or succeeded, its status is noted. Hence, the top level script can indicate success or failure to the SmilieFace maintainers/debuggers.

### ***combine2.pl***

This Perl module picks up its parameters from the command line or from a pre-defined config file. This Perl script will create a RAW audio file of silence for padding. It will open the FAP file and calculate the total number of FAP entries (number of lines/2). This gives the length

of the audio since it will be  $\text{number\_of\_FAPS} * 2 * 16000 / 25$  (i.e. 25 frames per second, 16 khtz audio). The script then concatenates all the produced WAV files into one total RAW audio file. The same process is done for the total number of FAP files. Finally, the raw audio is converted into a final WAV file.

### ***create\_mpeg4\_data – if requested***

This Perl subroutine will create FAP, WAV, MP3, TXT and a total ZIP file containing these components for MPEG4 production. These components will have been created by a previous step in the pipeline process. The created MPEG4 data is then copied to the MPEG4 Data folder and made available for future retrieval upon a recipient's request.

### ***add\_silence***

This Perl subroutine runs the *add\_silence.pl* program to add several seconds of silence to the end of the produced audio. The *add\_silence.pl* is passed to the folder that holds the produced audio and combines it with the raw silence produced by *combine2.pl* to produce a final 16000 hertz audio track for the video. It uses the *sox* program to combine both audios into the final audio soundtrack. If an error occurs, an error message is logged and the pipeline ends.

### ***create\_avi\_video***

This Perl subroutine calls the *create\_video.pl* program to convert the created JPG images and the audio into an AVI video. The *create\_video.pl* takes as its parameters the video width and height, the number of Frames per second and the name of the movie to produce. It uses the *jpegttoavi* program to convert the JPGs into an AVI movie. It then uses the *mencoder* program to add in the produced audio as a soundtrack to the video. The created AVI Video is then copied to the MOVIE folder awaiting retrieval upon a recipient's request. If an error occurs during the production, then an error message is logged and the pipeline ends.

### ***create\_flash\_video – if requested***

This Perl subroutine runs the *ffmpeg* program to convert the created AVI file into a Flash video. This Perl subroutine runs the *flvtool2* program to adjust the Flash video. The created Flash Video is then copied to the MOVIE folder awaiting retrieval upon a recipient's request. If an error occurs during the production, an error message is logged and the pipeline finished.

***create\_mpeg4\_video – if requested***

This Perl subroutine runs the *mencoder* program to convert the created AVI file into an MPEG4 video. The created MPEG4 Video is then copied to the MOVIE folder awaiting retrieval upon a recipient's request. If an error occurs during the production, an error message is logged and the pipeline finished.

***create\_animated\_gifs – if requested***

This Perl subroutine uses two Perl programs to create the animated GIF; *trim\_jpegs.pl* (deletes every other frame to reduce the size of the animated gif and have it run at half speed) and *create\_gif.pl* (runs the Imagick *convert* program to take the series of jpg images and create an animated GIF file. The created animated Gif is then copied to the GIF folder awaiting retrieval upon a recipient's request. If an error occurs during the production, an error message is logged and the pipeline finished.

***cleanup, stats, emailing, showing, logging***

At the end of the Message Production Pipeline, a general tidying up is done. If required, the temporary folder is removed along with the files created from the database that started the entire process. This depends upon whether the “cleanup” command line argument was specified or not. However, the cleanup is done by default.

Timing statistics are shown to indicate how long the Message Production Pipeline process took to complete. If the “show video” command line argument was given, then the video is shown using *mplayer* without sending a notification message to the recipient and is used for debugging the system. The start and end time along with the message descriptions as well as the SmilieFace message are sent to the maintainer and debugger (if enabled) via email for debugging purposes.

As indicated, the cycle continues from here, querying the database for a new message to be processed if multiple messages have been enabled as a command line argument. Else the process finishes and awaits the next new SmilieFace message in the database that needs rendering.

### **5.3 SmilieFace Server Issue and Concern**

As mentioned earlier in this chapter, the JavaScript SDK is responsible for communicating with Facebook and getting requests from the SmilieFace users, whilst the Facebook PHP SDK is responsible for extracting the information passed on by the JavaScript SDK and handling all the requests from the SmilieFace users. Ensuring the Facebook JavaScript SDK is working properly in conjunction with the Facebook PHP SDK is essential in the creation of a robust SmilieFace Server. However, in the middle of the research, Facebook decided to update their SDKs and render the previous versions obsolete. Unfortunately, the release of the updated Facebook JavaScript SDK and the updated Facebook PHP SDK was two months apart, which created a serious issue within this research. As the updated SDK versions are not backwards compatible, a two months waiting period had to be taken before a re-coding could be done to upgrade to the latest versions of SDKs (Hengky, Marriott, and McMeekin 2012a, 2012b)

Another concern was that the Smiliemail server is an 8 core PC, with 24 gigabytes of main memory communicating to the world via an ADSL2+ network connection. This may sound like a powerful server, but what would happen if the SmilieFace application became very popular? What if 100 users installed it and used it? What if 1,000 or 10,000 users installed it? Facebook encourages this as they can make money from putting advertisements around the application's canvas. But if a video takes 1 minute to produce and is 1 megabyte in size, then 10,000 users would easily swamp this server and its network connection. Response times would drop and the application would not be evaluated as useful nor usable. The researchers want SmilieFace to be popular, but not too popular (Hengky, Marriott, and McMeekin 2012b). This concern posed a serious threat in the ability to create a robust and scalable SmilieFace Server. However, as discussed in Chapter 6, the research experienced severe difficulties in attracting users and evaluators. Hence, this concern did not materialized.

### **5.4 Conclusion**

The Smiliemail Server was successfully converted into the SmilieFace Server by the installation of the Facebook PHP SDK and some adjustments in the SmilieFace Database, to enable it to collect and handle information sent by the SmilieFace Facebook Client Application. As shown in Table 3, the SmilieFace Server can produce a 17 second long video in 43 seconds which is 3 megabytes as an avi, 420 kilobytes as a Flash movie, and 220 kilobytes as an mp4. At the high end, a 5 minute, 13 second video took about 6 minutes to



produce and was 105 megabytes as an avi, and 8 megabytes as a Flash video (Hengky, Marriott, and McMeekin 2012a).

Video Length	Process Time	avi Size	Flash Size
17 Seconds	43 Seconds	3 megabytes	420 kilobytes
5 Minute 13 Seconds	6 Minutes	105 megabytes	8 megabytes

Table 3 SmilieFace Server processing capabilities

The SmilieFace Server is able to reliably and consistently handle all of the requests from the SmilieFace Facebook Client Application and produce SmilieFace videos accordingly in a timely manner, the Sub-hypothesis 2: “A *robust and scalable SmilieFace server for producing affective videos can be developed and implemented*”, is proven.

# Chapter 6

## Data Collection

This chapter discusses the recruitment of participants for, and data collected from the evaluations of SmilieFace. Participation in the evaluation of the app was purely voluntary and was conducted solely via the completion of web-based questionnaires. There were 4 evaluation forms for users to fill out. These will be described in the next section, followed by the reasoning for the questions asked by the research in the questionnaires, and the five point Likert Scale used as a measurement. A description of the statistical tests used to analyse the data given by such a scale will also be given.

### 6.1 Experiment

Every SmilieFace user was able to participate in the evaluation of the app in a purely voluntary manner and this would not affect their experience in using the app should they chose not to partake in the evaluation. However, should they choose to participate, with every questionnaire form filled out, user unlocked extra features privy to evaluators of the app. These extra features included new SmilieFaces to use as avatars, new voices and accents, extended usage of the app as well as the ability to construct bigger SmilieFace messages and the ability to send a SmilieFace message to large number of friends at a time. The purpose of the questionnaire was to obtain feedback from the users, and their feedback is later used to evaluate the hypotheses of this research. Hence to encourage user participation in the evaluations of the app, incentives in the form of unlockable extra features for every questionnaire form filled out was implemented.

There were four questionnaires required to be filled out:

- **Demographic Form.** This inquired about the users' background such as age, gender and their overall familiarity with the internet and web technologies, as well as their preferred means of communicating with their friends and their expectations. It would take approximately ten to fifteen minutes to complete.
- **Sender Evaluation Form.** For those users who **sent** a SmilieFace message, this form asked them about their experiences in composing a SmilieFace message. It also asked about their general opinion about the app and their expectations after sending out a SmilieFace message. It would take approximately ten to fifteen minutes to complete.

- **Viewer Evaluation Form.** This form asked those who have **received** a SmilieFace message about their opinion after viewing a SmilieFace video. It also asked about their general view on the app and whether they would send out a SmilieFace message. It would take approximately ten to fifteen minutes to complete.
- **Summative Form.** After the users have been familiar with the SmilieFace application through sending and receiving SmilieFace messages, this form allowed the users to assess the application by giving comments on their overall experiences after using the app. It would take approximately twenty to thirty minutes to complete.

## 6.2 Questionnaires

The questionnaires were designed primarily to fulfil the requirements of evaluating the effectiveness of SmilieFace against the hypotheses described in Chapter 3. Table 6.1 below will show the reasoning behind every question and its correlation with the related hypotheses that the question aimed to test. Each questionnaire will be described in its own subsection.

Subsection	Purpose	Related Hypothesis
6.2.1 Demographic Form (Online)	Questions concerning the users' background such as age, gender etc. Users' familiarity with the internet and related web technologies can be used for classifying the user when analysing feedback.	
6.2.2 Sender Evaluation Form (Online)	Questions concerning whether or not users are able to compose a SmilieFace message intuitively and easily as well as their expectations after sending a SmilieFace message.	<b>Sub-hypothesis 3:</b> SmilieFace will be easy to use and engaging for its users, capable of attracting a substantial number of users, and become a popular application
6.2.3 Viewer Evaluation	Questions concerning whether or not users are able to understand the SmilieFace message sent to them and	<b>Sub-hypothesis 1</b> A robust SmilieFace client for creating and viewing affective videos as an

Form (Online)	reciprocate in kind the emotion associated in the message. As well as whether they will continue to use SmilieFace to exchange messages with their friends.	alternative Facebook messaging service can be designed, developed and implemented  <b>Sub-hypothesis 2</b> A robust and scalable SmilieFace server for producing affective videos can be developed and implemented
6.2.4 Summative Form (Online)	Higher level questions that enable SmilieFace users to assess the effectiveness of the applications by giving comments on their overall experiences after using the app.	<b>Hypotheses:</b> SmilieFace will be an innovative and engaging Facebook application which will enhance its users' experience in Social Networking

Table 6.1: Reasoning for Questions

### 6.2.1 Demographic Form

This questionnaire obtained some background information on the participants which can be used to group participants. Different groups may have varying attitudes towards the SmilieFace application. However, by splitting the number of participants into groups, a large number of participants will be required in order to ascertain the legitimacy of the data collected. The distinction between the feedback from each group will be trivial if the difference between the members of each group is small. As an example, in a group that consist of two people under the age of 30, one out of the two preferred cheese rather than chocolate, however, there is insufficient data to conclude that 50% of people under the age of 30 likes cheese better than chocolate due to inadequate number of people in the group.

The reasons for the questions in the demographic form are justified by the following:

- “Do you primarily communicate in English on a day to day basis?” is necessary to determine how proficient the users are able to communicate in English, in order to

establish whether the user is able to understand what is required of them as SmilieFace is to cater primarily for English speaking users.

- *Gender* is necessary as females might send more SmilieFace message than male or vice versa.
- *Age* is necessary to gauge the age group that would most likely use the app.
- *Highest Education* is necessary to ensure everybody should find the application easy to use regardless of their education level.
- Their experience in using *Emails* is necessary as familiarity with using Emails should make using the SmilieFace application intuitive for them as well.
- Their experience in using *Short Messaging Service (SMS)* is necessary to determine whether they are accustomed to send short messages to their friends.
- Their experience in using *Instant Messenger* is necessary to decide whether they are comfortable with exchanging messages.
- Their experience in using *YouTube* is necessary to gauge their inclination in viewing videos online.
- Their experience in using *Video Games* is necessary to understand their familiarity with cartoon or lifelike controllable characters.
- Their experience in using *Avatars (Digital Representation)* is necessary to comprehend whether they are well adjusted in using a digital representation.
- Their experience in using *Second Life* is necessary as being knowledgeable here might mean the users are less awkward in using avatars to represent themselves.
- Their experience in using *Cell Phones* is necessary to ascertain their preferred method of communication.
- Their experience in using *Smart Phones (iPhone, Android, etc)* is necessary to establish whether the users are familiar with apps.
- Their experience in using *iPad type devices* is necessary to determine whether they are up to date with different communication devices.
- Their experience in using *Facebook* is necessary to discern their level of familiarity with Facebook.
- Their experience in using *Google+* is necessary to discover whether the users are current with the latest SNS.
- Their experience in using *Other Social Network Sites (MySpace, Friendster, etc)* is necessary to understand their interest in SNS.

- Their experience in using *Other Social Media Sites (tumblr, flickr, blogs, etc)* is necessary to recognize how familiar the users are with Social Media in general.
- “*Which of the following technology do you prefer to use to communicate with you friends?*” is necessary to establish the users preferred communication method.
- “*How do you normally access Facebook?*” is important to denote the users preferred device when accessing Facebook.
- “*What do you mainly use Facebook for?*” is important to understand the users’ motivation in using Facebook.
- “*On average, how much time do you spend on Facebook per day?*” is important to establish the users’ familiarity with the Facebook platform.
- “*On average, how much time do you spend online per day?*” is important to understand the correlation between the time they spent online and compare it with the time they spent on Facebook.
- “*What do you normally do online?*” is required to differentiate between the time spend online with the time spend on Facebook and recognize the users’ online behaviour.
- “*What features do you expect from a messaging application?*” is crucial for understanding the users’ expectation of a messaging application.
- “*What features do you expect from a messaging application in the future?*” is crucial to determine the users idea of a futuristic messaging application.

The questions in the Demographic Form are required in order to better understand the SmilieFace’s user base. By comprehending which type of users that the app is able to attract, it will make any future efforts to improve the app easier as well as realizing any potential to market the app to a broader audience. By analysing the app’s user base, their familiarity with the Internet and technology as well as their online behaviours, it is possible to use this knowledge as a foundation for future research and app development.

### **6.2.2 Sender Evaluation Form**

Questions in the Sender Evaluation Form were specifically designed to test Sub-hypothesis 3: “*SmilieFace will be easy to use and engaging for its users, capable of attracting a substantial number of users, and become a popular application*”. The evaluators are asked a series of questions concerning their experience whilst composing a SmilieFace message, to determine whether they found their experiences intuitive and easy. They were also asked what their

expectations were after sending out a SmilieFace message. Whether they are looking forward to getting a reply from the recipient of their message and whether it meets their expectations of what a messaging application should be.

Questions	Purpose
It is easy to create a SmilieFace message.	Test whether the user finds the application easy to use.
The SmilieFace application is intuitive.	Test whether the user is able to intuitively use the application without any assistance.
It is quick and easy to create a SmilieFace Message.	Tests whether the user finds the entire message composition process quick and easy.
The tags helped me to express my emotion in my message.	Test whether the user finds the application helpful in expressing their emotion.
What do you like about the "compose a message" component of SmilieFace?	Discover what the user enjoyed using during the message composition process.
What do you dislike about the "compose a message" component of SmilieFace?	Discover what deterred the user from composing a SmilieFace message.
Any change / improvement you would like to see in the composing of the message?	Getting feedback from the user on how the message composition process can be improved.
Would you use the SmilieFace application again in the future?	Getting feedback from the user on their satisfaction after using the application.
I look forward to seeing how my friends react to the Smilieface message I sent to them.	Enquire about how the user expects their friends would react after receiving their message.

I look forward to receiving a Smilieface message in return.	Enquire whether the user would like their friends to send them a Smilieface message.
-------------------------------------------------------------	--------------------------------------------------------------------------------------

**Table 6.2: Reason for Sender Evaluation Form**

The understanding of users' experiences after composing a SmilieFace message is crucial in testing Sub-hypothesis 3: "*SmilieFace will be easy to use and engaging for its users, capable of attracting a substantial number of users, and become a popular application*". The feedback obtained can be used to establish the positive and negative aspects of the app as perceived by the users. The feedback can also be used to determine the users' attitude after using the app which served as an important indicator to the effectiveness of the app itself. The separation of the Sender Evaluation Form from other evaluation forms allowed the research to focus on the "Compose a SmilieFace message" part of the app and any feedback obtained can be used to further improve the app in the future.

### 6.2.3 Viewer Evaluation Form

The questions in the Viewer Evaluation Form enquire whether the users are able to understand the SmilieFace message sent to them and reciprocate the emotion infused in the message sent to them. The users will also be asked whether they would continue to use SmilieFace to exchange messages with their friends. The primary purpose for the Viewer Evaluation Form is to test Sub-hypothesis 1: "*A robust SmilieFace client for creating and viewing affective videos as an alternative Facebook messaging service can be designed, developed and implemented*" and Sub-hypothesis 2: "*A robust and scalable SmilieFace server for producing affective videos can be developed and implemented*".

Questions	Purpose
The SmilieFace message is interesting.	Test whether the user finds the application interesting.
I can understand the feeling that the sender is trying to convey through the SmilieFace message.	Test whether the user is able to comprehend the emotion infused within the SmilieFace message sent to them.



I look forward to receiving more SmilieFace messages in the future.	Tests whether the user would like to continue receiving more SmilieFace message.
What do you like about the "view the message" component of the SmilieFace?	Discover what the user finds enjoyable whilst viewing the SmilieFace message.
What do you dislike about the "view the message" component of the SmilieFace?	Discover what dissuades the user from viewing the SmilieFace message.
Any change / improvement you would like to see in viewing the message?	Getting feedback from the user on how the viewing process can be improved.
I look forward to send a Smilieface message in return.	Enquire whether the user would like to send their friends a Smilieface message.

**Table 6.3: Reason for Viewer Evaluation Form**

Sub-hypothesis 1: “A robust SmilieFace client for creating and viewing affective videos as an alternative Facebook messaging service can be designed, developed and implemented” and Sub-hypothesis 2: “A robust and scalable SmilieFace server for producing affective videos can be developed and implemented” can be confirmed or denied by comprehending the users’ experiences after viewing a SmilieFace message. The feedback obtained can be used to gauge the effectiveness of the app and define the users’ attitude towards the app.

#### 6.2.4 Summative Form

The higher level questions in the Summative Form are intended to test the Hypotheses: “SmilieFace will be an innovative and engaging Facebook application which will enhance its users’ experience in Social Networking”. SmilieFace users assess the effectiveness of the application by giving comments on their overall experiences after using the app.

Questions	Purpose
The SmilieFace application is an innovative way to communicate with my friends on Facebook.	Test if the user finds the application original and inventive.

The SmilieFace application is an effective way to communicate with my friends on Facebook.	Test if the user finds the application to be a practical way to communicate.
The SmilieFace application allowed me to express my emotion on the SmilieFace message I created.	Tests if the user finds the SmilieFace message created is affective in nature.
The SmilieFace application improved my interactions with my friends on Facebook.	Test if the user finds the application helpful in expressing themselves.
Any change / improvement you like to see in the SmilieFace application?	Discover what the user might suggests to make the application better.
Would you use the SmilieFace application again?	Discover whether the user would continue using the app.
Would you recommend the SmilieFace application to someone else?	Discover whether the user would share the app.
Do you know of any application that is similar to the SmilieFace application?	Discover whether the user has knowledge of a related app.
Did the SmilieFace application enhanced your Social Networking experience in Facebook?	Enquire whether the user finds the app able to make their SNS experience better.
How often did you check your SmilieFace Messages?	Cross checking the user's input with our records.
How often did you use the SmilieFace Application?	Cross checking the user's input with our records.
How many SmilieFace message did you received?	Cross checking the user's input with our records.
How many SmilieFace message did you send out?	Cross checking the user's input with our records.
Does it meet your expectation for a messaging application?	Discover whether the app fulfilled their expectations.

Does it meet your expectation for a messaging application in the future?	Discover whether the app fulfilled their expectations for a futuristic application.
What part of the SmilieFace application failed to meet your expectation?	Discover what part of the app that the user disliked.
What part of the SmilieFace application did you enjoyed the most?	Discover what part of the app that the user liked.
Further comments you liked to make regarding the SmilieFace application?	Enquire whether the user has any further comments about SmilieFace.

**Table 6.4: Reason for Summative Form**

Users assessment collected by the Summative Form will prove or disprove the Hypotheses: “*SmilieFace will be an innovative and engaging Facebook application which will enhance its users’ experience in Social Networking*”. The comments and feedback given by SmilieFace users in the Summative Form as well as the other evaluation forms previously mentioned were conjunctively used in to conclude the overall effectiveness of the application.

### **6.3 Recruitment Process and Data**

The previous section discussed the web-based questionnaires that were used to test the hypotheses in this research. This section will discuss the recruitment process undertaken as well as the data obtained during the evaluation of SmilieFace. The data collected during the evaluations stems from the questionnaires forms that the user voluntarily filled out, the user statistics collected by the SmilieFace database, and application statistics collected by Facebook.

#### **6.3.1 Recruiting participants for the evaluation**

A preliminary evaluation of SmilieFace was started on the 24<sup>th</sup> of September 2012. This intensive pilot study was advertised through a wall post in a Facebook account owned by the primary researcher who had 52 friends.

This was necessary because in a controlled environment consisting of a small number of users, any flaws in the application or issues experienced by the users can be reported directly to the primary researchers. This research also looked into the viral nature of how applications, news or pictures can spread through the internet, via a *Social Networking Site* such as Facebook, as it might help in getting more people to use SmilieFace and participate in the evaluations. Furthermore, it was a precautionary action undertaken to ensure that the SmilieFace Server was able to robustly handle all requests made in a timely manner.

However after 5 days, there was not a single new user for SmilieFace and nobody was sharing or promoting the application. After discussing this result with members of the research team, it was decided that a possible reason for the lack of new participants might be due to the small pool of potential users coupled with the fact that some had already participated in the preliminary evaluation prior to the public release of the application. Potential users that might be interested to use the application might already be using it hence did not feel the need to participate again.

Therefore a new strategy to obtain new users was needed. Hence from the 1<sup>st</sup> of October, SmilieFace was promoted in 3 tutorial classes for a computing unit in Curtin University, where one of the researchers was the lecturer in charge. Flyers that provided a short description of the app, with images of various avatars to choose from, as well as how to access the app, along with the benefits in participating in the evaluation of the app were distributed in each of the tutorial classes. Each tutorial class consisted of between 15 to 20 students. Unfortunately, it coincided with the unit's midterm exam which might contribute to the lack of the students' interest in using the app hence there was no new users at the end of the week.

After two weeks without a single new user, a more proactive approach was taken. A face to face presentation between the primary researcher and potential users was deemed necessary. In the presentation, the primary researcher could introduce the application, explain about the research and how participants are necessary, and at the same time potential users could voice their opinions about the research and enquire about the application as well.

Hence, between the 8<sup>th</sup> of October and 19<sup>th</sup> of October, four presentations were carried out during the lectures for four computing units in Curtin University. The presentations were well received, with a lot of enthusiasm in the form of questions about the application and the

research in general. However, despite the enthusiasm from potential users during the presentation, the number of new users was scarce. And as of 29<sup>th</sup> of October 2012, SmilieFace had 24 users. 12 users had installed the application but did not compose a message. While only 9 users had filled out the evaluation forms.

### 6.3.2 Recruitment Data

This section will discuss the statistic data collected by Facebook during the evaluation of SmilieFace. Facebook had collected the number of users who had clicked and installed the app, a record of daily, weekly and monthly active users, their gender and age distributions as well as the user's country of origin.

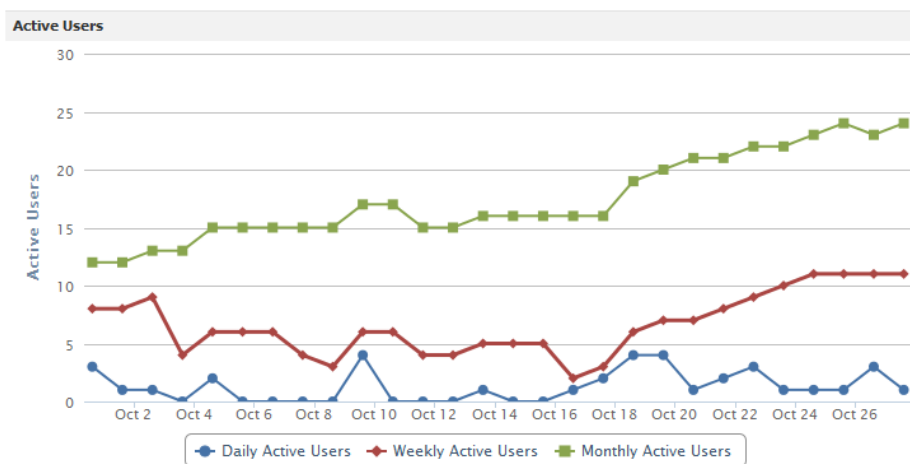


Figure 30 SmilieFace Active Users (1/10/2012 - 27/10/2012)

Figure 30 is the data statistics collected in Early October. The figure showed that SmilieFace, on the first of October had 12 active users and at the end of the month, the application had 24 active users. The numbers of weekly active users deteriorated at the start of the month yet gradually increased towards the end of the month and reached a higher point than at the start of the month. The number of daily active users peaked at 4 users in a day.

#### Demographics - Total Users

##### Gender and Age<sup>2</sup>

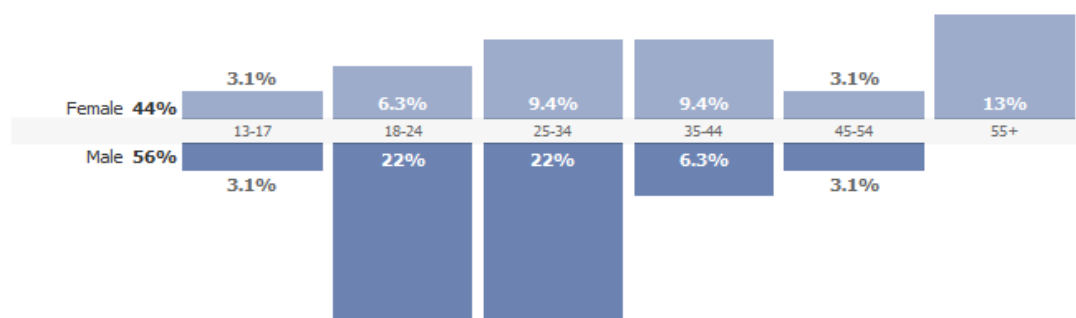


Figure 31 SmilieFace Users Demographics (1/10/2012 - 27/10/2012)

Figure 31 showed that in October, SmilieFace users are mostly Male (56%) although Female (44%) are quite close behind. Most of the male users are between the age of (18-24 and 25-34) while the female users are generally older (25-44 and 55+).

Figure 32 demonstrates where SmilieFace users are based. And from that figure it can be observed that the majority of the SmilieFace users are located in Australia and resided in Perth (14 users). The primary language that SmilieFace users used is English (22 users). SmilieFace has 11 European users and 3 of them are Scandinavians. There are also 6 users from South East Asia and 1 from the US. During this period, Facebook recorded a total of 32 users for SmilieFace, while the SmilieFace database recorded only 25 users. The discrepancies in data occurred as Facebook included people who install the app but chose not to share their information with the app while the database can only register those who do share their information.

Countries <sup>?</sup>	Cities <sup>?</sup>	Language <sup>?</sup>
14 Australia	14 Perth, WA, Australia	15 English (US)
2 Germany		7 English (UK)
2 United Kingdom		3 German
1 Austria		1 Indonesian
1 Denmark		1 Danish
1 Hong Kong		1 Italian
1 Indonesia		1 Malay
1 Malaysia		1 Norwegian (bokmal)
1 Italy		1 Swedish
1 Hungary		1 Hungarian
1 Norway		<a href="#">Less</a>
1 Philippines		
1 Pakistan		
1 Serbia		
1 Singapore		
1 United States		
1 Sweden		

Figure 32 SmilieFace Users Base (1/10/2012 - 27/10/2012)

Application statistics from Late October to Mid November as shown in Figure 33, displayed a steady increase in the number of people who had installed SmilieFace. From 18<sup>th</sup> of October until 14<sup>th</sup> of November, people who had installed SmilieFace doubled in number, rising from 19 to 45. This might suggest that the presentations previously conducted in four computing lectures in Curtin University, had come to fruition. However during this period, only 7 SmilieFace messages were sent out, while only 1 user partially evaluated the application. While people seemed quite happy installing the application, encouraging them to continually use and send SmilieFace messages in addition to evaluating the application was another challenge in itself.

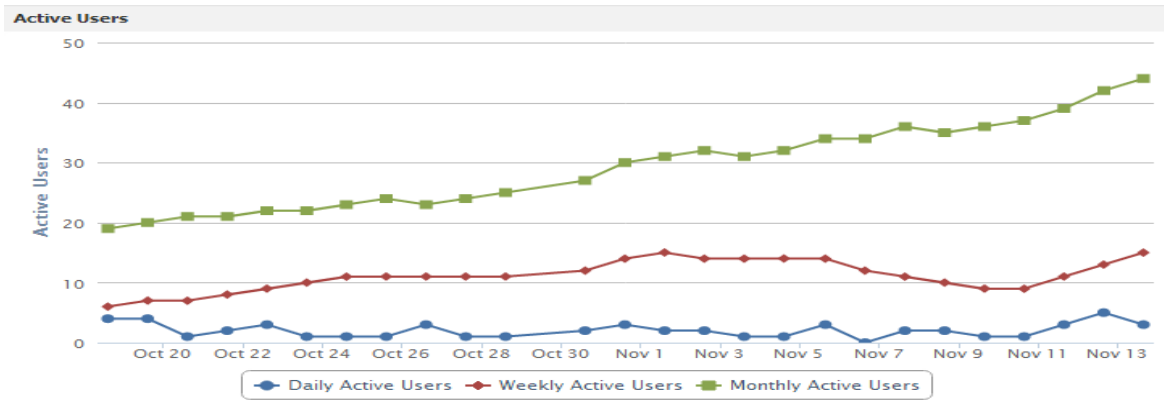


Figure 33 SmilieFace Active Users (18/10/2012 - 13/11/2012)

Compared to Figure 31, Figure 34 shows an even distribution of Male and Female users. Continuing the previous trend, most of the male users are still between the age of 18-24 and 25-34. The female users on the other hand are from a wider range of age group.

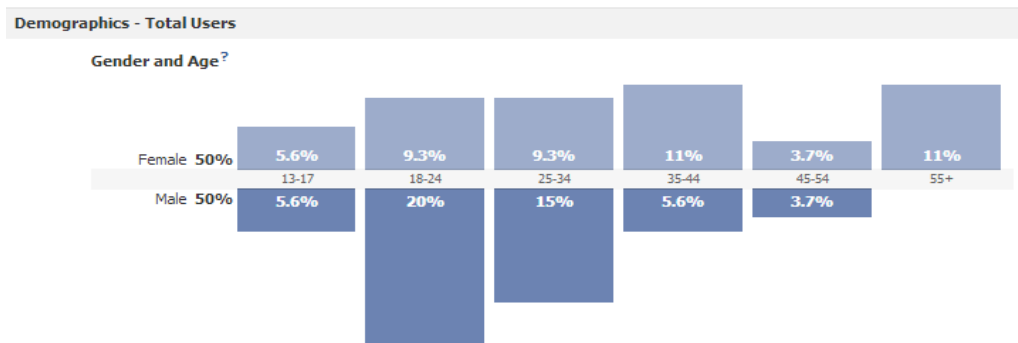


Figure 34 SmilieFace Users Demographics (18/10/2012 - 13/11/2012)

Figure 35 still maintained that the majority of the SmilieFace users are Australian and resided in Perth. The primary language used is still English (28 users). SmilieFace has attracted users from a more variant countries in the world compared to previous data.

Countries?	Cities?	Language?
13 Australia	13 Perth, WA, Australia	20 English (US)
9 Germany		10 German
4 United Kingdom		8 English (UK)
4 Norway		4 Norwegian (bokmal)
2 Belgium		3 Dutch
2 Indonesia		1 Arabic
2 India		1 Danish
2 United States		1 French (France)
1 Hong Kong		1 Hebrew
1 Austria		1 Hungarian
1 Canada		1 Indonesian
1 Algeria		1 Italian
1 France		1 Malay
1 Malaysia		1 Swedish
1 Denmark		Less
1 Israel		
1 Italy		
1 Philippines		
1 Hungary		
1 Pakistan		
Less		

Figure 35 SmilieFace Users Base (18/10/2012 - 13/11/2012)

As previously discussed in Chapter 4, Facebook policy changed during this research and subsequently required all third party application such as SmilieFace to obtain a valid SSL certificate. A valid SSL certificate must be issued by a Certificate Authority which identified the legitimacy of a website owner's identity. A valid SSL certificate contains information that verified the owner of the certificate, and must be signed by a trusted authority.

This research had decided to use a Self Signed SSL certificate instead which caused a security warning that appears in IE and FF browsers. These security warnings alert the users of certificate errors or unverified certificate errors and might deter any uninformed potential users from clicking and installing SmilieFace. The Self Signed SSL certificate also caused the application to be inaccessible via a Chrome browser or an older version of FF, hence further limiting the potential SmilieFace users.

Cases where user Facebook accounts were getting hacked or viruses spreading through clicking links or installing applications on Facebook made most users more cautious and wary about installing some unknown application with a security warning even if they are being sent by a friend. It was decided that the research would sign up for a trial SSL certificate users which last for 90 days hence eliminating all the issues associated with the Self-Signed SSL certificate.

Facebook statistics collected from Mid November to Mid December as shown in Figure 36, displayed the number of active SmilieFace users from 14<sup>th</sup> of November until 11<sup>th</sup> of December had dropped from 42 users to 40 users at one point before rising up to 52 users. Meanwhile, during this period, no users sent out any SmilieFace message or evaluated the application. After reviewing the data collected in this period, it was suggested that a lack of a SSL certificate might be preventing the application from getting more users.

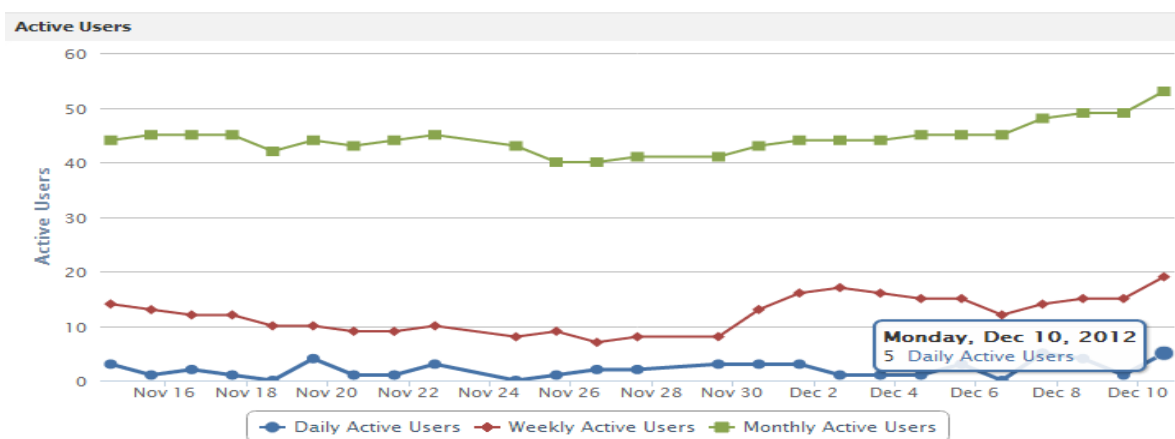


Figure 36 SmilieFace Active Users (14/11/2012 - 11/12/2012)



Figure 37 shows that during the period of 14<sup>th</sup> of November until 11<sup>th</sup> of December, SmilieFace experienced a large influx of users from Germany. This was welcomed albeit unexpected as the application itself is primarily released in Western Australia and is exposed in a university environment that consist of either Australians or from a more diverse number of countries instead of a concentrated group of people from Germany.

Countries <sup>?</sup>	Cities <sup>?</sup>	Language <sup>?</sup>
33 Germany	13 Perth, WA, Australia	36 German
13 Australia		23 English (US)
6 United Kingdom		11 English (UK)
5 Norway		5 Norwegian (bokmal)
4 India		4 Dutch
3 Austria		2 French (France)
3 Belgium		1 Arabic
3 United States		1 Danish
2 Algeria		1 Hebrew
2 Indonesia		1 Hungarian
1 Hungary		1 Indonesian
1 Denmark		1 Italian
1 France		1 Malay
1 Hong Kong		1 Swedish
1 Israel		Less
1 Canada		
1 Italy		
1 South Korea		
1 Malaysia		
1 Nepal		
Less		

Figure 37 SmilieFace Users Base (14/11/2012 - 11/12/2012)

Facebook statistics collected from Mid December to Early January as shown in Figure 38 displayed the start of a period where the Self Signed SSL Certificate was replaced with a valid trial SSL Certificate. During this period, the number of people who have installed Smilieface rises from 50 to 100. This suggested that without the security warning caused by the Self-Signed SSL certificate, users are more willing to install the application.

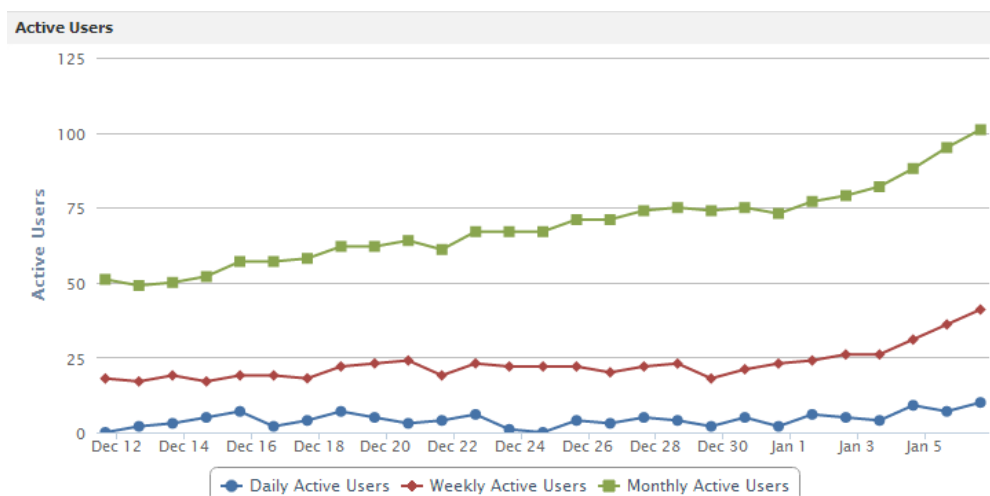


Figure 38 SmilieFace Active Users (11/12/2012 -7/1/2013)

Figure 39 continued to show the increasing popularity of SmilieFace among users from Germany. While SmilieFace continued to spread among other countries as well, the number of people who evaluated the application remained scarce.

Countries?	Cities?	Language?
71 Germany	14 Perth, WA, Australia	77 German
15 Australia		40 English (US)
11 United States		13 English (UK)
9 India		7 Norwegian (bokmal)
8 United Kingdom		6 Dutch
7 Norway		3 French (France)
6 Austria		2 Spanish (Spain)
5 Belgium		2 Hebrew
2 Denmark		1 Hungarian
2 Algeria		1 Danish
2 Indonesia		1 Spanish
2 Israel		1 Italian
2 Malaysia		1 Indonesian
1 Bosnia and Herzegovina		1 Arabic
1 Canada		1 Malay
1 Chile		1 Serbian
1 Ecuador		1 Swedish
1 France		Less
1 Hong Kong		
1 Hungary		
Less		

Figure 39 SmilieFace Users Base (11/12/2012 - 7/1/2013)

In an effort to get more users to use and evaluate SmilieFace, it was decided that 2 more presentations would be held in summer classes held during the 11<sup>th</sup> and 14<sup>th</sup> of January. During the presentation, the application was introduced to the class and SmilieFace example videos of were also shown.

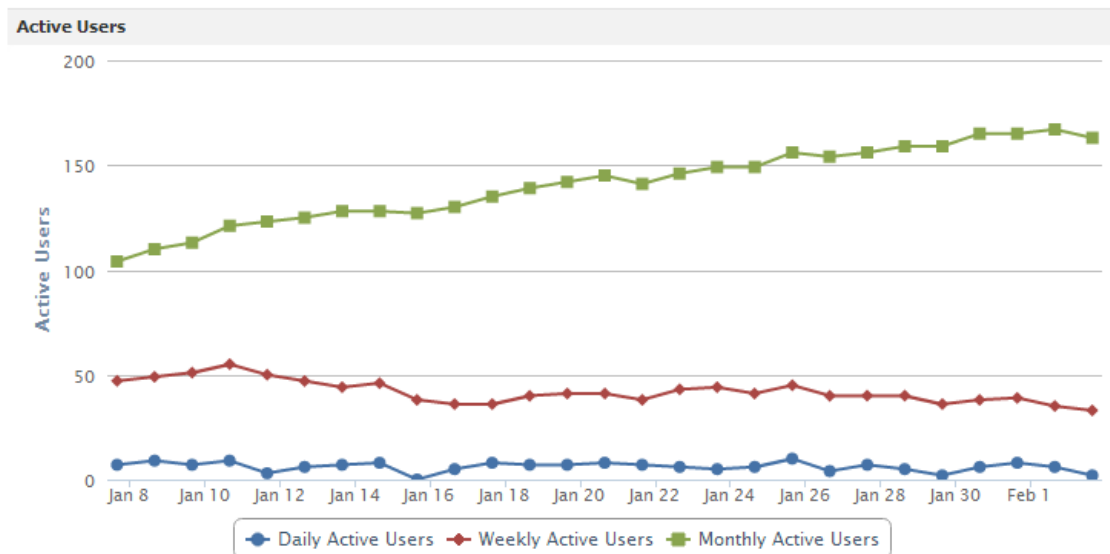


Figure 40 SmilieFace Active Users (7/1/2013 - 3/2/2013)

Facebook statistics collected from Early January to Early February as shown in Figure 40, showed the ever increasing number of people who have installed SmilieFace. During this particular period, the number of users rises from 100 to 152 users. However, only a small number of users actually sent out a SmilieFace message and even fewer users helped to evaluate the application.

The ever increasing number of users from Germany as shown in Figure 41 is an interesting anomaly. It was decided that the research should look further into the reason why the application was able to attract such a large number of users from Germany. An email containing some follow up questions was sent to each of the German users in order to try to explain this anomaly.

The follow up questions were translated from English into German in order to better the chance of getting a reply from them. In the email sent to the Germans, they were asked about how they came across the app, why they decided to install the app and whether they experienced any difficulties in using the app or partake in the evaluation of the app. However, not one of the hundreds of Germans who had installed SmilieFace replied to the email sent to them, casting doubts whether these German users were legitimate Facebook users instead of a series of bots that installs various third party applications on the Facebook platform, with malicious or questionable intent.

Countries <sup>?</sup>	Cities <sup>?</sup>	Language <sup>?</sup>
123 Germany	15 Perth, WA, Australia	137 German
19 Australia		55 English (US)
16 United States		20 English (UK)
15 India		10 Norwegian (bokmal)
12 Austria		8 Dutch
12 United Kingdom		6 French (France)
10 Norway		2 Spanish (Spain)
5 Belgium		2 Hebrew
3 Algeria		1 Indonesian
3 Sri Lanka		1 Arabic
2 Israel		1 Spanish
2 Denmark		1 Hungarian
2 Indonesia		1 Serbian
2 Malaysia		1 Danish
2 Mauritius		1 Malay
2 Switzerland		1 Romanian
2 Netherlands		1 Italian
2 Saudi Arabia		1 Swedish
1 Bosnia and Herzegovina		Less
1 Canada		
Less		

Figure 41 SmilieFace Users Base (7/1/2013 - 3/2/2013)

Facebook statistics collected from Early February to Early March as shown in Figure 42, displays a large dip in the number of active SmilieFace users. It went from 152 users to 125 users before it experienced an increase close to 200 users. The dip coincided with the Chinese New Year as well as Valentines’ day, which suggest that some Facebook users did not remain active during this period. SmilieFace had added a Valentine’s Day message template especially for the occasion.

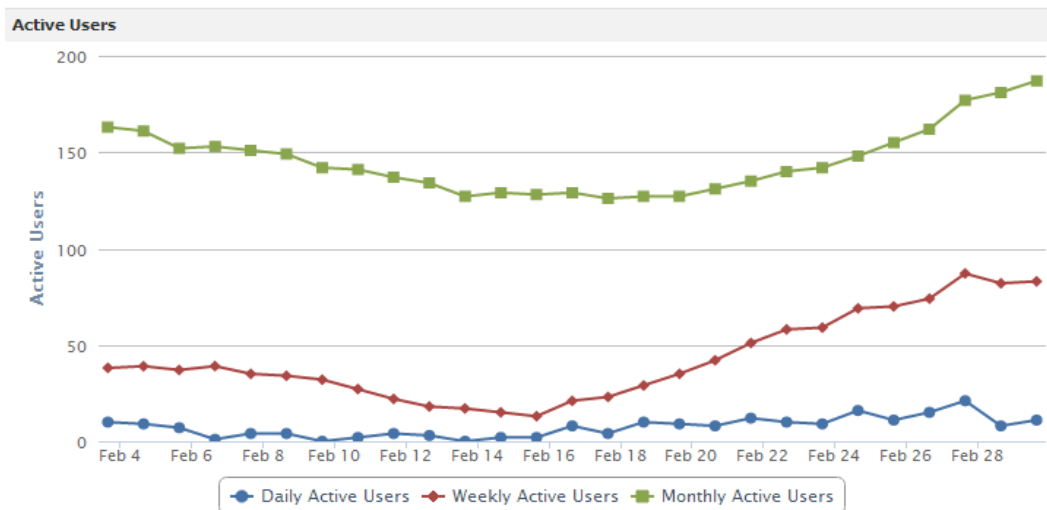


Figure 42 SmilieFace Active Users (3/2/2013 - 2/3/2013)

Figure 43 not only showed that most of SmilieFace’s users are from Germany but it also showed that users’ from India had exceeded the number of users from Australia where the application was originally released.

Countries?	Cities?	Language?
196 Germany	16 Perth, WA, Australia	218 German
22 India		72 English (US)
21 Australia		26 English (UK)
20 United States		12 Norwegian (bokmal)
16 Austria		9 Dutch
15 United Kingdom		9 Portuguese (Brazil)
13 Norway		8 French (France)
9 Brazil		4 Danish
7 Belgium		3 Spanish (Spain)
7 Switzerland		3 Hungarian
5 Denmark		3 Swedish
5 Algeria		2 Czech
3 Hungary		2 Hebrew
3 Indonesia		2 Italian
3 Sri Lanka		2 Romanian
3 Sweden		2 Serbian
2 Canada		1 Arabic
2 Israel		1 Greek
2 Italy		1 Spanish
2 Mauritius		1 Croatian
Less		Less

Figure 43 SmilieFace Users Base (3/2/2013 - 2/3/2013)

### 6.3.3 Recommendation for future evaluations

After going through the difficulties in getting participants to evaluate SmilieFace, the research has some recommendations that might be beneficial to future research that is conducted via a third party application on the Facebook platform:

1. Getting an SSL certificate. Facebook requires all third party application to obtain a valid SSL Certificate and for the app to be hosted in a https site.
2. Group of active users. Having a core of active users with a large friend list that are actively using the app and constantly sending out invites to their friends will help the app to gain more popularity as mentioned in Chapter 2. This is a possible reason why SmilieFace was not a viral success. One researcher was not a Facebook user, one was a casual user, and the other was the chief investigator, and it was not seen as ethical nor statistically valid for any of the researchers to “drive” the adoption of the app.
3. Incentives. Giving a token of appreciation for users when they took part in the research as well as when they help promote the app. This can be as simple as making certain features in the application available or giving them additional functionality not available to normal users.
4. Fun. Making the application fun and engaging is very important. Users might be reluctant to participate if the application is designed solely for research and makes the users feel like they are test subjects. Getting the users to enjoy using the app will ensure continuous use as well as the promotion of the app to other users.
5. Trust. If the users do not trust the app, they will never use it. Having an app page where users can contact the developer as well as having a clearly written privacy statement and terms and conditions will give more credibility to the app. Ensuring users that their information and private data will not be abused will make them more likely to use the application.

As Facebook constantly evolves, so will its user base, users might be more sceptical and cautious when sharing their private information, Facebook might remove or implement certain features and it is of utmost importance for current and future developer to keep track with the changes and adapt then act accordingly.

## **6.4 Conclusion**

From the Facebook statistics gathered, several things become clear. Using a Self Signed SSL certificate was one cause for the lack of SmilieFace users. However, getting existing users to fill in the evaluation forms is another issue by itself. Users might be unwilling or reluctant to spend the time and effort to fill in the evaluation unless given some incentives. While the SmilieFace application provided certain bonus features for every evaluation forms filled, it still finds it especially difficult to attract participants.

Unfortunately, a third party application such as SmilieFace will always have difficulties in handling bot users with malicious or questionable intents. An application on Facebook will always assume all Facebook users are legitimate. As part of its due diligence, Facebook has required all its users to submit valid user information on their profile. However, this can always be circumvented hence it would be in Facebook's interest as well as responsibilities to ensure that Facebook users are who they say they are.

People who are accessing SmilieFace via their mobile device, might be discourage when they are experiencing a significant loading time due to their mobile network as well as the constraints posed by the size of their mobile screen.

It is fairly clear that security and privacy is of utmost importance to users, especially since people are becoming more knowledgeable about Facebook.

SmilieFace also faced tough competitions from mobile messaging application which is an easier and more familiar way people to communicate compared to the innovative SmilieFace.

Regrettably, SmilieFace was not able to go viral and attract thousands of users. Furthermore, given the exposure and the large pool of potential users afforded by Facebook, it was quite surprising how the application only managed to attract so few users. As shown in Chapter 7, the Data Analysis Chapter, the results obtained in this study could not be easily applied as the view of the broader Facebook community.

# Chapter 7

## Data Analysis and Results

The previous chapter described the process and the difficulties involved in getting participants for the evaluation of SmilieFace. Usage statistics from Facebook were also provided, along with the justifications and explanations of the questionnaire forms used to get evaluations from users of the application. This chapter analyses the data gathered from the questionnaire forms. Each of the questionnaire forms is discussed and analysed starting from the Demographic Form to the Sender Form, proceeding to the Viewer Form and ending in the Summative Form. A conclusion derived from analysing the data gathered from the evaluation forms is provided at the end of the chapter.

As mentioned previously, user's participation was purely voluntary and there was no penalty for not participating. However, should a user choose to partake in the evaluation, additional features were unlocked for every questionnaire form submitted. All the extra unlockable features privy to the evaluators have been discussed in the previous chapter, and were deemed necessary as an incentive for getting more users to evaluate SmilieFace.

### **7.1 Database Statistics**

The SmilieFace Database has recorded a total of 340 people who have installed the application. However, 293 users which represent 86.2% of the total users, did not send a single SmilieFace message, while 47 users or 13.8% of the total users, sent at least 1 SmilieFace message. A full breakdown of the users can be seen in the Table 4 below.

Of the 47 users that sent a SmilieFace message, 32 users completed the Demographic Evaluation Form, 27 users completed the Sender Evaluation Form, 28 users completed the Viewer Evaluation Form, and 28 users completed the Summative Evaluation Form. A total of 120 SmilieFace messages were sent out during the evaluation period.

As shown in Chapter 6, Figure 43, 196 users out of the recorded 340 users were from Germany, represented an interesting anomaly which is discussed and explained in Chapter 6.

Message Sent	Number of Users	Percent	Cumulative Percent
0	293	86.2	86.2
1	27	7.9	94.1
2	6	1.8	95.9
3	5	1.5	97.4
4	1	.3	97.6
5	2	.6	98.2
6	4	1.2	99.4
10	1	.3	99.7
18	1	.3	100.0
<b>Total</b>	<b>340</b>	<b>100.0</b>	

Table 4 SmilieFace Messages Sent

Table 5 shows the number of times users logged into SmilieFace. From the data, most users logged in at least twice during the evaluation period while the most active user logged in 61 times. The number suggested that most people who installed the app did not login and check their SmilieFace on a regular basis.

Number of Logins	Number of Users	Percent	Cumulative Percent
1	39	11.5	11.5
2	151	44.4	55.9
3	29	8.5	64.4
4	43	12.6	77.1
5	19	5.6	82.6
6	19	5.6	88.2
7	12	3.5	91.8
8	9	2.6	94.4
9	2	.6	95
10	5	1.5	96.5
11	3	.9	97.4
12	3	.9	98.2
14	3	.9	99.1
16	2	.6	99.7
61	1	.3	100.0
<b>Total</b>	<b>340</b>	<b>100.0</b>	

Table 5 User's Login Count

Looking at the usage statistics recorded in the SmilieFace database, the number of users and evaluators was significantly lower than had been anticipated. At the start of the research, after



reviewing various literature on research conducted in relation to Facebook, it was discovered that Nazir, Raza and Chuah (2008) managed to build 3 very successful third party application on Facebook, which this research hoped to emulate. However, it must be noted that the immensely successful applications were developed and released at a time when Facebook was relatively new and fewer concerns existed on hacking or phishing in Facebook.

During the evaluation of this research, users' concern about their security and privacy was detrimental to the popularity of SmilieFace. Some users expressed understandable hesitancy when asked to share their private information, even if it was their basic information that they voluntarily provide to Facebook. Allowing a third party application to post on their behalf also caused some reluctances, for fear that the app might spam their friends' newsfeed or even post things that the user does not want to be posted. The research has found it extremely difficult to gain users' trust and get them to install and evaluate SmilieFace.

## 7.2 Demographic Form

As mentioned in the previous chapter, the Demographic Form collects background information on the participants. Figure 44 showed that most SmilieFace users use English on a daily basis, which implied that they should have no problem understanding SmilieFace's interface.

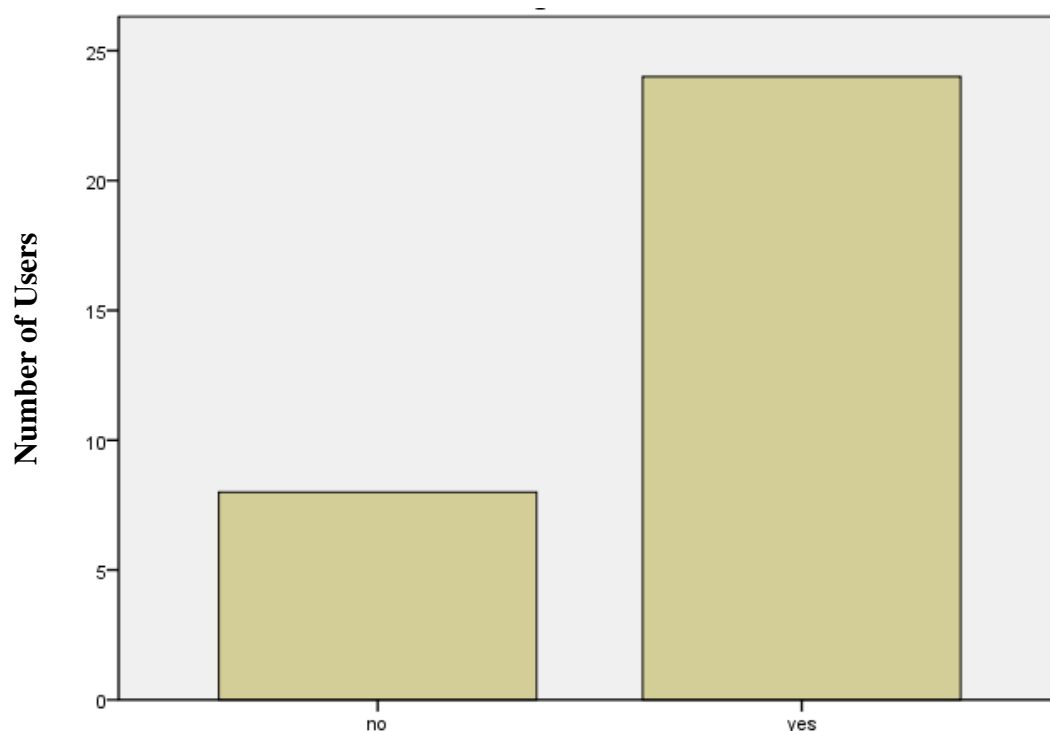


Figure 44 Daily English User

The gender distribution of SmilieFace users as depicted in Figure 45 shows that there is no significant difference between the number of male users and female users, which matched with the application statistics provided by Facebook.

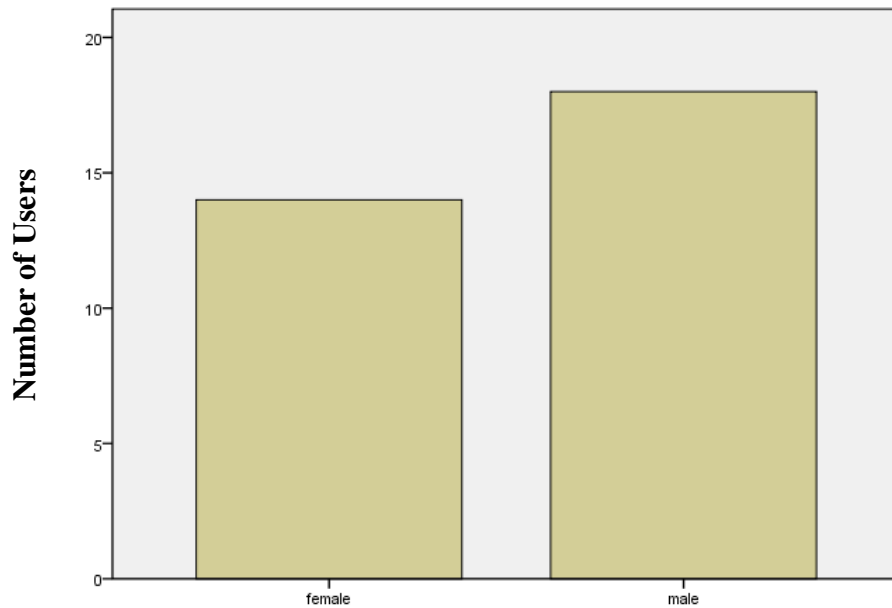


Figure 45 Gender Distribution

The age distribution of SmilieFace users is shown in Figure 46. Users are sorted into ten age groups and it can be seen that most users are between the ages of 24 to 26 followed closely by the ages of 27 to 30. It is apparent that most SmilieFace users are below the age of 31. However, due to the small number of evaluators, it is difficult to conclude that this type of application will be popular among Facebook users below the age of 31.

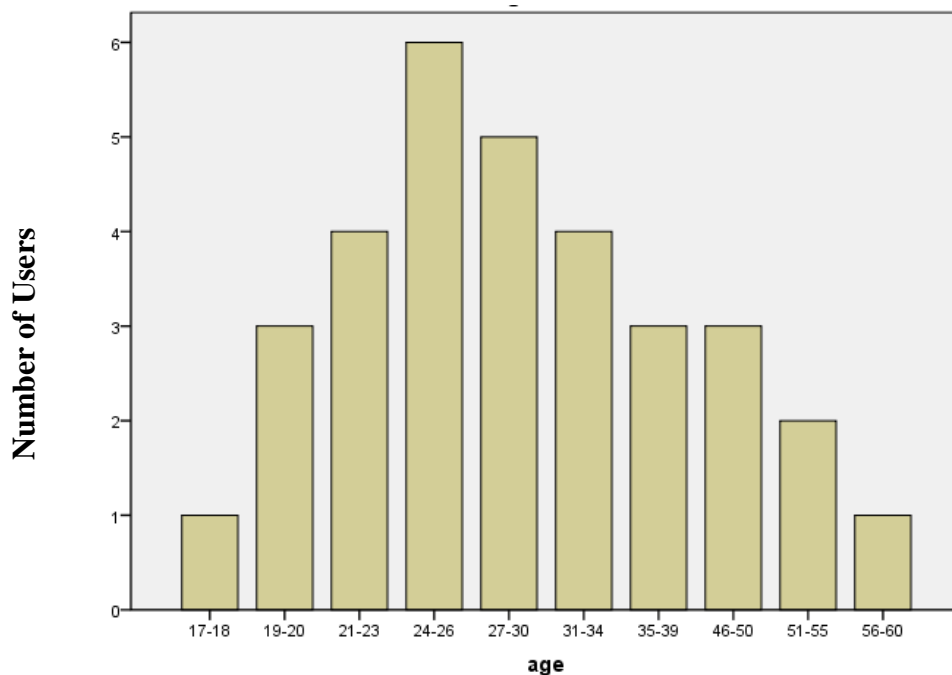


Figure 46 Age Distribution

A distribution of SmilieFace users' level of education is shown in Figure 47. While the majority of the evaluators has either a Bachelor degree or a College education, the research has encompassed users from a varying level of education, therefore it is not limited to university students.

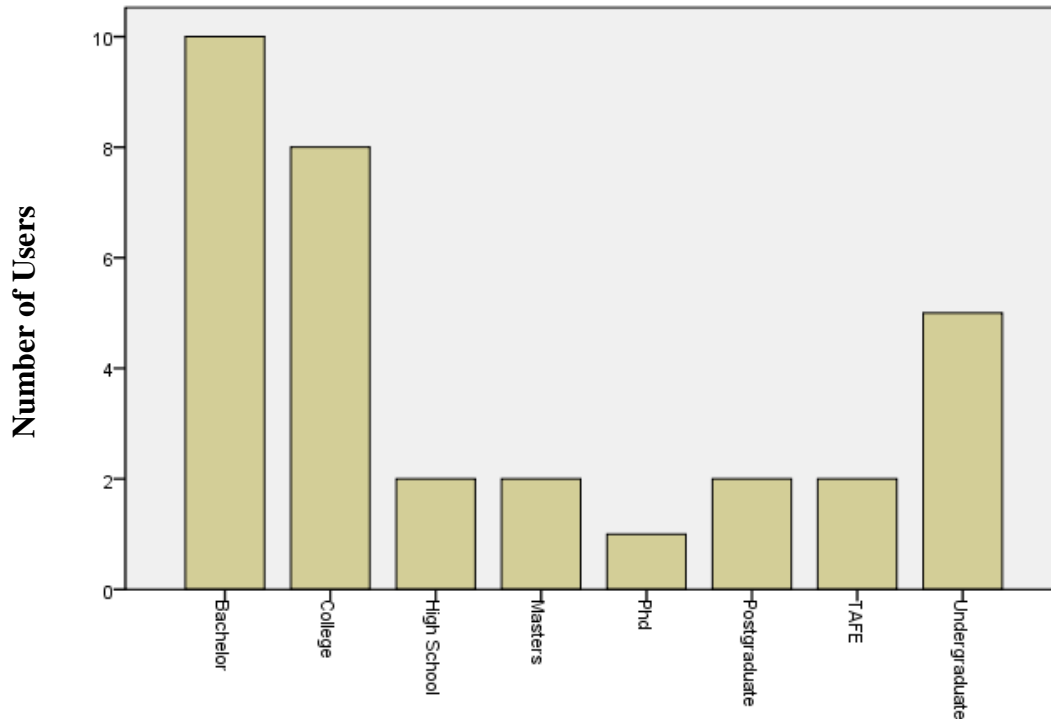


Figure 47 Level of Education

SmilieFace users were also asked about their familiarity with various types of technology in the Demographic Form. A five point Likert Scale was used as a unit of measurement (0 = No Experience, 1 = Little Experience, 2 = Average, 3 = Experienced, 4 = Highly Experienced). Figure 48 shows that most SmilieFace users are experienced with emails.

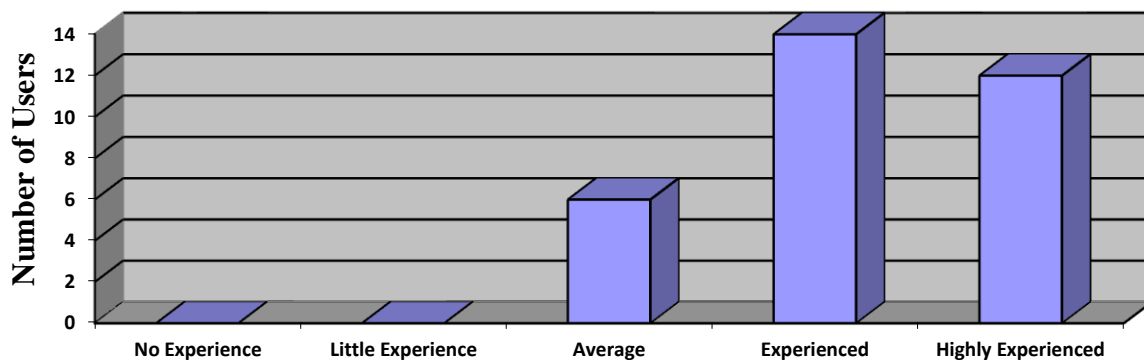


Figure 48 Familiarity with Emails

Figure 49 indicated that most SmilieFace users are fairly experienced with the use of Short Message Service (SMS). Comparing the numbers in Figure 48 and Figure 49 suggested that SmilieFace users are more experienced with using SMS than emails.

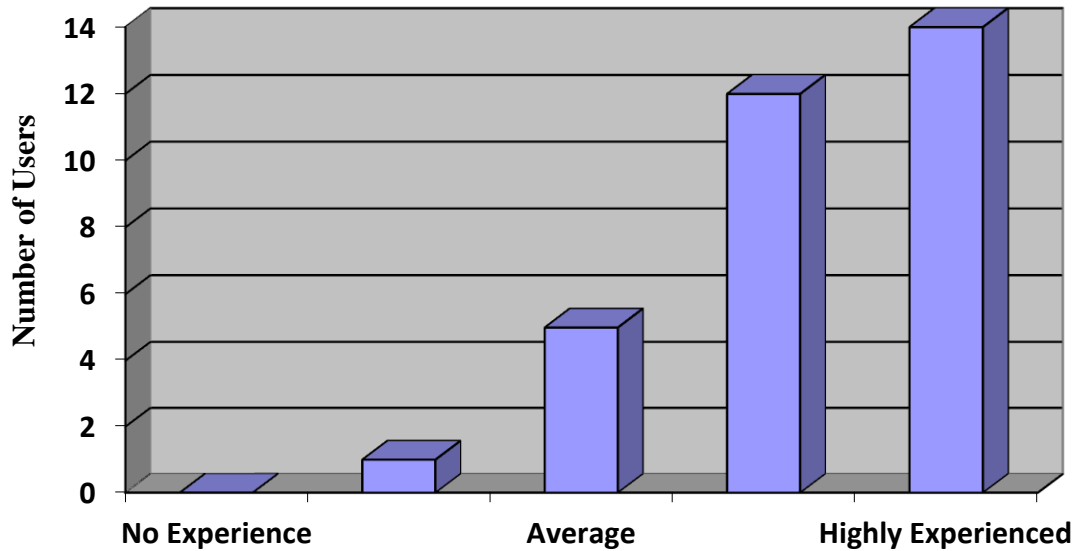


Figure 49 Familiarity with SMS

Figure 50 indicated that most users are experienced with instant messaging, however, compared to Figure 5 and Figure 6, SmilieFace users' are a lot more experienced with emails and SMS than instant messaging. This implied that most of the evaluators preferred *asynchronous* type of communication, where they do not expect instantaneous reply. Hence, they should find the *asynchronous* nature of SmilieFace messaging favourable.

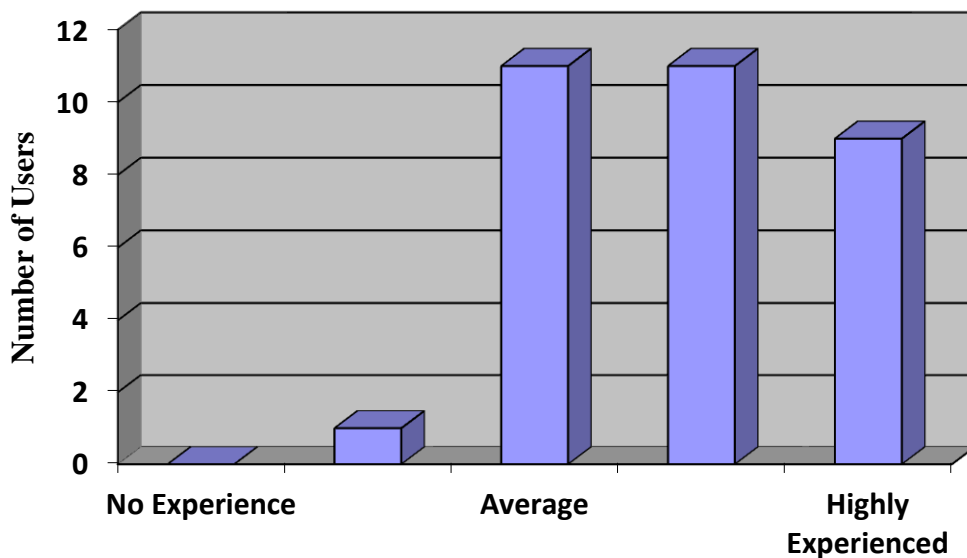


Figure 50 Familiarity with Instant Messaging

Figure 51 suggested that most users are experienced with YouTube and only 4 people have little experience with it, while the rest of the users considered themselves to be experienced. This suggested that the evaluators are not a stranger to viewing videos over the Internet.

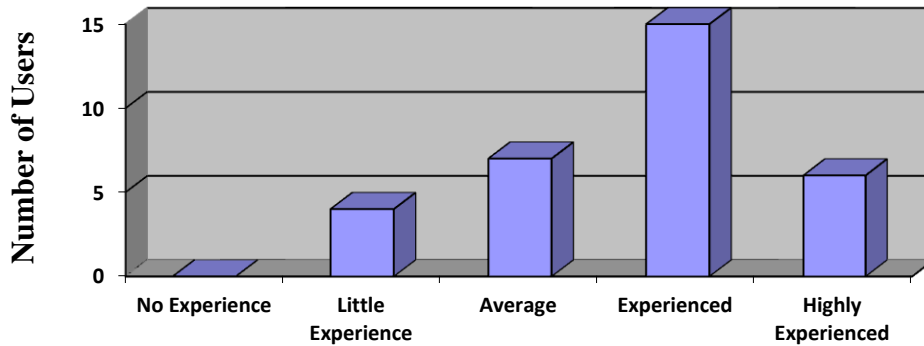


Figure 51 Familiarity with YouTube

Figure 52 suggested that most users are quite accustomed to playing video games. Therefore, they should have some experience with using an avatar as a digital representation.

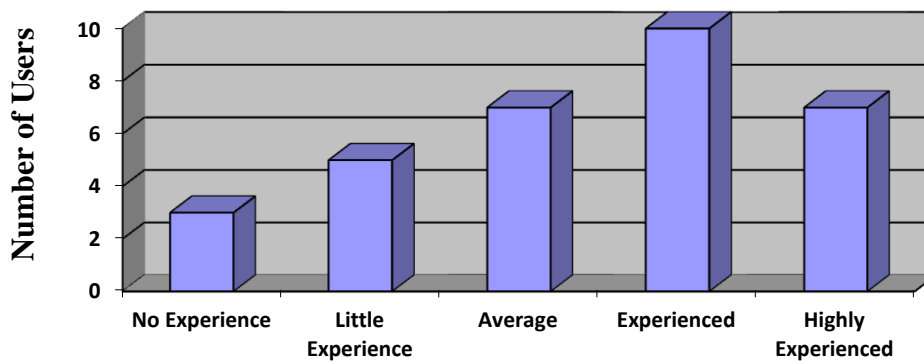


Figure 52 Familiarity with Video Games

Figure 53 showed that whilst users do possess knowledge of avatars, most do not claim to be very experienced with the concept.

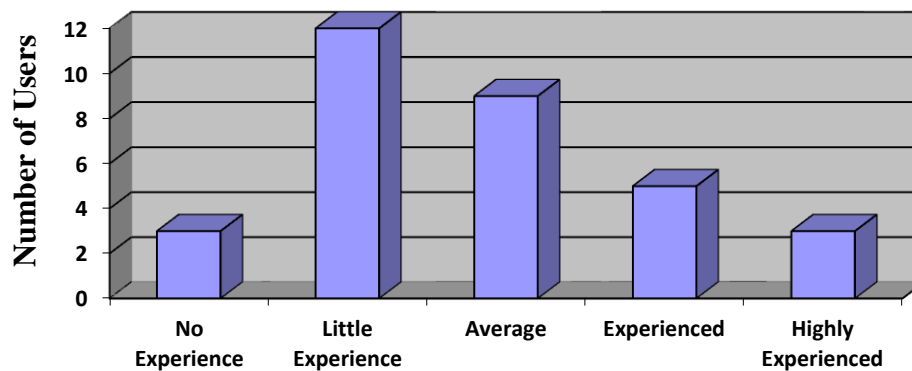


Figure 53 Familiarity with Avatars

Figure 54 showed that most users are not very familiar with Second Life, a social simulation game that emphasizes the use of avatars in their gameplay. Figure 53 and Figure 54 implied that the evaluators have some knowledge of avatars but did not feel the need to set up a digital persona and use an avatar as a digital representations of themselves in a virtual world.

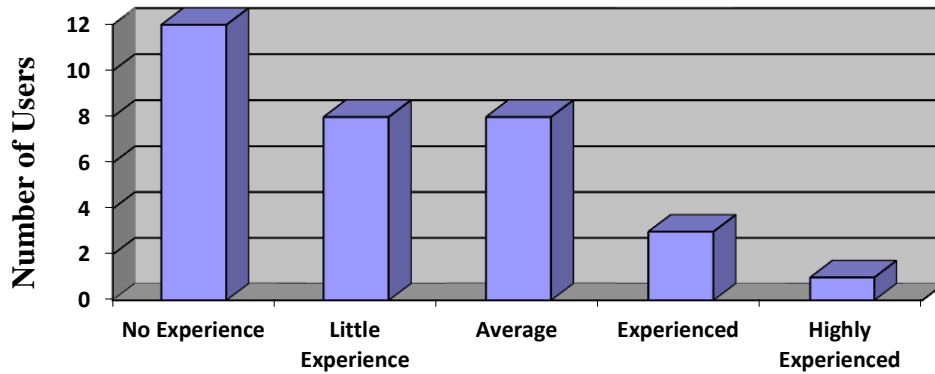


Figure 54 Familiarity with Second Life

Figure 55 suggested that most of the evaluators are experienced cell phone users.

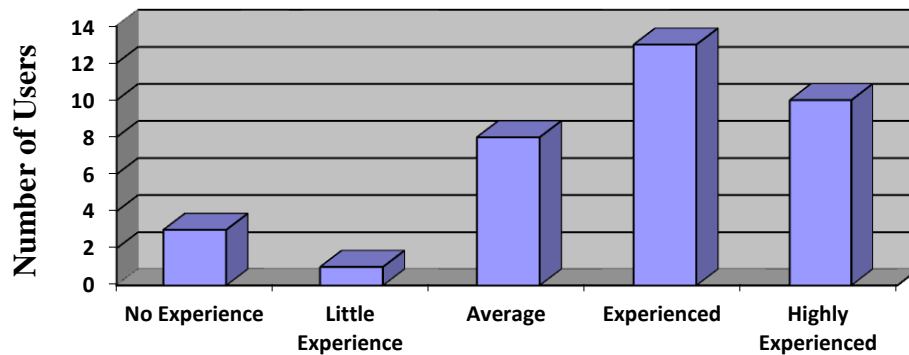


Figure 55 Familiarity with Cell Phones

Figure 56 indicated that most users are experienced in using Smart Phones. However, it showed that most users are more adept in using cell phones when compared with Figure 55.

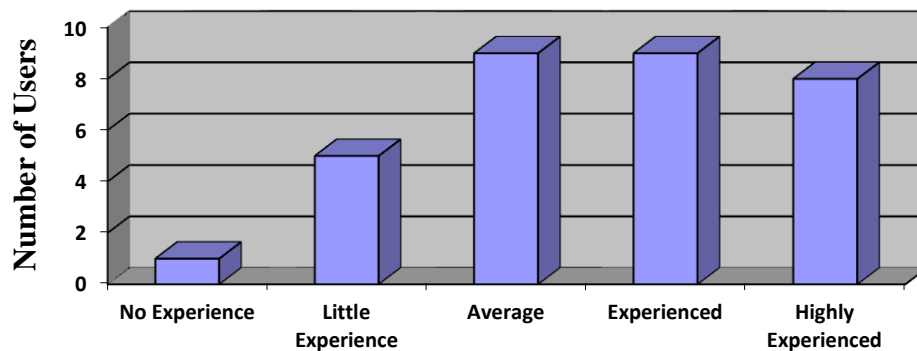


Figure 56 Familiarity with Smart Phones

Figure 57 indicated that most users do not have much experience in using tablet devices.

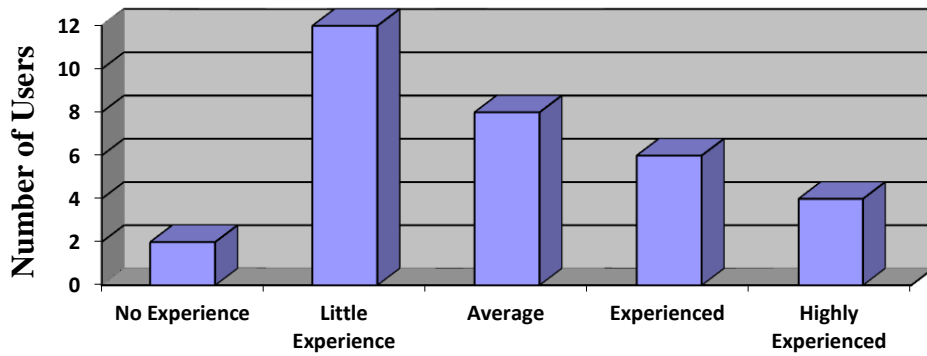


Figure 57 Familiarity with iPad (tablet devices)

Figure 56 and Figure 57 suggested that the evaluators are savvy and up to date with the latest communication devices or technology.

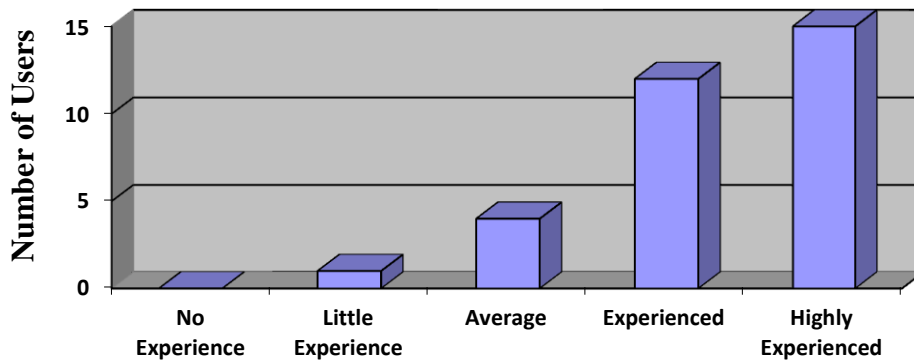


Figure 58 Familiarity with Facebook

Figure 58 showed that most users are quite well versed in using Facebook. Conversely, Figure 59 suggested that most users were not as experienced in using Google. Furthermore, Figure 58 also suggested that users claimed to be more experienced in using Facebook than any other form of technology asked in the questionnaires, including the use of SMS.

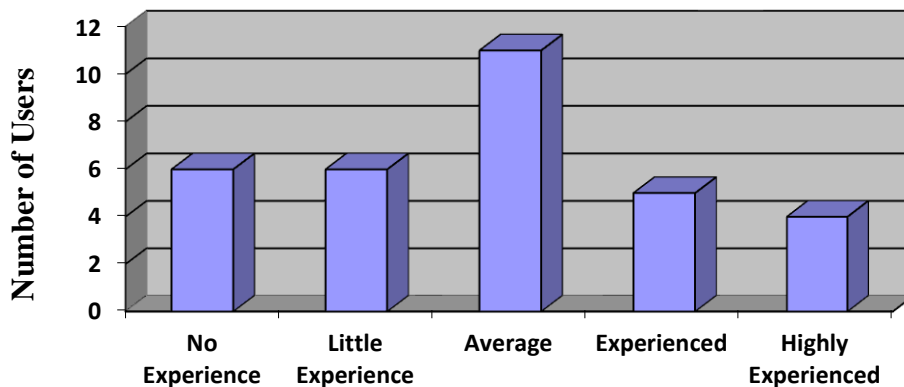


Figure 59 Familiarity with Google

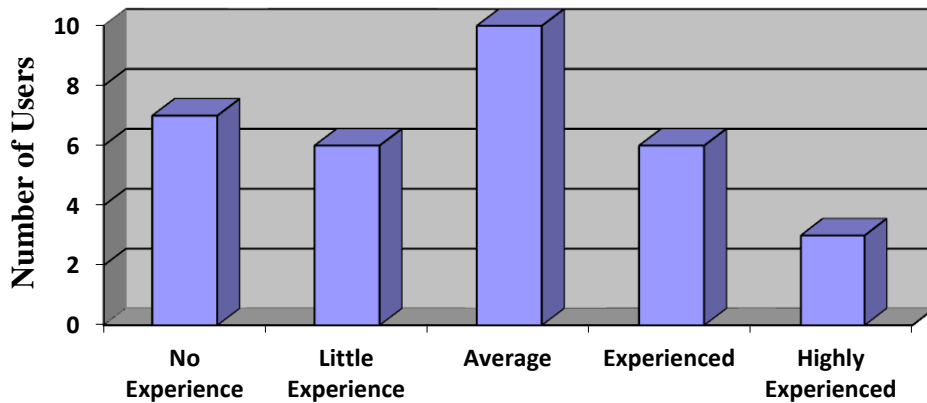


Figure 60 Familiarity with Social Network Sites

Figure 60 showed that most users are not as experienced with other Social Network Sites listed in the questionnaire (Google+, LinkedIn), while Figure 61 indicated that most users are not as familiar with other Social Media Sites listed in the questionnaire (tumblr, flickr).

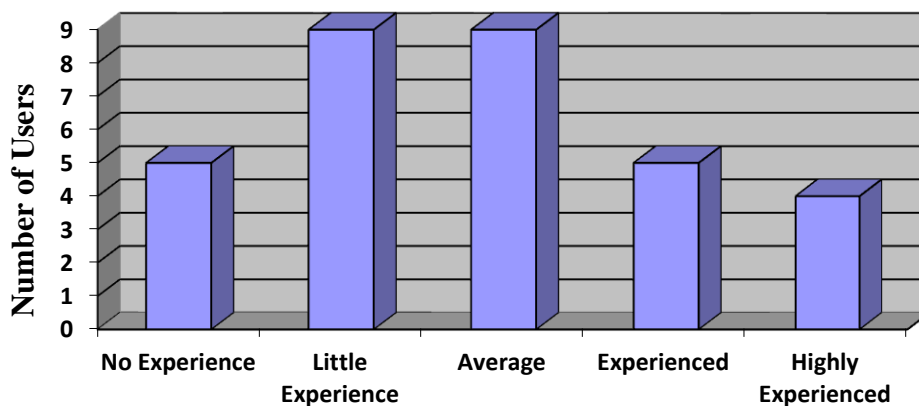


Figure 61 Familiarity with Social Media Sites

SmilieFace users' also provided some comments about the web technologies mentioned above. The main reason in general for them to use these web technologies is because they are fun and easy to use as well as making their life and communicating with friends easier.

SmilieFace users were asked about their preferred method to communicate with their friends, and Figure 62 indicates that Facebook and Smart Phone is their preferred communication method surpassing the conventional Email, SMS and Instant Messaging.

From the comments provided by the users, it was suggested that the reason they preferred Facebook is due to the fact that it is free, most of their friends are constantly on it and it is easy, while people who preferred a Smart Phone say that they are convenient, full of features and they always carry the Smart Phone with them.



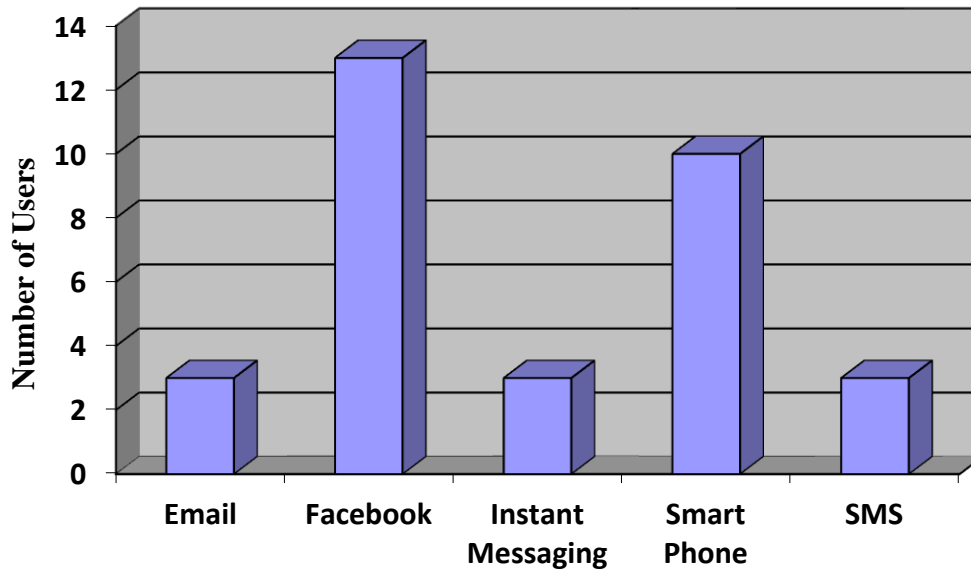


Figure 62 Preferred Communication Method

Figure 63 showed that SmilieFace users preferred to access Facebook using their computer.

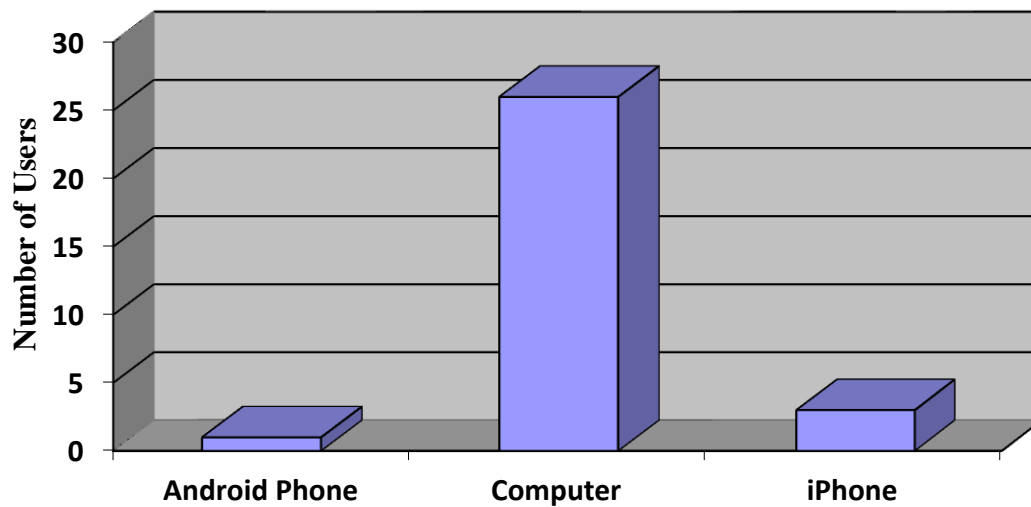


Figure 63 Preferred ways to access Facebook

SmilieFace users also commented that they generally use Facebook for gaming, and keeping in touch with their friends and family. They also post pictures and update their status to let their friends and family know about how they are doing.

SmilieFace users were also asked questions on how much time they spend on Facebook and the Internet as well as their purpose to establish their online behaviour. Knowledge and comprehension of their online behaviour might explain why users installed and used SmilieFace hence paving a way for future related research.

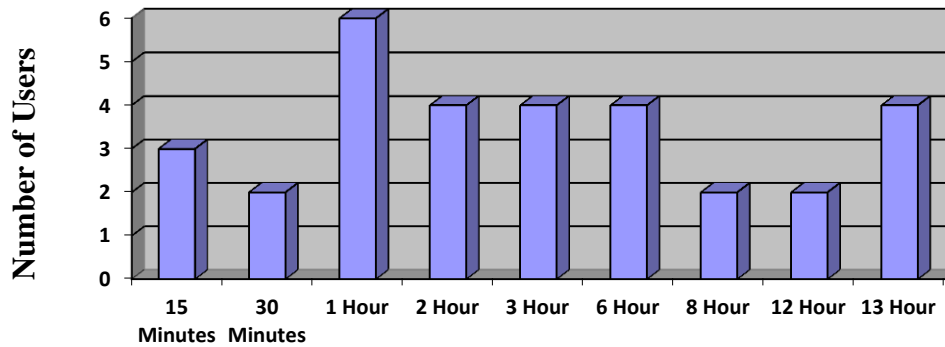


Figure 64 Time Spent on Facebook

As shown in Figure 64, SmilieFace users spent as little as 15 minutes each day to more than 12 hours in a day. The majority claimed to spend about an hour or less on Facebook although the number of people who spent 8 hours and more on Facebook are not far behind.

Figure 65 shows the amount of time SmilieFace users spent on the Internet. Most users answered that they spent around 6 hours similar to the number of people who spent 12 hours or more. Only 3 users claimed to spend no longer than an hour each day on the Internet.

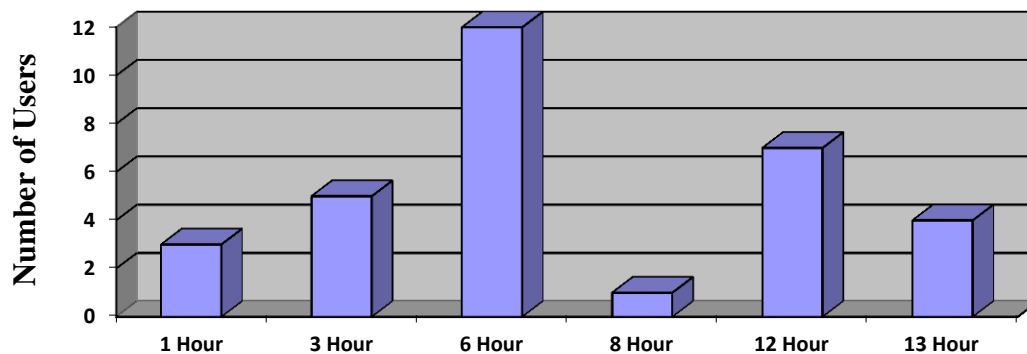


Figure 65 Time spent on the Internet

SmilieFace users commented that they spent their time on the internet doing various things. However the most common things are games, entertainment (watching movies, listening to music), communications (emails, chatting), and researching.

SmilieFace users were also asked about their expectations from a messaging application and they generally want it to be fast and easy to use, with funny and interesting expressive emoticons, whilst being reliable as well. For the future however, they would like the ability to send attachments (voice or video), and message filtration or classification to prevent spam. The comments from SmilieFace users are useful not only for the development of future messaging application but can also be used to improve existing messaging application.

<b>Descriptive Statistics</b>				
	N	Mean		Std. Deviation
	Statistic	Statistic	Std. Error	Statistic
emails	32	3.19	.130	.738
sms	32	3.22	.147	.832
im	32	2.88	.154	.871
youtube	32	2.72	.163	.924
videoGames	32	2.41	.224	1.266
avatars	32	1.78	.199	1.128
secondLife	32	1.16	.201	1.139
cellPhones	32	3.00	.149	.842
smartPhones	32	2.56	.200	1.134
iPad	32	1.94	.205	1.162
FB	32	3.28	.144	.813
google	32	1.84	.225	1.273
SnetworkS	32	1.75	.225	1.270
SmediaS	32	1.81	.222	1.256
Valid N (listwise)	32			

**Table 6 Familiarity Statistic Summary**

Table 6 summarizes SmilieFace users' familiarity with current web technologies, where N represented the number of evaluators, and the mean shows how familiar the average users are with a particular technology. If the mean is below 2 then the average users are not very experienced, while if the mean is above 2 then the users are experienced. A high standard deviation meant that there is a wider gap between the number of inexperienced users and highly experienced users than one with a low standard deviation. The numbers suggested that the majority of users considered themselves experienced in emails, SMS, instant messaging, YouTube, video games, cell phones, smartphones and Facebook in particular. Although they are below average in their knowledge of avatars, Second Life, tablet devices, Google, other Social Networking Sites, and other Social Media Sites. Hence it can be assumed that most SmilieFace users are proficient with various forms of communication technologies and also reasonably up to date with current communication devices whilst not too familiar with the use of avatars and other Social Networking Sites or Social Media sites apart from Facebook. This suggested that the evaluators should not have any significant issues in adopting SmilieFace.

After looking at various types of SmilieFace users and establishing their online behaviours from the Demographic Form, the next section will look at the Sender Evaluation Form and analysed the users' experiences with the "Compose a Message" part of SmilieFace.

### 7.3 Sender Evaluation Form

The Sender Evaluation Form asked SmilieFace users about their experiences in composing a SmilieFace message. They were also asked what their expectations were after sending out a SmilieFace message, whether they are looking forward to getting a reply from the recipient and whether it meets their expectations of what a messaging application should be. The feedback can be used to establish the positive and negative aspects of the app. The feedback will be used to determine the users' attitude as an indicator to the effectiveness of the app.

The Sender Evaluation Form was used to test "Sub-hypothesis 3: *SmilieFace will be easy to use and engaging for its users, capable of attracting a substantial number of users, and become a popular application*". However, due to the small number of evaluators, a definite conclusion was unable to be produced. The research can only ascertain the opinions of the majority of the evaluators.

SmilieFace users were asked whether it is easy to create a SmilieFace message and the result is as shown in Figure 66. A five point Likert Scale was used as a unit of measurement. (0 = Highly Disagreed, 1 = Disagreed, 2 = Neutral, 3 = Agree, 4 = Highly Disagreed). Figure 66 showed that there are 12 people who agreed and 6 people who highly agreed that it is easy. While 8 users are neutral and 2 people disagreed with the statement. The numbers suggested that the majority of SmilieFace users agreed that it is easy to create a SmilieFace message. This was a design goal and based on the evaluators' feedback has proven to be successful. Chapter 4 detailed the evolution of the SmilieFace Interface.

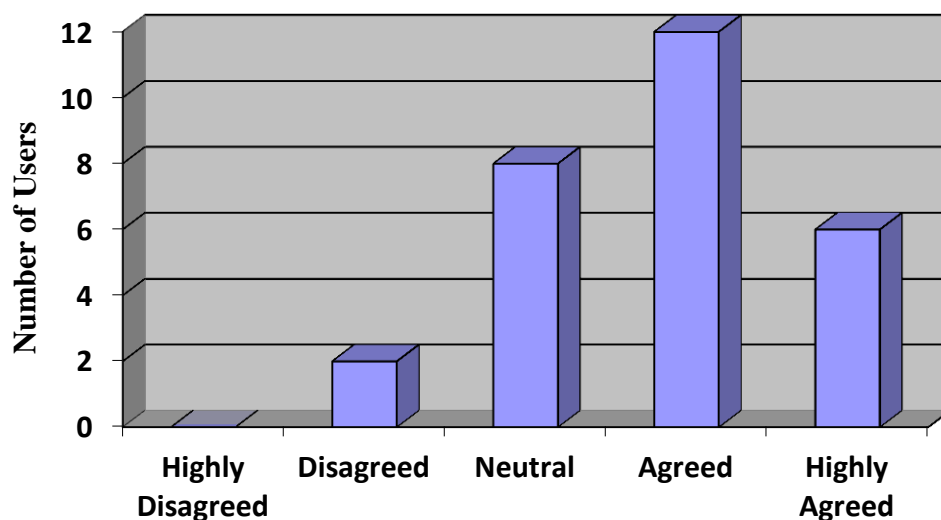


Figure 66 It is easy to create a SmilieFace Message

4: A message can be created in just a few clicks, not too complicated
8: Was easy for me, the tags prob. confuse average people. UI is cluttered
10: no it is confusing to find where the friend's photo is going to be and where to type the message- at first one assume that you have to go to your normal FB page in the same manner you usually send messages, to use the smilieface app but its not true.
19: it was a snap
20: The instruction are easy to follow.
21: the faq helped
22: i tried without reading the faq
25: The UI needs some improvements though. i.e. make it like a wizard, so it doesn't clutter the screen, and omit the need to use the scroll bar.
26: Just click, easy of course

**Quote 7.1: Comments on whether it is easy to create a SmilieFace message**

The quotes above came from users who commented whether it is easy to create a SmilieFace message. At first, SmilieFace was designed to be clutter free, however, some users commented that they do not want to scroll through the page when composing a SmilieFace message during the pre-evaluation period. Based on the advice of a professional web developer, the solution was to fit everything onto a single page hence the cluttered UI.

Figure 67 displays the SmilieFace users' opinion about how intuitive the application is. 12 users have a neutral opinion about the matter, but 11 users agreed and 2 users highly agreed with the opinion that the application is intuitive to use. Only 2 person disagreed and one person highly disagreed with the statement. Hence, it can be concluded that the majority of SmilieFace users agreed that the application is intuitive to use. One of the design goal was to make the process of composing a SmilieFace application as intuitive as possible, and, based on the feedback from the evaluators, this design goal was achieved.

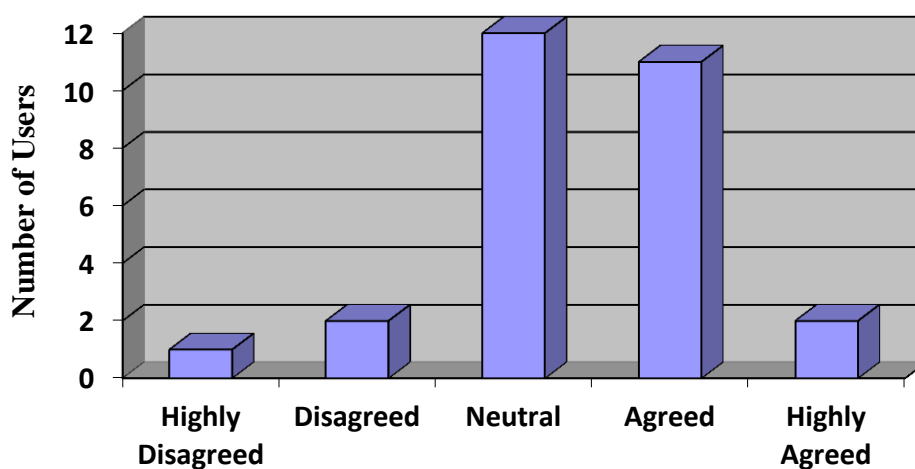


Figure 67 The SmilieFace Application is intuitive

4: The message box should come before the "select emotion" part, since the app requires users to highlight the text then click on a box
7: maybe can make it animated
8: Don't understand what happens when I send msg.
9: The faces (apart from the smilies) dont express a particular recognisable emotion
10: Had to search for the message boxes etc, it wasnt clear from the start
19: only problem was the birthday message had a strange choice for emotion, had to select happy
20: It is intuitive to a certain extent
21: its very intuitive
22: not much
25: The app is easy to be understood.
26: Agree with that too

**Quote 7.2: Comments on whether it is intuitive**

The quotes above came from users who commented about whether it is intuitive to create a SmilieFace message. The comment about the *message box should come before the "select emotion" part* was taken into consideration and the SmilieFace UI was adjusted accordingly.

Figure 68 shows the results of whether it is quick and easy to create a SmilieFace message and 19 users agreed with the statement with 4 users highly agreed. Although 3 users disagreed with the statement and 1 user highly disagreed, it is safe to assume that the majority of SmilieFace users think it is quick and easy to create a SmilieFace message. Another design goal was to make the process of composing a SmilieFace application quick and easy, and, based on the feedback from the evaluators, this design goal was achieved.

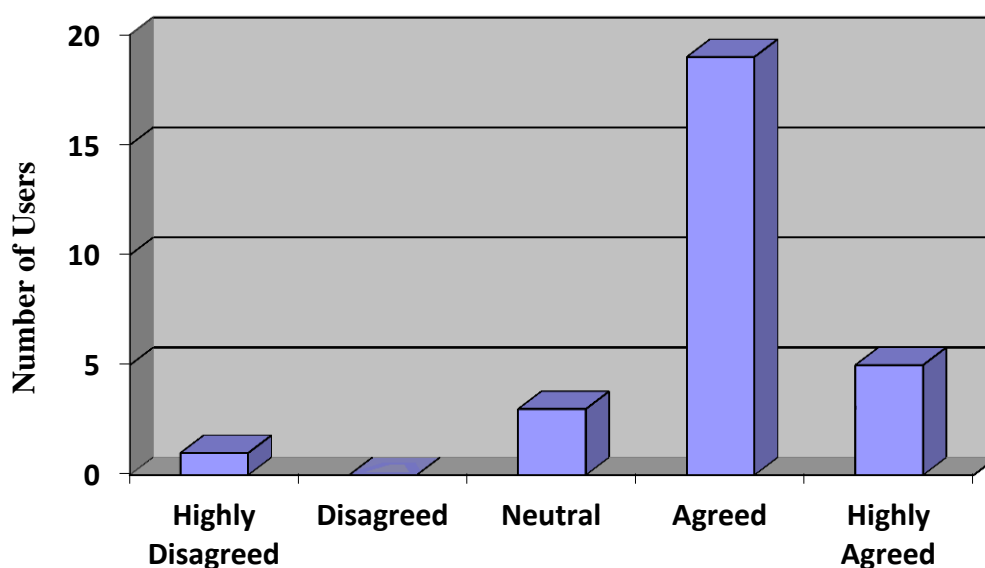
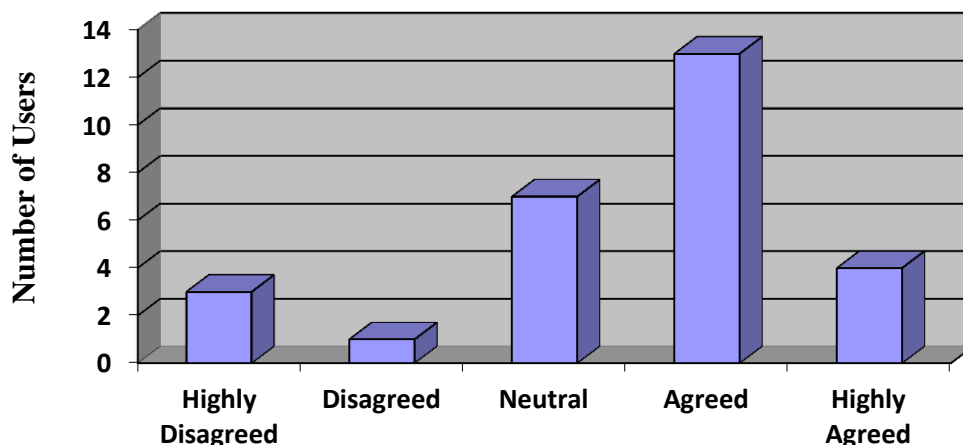


Figure 68 It is Quick and Easy to Create a SmilieFace Message

8: Too much questions just to send a msg
10: i had to redo my message as i thought it would provide a smilie face next to the text that i had written. seems i had to highlight the text i wanted to apply the emotion to instead. i also didnt see a final version (preview) of what the message will look like before it was sent. also a message indicating it will take 5-10 mins to process is certainly not inviting to use the app again.
19: seems very straight forward
20: Great for short greetings
21: after reading the faq yes
22: after reading faq
25: - comment about the same like no 1's..
26: Same as above

**Quote 7.3: Comments on whether it is quick and easy**

The quotes above came from users who commented whether it is quick and easy to create a SmilieFace message. Some users did not realized there was a default setting as well as message template that allowed users to send a SmilieFace message in 3 easy steps (select a recipient, select a message from template, send message). It took less than 1 minute for the SmilieFace Server to process and send a SmilieFace message, however, taking into consideration on the possible network latency and excessive number of requests, a 5 minutes waiting period was recommended.



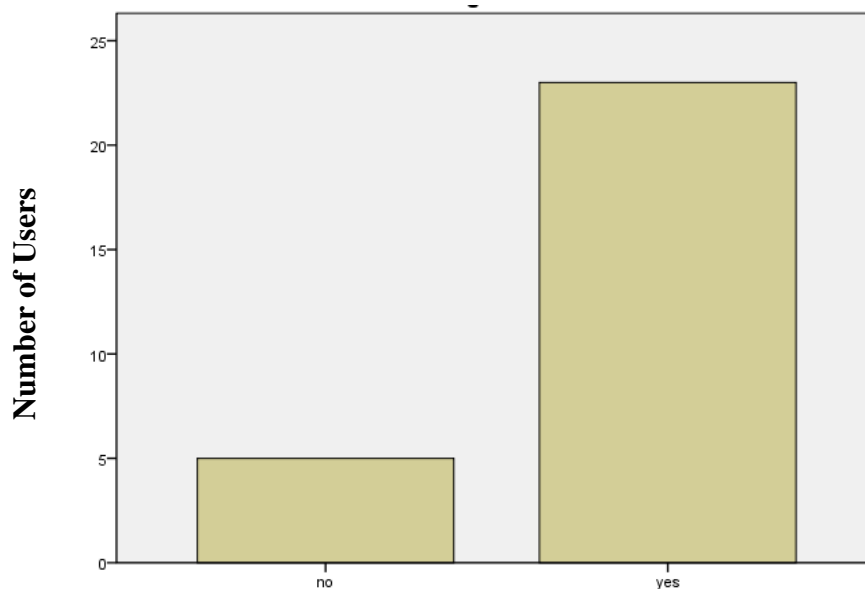
**Figure 69 The Tags Helped Me to Express My Emotion in My Message**

Figure 69 showed that 13 users agreed and 4 users highly agreed with the statement that the emotion tags helped the expression of emotion in their SmilieFace messages. 7 users are neutral while 1 user disagreed and 3 users highly disagreed with the statement. From analysing the numbers, it can be concluded that the majority of SmilieFace users do find the emotion tags helpful in expressing emotions in SmilieFace messages. Hence an *affective* SmilieFace message was successfully sent.

4: More tags would be better?
10: i was unable to view the outcome of the message as it instead entered html formatting to my message as opposed to showing me a picture.
19: as noted above, the tag on my message when first picked seemed inappropriate (disgusted) for a song but took seconds to correct
20: There was some emotion in the message.
21: emoticons helped
22: tags make it easier to be noted
25: Maybe can add some more emotion tags?
26: It's a bit confusing.

**Quote 7.4: Comments on whether the tags helped in expressing emotion**

The quotes above came from users who commented whether the tags helped in expressing emotion in their message. From the comments it seemed that some users would like more emotion tags and some noticed that emotions are being conveyed in a SmilieFace message.



**Figure 70 Would You Use the SmilieFace Application Again in the Future?**

Figure 70 noted that 23 users said they would use SmilieFace again in the future while only 5 users declined. Hence, it can be concluded that the majority of SmilieFace users are willing to use the SmilieFace application again in the future.

The quotes below came from users who commented they would not use SmilieFace again.

3: takes time
8: Reasons above; have no use for it
15: I generally don't use apps. Except gaming ones.
24: i don't use that sort of thing

**Quote 7.5: Comments from those who would not use SmilieFace again**



2: to see the improvement
4: Seems fun!
5: if it improved ..... depend
7: maybe if many people are using it. but i am not receiving it so i doesn't know how it looks like.
11: To creep out my friends with the penguin.
12: Because i have friends and family that i know would like them.
14: because it's fun maybe
16: because its giving me an oppportunity to share my emotions
17: because its funny and easy to use
19: easy quick seems to have potential
20: Message with emoticons are great to send to friends
21: makes sending messages more fun
22: there is always room for improvement
23: its cool new way of sending a message
25: It's interesting to send people message like this. Because sometimes people mistook our written words, the emotion smiley helps on this part.
26: Actually dunno, if my friends are interested. I'll send to them again.
27: Just to explore more about it.
28: of course and i will use it, i found the application that suits me !

**Quote 7.6: Comments from those who would use SmilieFace again**

The quotes above came from users who commented they would use SmilieFace again. Some would use it again because they think it was fun and engaging as well as quick and easy to use. Others would use it again if their friends would use it as well.

The numbers in Figure 71 showed that 14 users agreed and 5 users highly agreed that they are looking forward to seeing their friends' reactions when viewing the SmilieFace message sent to them. Although there were 8 users who disagreed and 1 user who highly disagreed with the statement, the numbers still suggest that most users are curious in knowing how the recipient of their SmilieFace message will react.

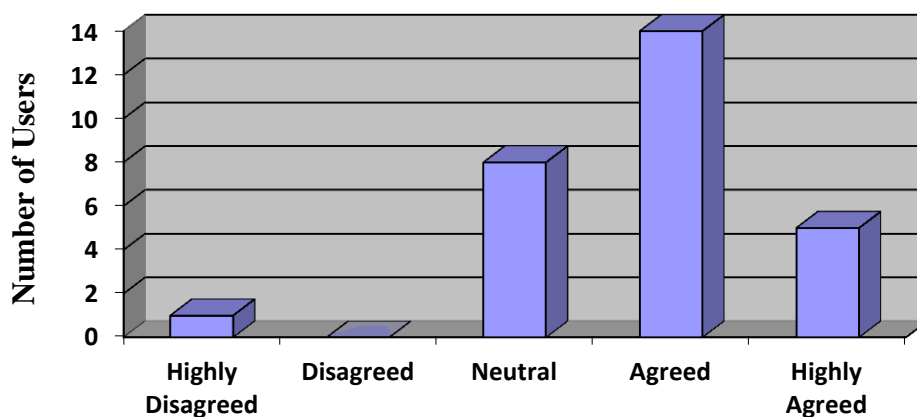


Figure 71 I Look Forward to Seeing How My Friends React to the SmilieFace Message I Sent to Them

Figure 72 showed that 13 users and 5 users are looking forward to receiving a SmilieFace message in return, while 7 users remained neutral. On the other hand, 2 users disagreed and 1 user highly disagreed with the statement. The general opinion suggested that the majority of SmilieFace users are looking forward to receiving a SmilieFace message in return.

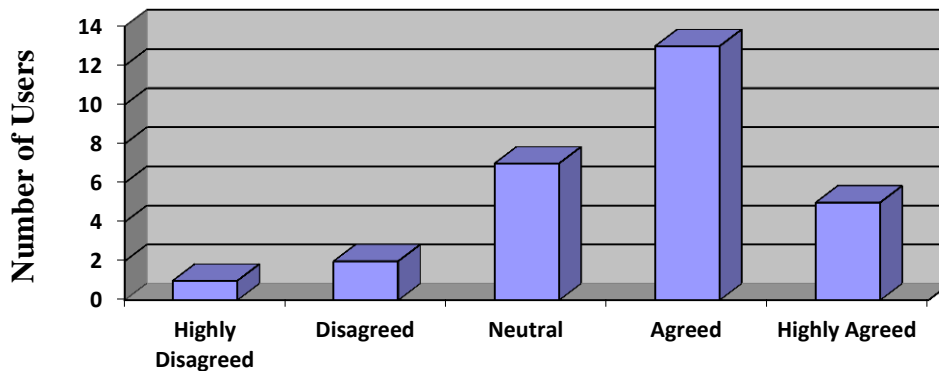


Figure 72 | Look forward to receiving a SmilieFace message in return

The quotes below are comments the evaluators gave when asked about what they liked about the process of composing a SmilieFace message. The majority of the evaluators commented that they liked that SmilieFace is easy to use. This met the research's objectives and design goals as well as proving the first part of "Sub-hypothesis 3: *SmilieFace will be easy to use and engaging for its users, capable of attracting a substantial number of users, and become a popular application*".

1: nice...
2: Easy
3: unique smilieface
4: Straightforward to use
5: ... not sure what to use, maybe can have a japanese animation voice actor to compose the message voice?
6: can compose a message
7: easy to understand interface
8: Honestly, not much
10: not much at present, sorry :(
11: it's unique :D
13: I like big buttons.
14: the smiley pic
15: It's okay. More personalized.
16: here the smileface are more alive ,,
17: easy to use
18: east to use
19: easy to choose, fair number of options

20: Easy to use
21: many choices on what to send as a message
22: easy to use
23: its easy to use
24: easy to use
25: It's simple.
26: I like the friend list, Can load list quickly.
27: Quick and live preview
28: its quite easy and user friendly plus u can compose very fast anything u want ,awesome !

**Quote 7.7: Comments on what they liked about Composing a SmilieFace message**

The quotes below are comments the evaluators gave when asked about what they disliked about the process of composing a SmilieFace message. Based on the comments received in regards to the difficulties with finding a friend in a long friend list, the SmilieFace UI was modified to accommodate this by breaking down the list into clickable pages of friends as described and shown in Chapter 4. The SmilieFace UI was also adjusted to remove the need to scroll through the page before the user can start composing a message.

2: unnecessary
3: it cant go beyond 160 characters. I perceived difficulties in seeing the video of smilieface before sending it to whoever in my friendlist.
4: Scrolling to find friends to send message to is troublesome when there is a long friend list
5: the girl voice is not cute enough
6: is text message
7: i have many friends. and i have to scroll to very bottom after choosing a friend to send a message.
8: The UI, the fact that the graphics are low-quality, the fact that HTML-ish code is in the messages
10: the fact that is was hard to find the compose box- it is WAY down the page. you first have to scroll through many other text on the page before you can get down to business.
11: Creepy penguin...
13: Message limit.
14: all the friends pic
15: I have no idea. Nothing.
16: still dint notice anything which will cause me dislike
17: nothing.its perfect !
19: needs a few more options (some might not be appropriate for minors as an example, but would be cool to have)
20: Waiting time
21: limited choices
22: limit characters
23: nothing
24: too much for first time user, best to put things in stages and leave at defaults (then have option

to customise then show what you have now)
25: It really looks like HTML tags to me. People will easily get confused by those tags.
26: I need to highlight the text first to apply the emotion.
27: No icons displayed?
28: nothing i find it very nice and well structured !

**Quote 7.8: Comments on what they disliked about Composing a SmilieFace message**

The quotes below are comments about what the evaluators would change or improve in Smilieface. From the comments, it was suggested that SmilieFace should have a preview option, where users can see the message they composed before sending it to the recipients and adjust if need be. However, due to the fact that each SmilieFace message must be sent to the SmilieFace Server before a SmilieFace video can be produced, this cannot be done without compromising the turn-around time. Hence by implementing a preview option, SmilieFace would no longer be a quick and easy application to use.

2: i can see my own msg before i send it to the receipient and ability to edit before send through
3: yes. if people could have a look at video which is being made before sending it to someone else, that would be great.
4: Not having to highlight text before applying emotion
5: less text ..... if it is aim for animation.
7: i think user interface can be improved
8: Simplify it, improve the design, explain what its purpose is
9: the faces
10: as above
11: Better graphics
13: Icon should be more pretty.
14: change the friends pic to name only
15: No. Everything is decent.
16: not for now, may be in future..
17: more animated emoticons
19: see 6 above
20: Autocorrect
21: increase the limit
22: increase the limit of characters
23: better animated faces, it loads properly no need for F5
24: read above answer
25: Improvement in UI as I've written in comment no. 1.
26: More emotion, maybe
27: Display the stuffs in a box next to the textbox.
28: i would like to see mini games and cooperation with many srv via the world for high speed videocalls and file share

**Quote 7.9: Comments on the change and improvement the liked to see**

A statistic summary of SmilieFace users' experience can be seen in Table 7. As previously explained, a 5 point Likert Scale was used where 0 (Highly Disagree) is the lowest value, 2 represent a neutral, and 4 (Highly Agree) is the highest value. Except in the case of useAgain where the value is either yes represented by 1 or no represented by 0. In Table 7, N represents the number of evaluators which is 28 users. If the mean is 2 then the average SmilieFace users has a neutral opinion about the statement. However, if the mean is below 2 then the average user would disagree, where as if the mean is higher than 2 then the average users would agree with the statement. In the case of the statement "Will the user use SmilieFace Application again" where the answer is yes (1) or no (0), a mean of 0.50 represent a neutral position, while less than 0.50 represent a disagreement and more than 0.50 represent an agreement. From the numbers, the majority of SmilieFace users are leaning towards being in agreement with most of the statements in the Sender Evaluation Form.

	N	Mean		Std. Deviation
	Statistic	Statistic	Std. Error	Statistic
easy	28	2.79	.166	.876
intuitive	28	2.39	.165	.875
quick	28	2.96	.150	.793
express	28	2.50	.215	1.139
useAgain	28	.82	.074	.390
react	28	2.79	.166	.876
receive	28	2.68	.186	.983
Valid N (listwise)	28			

**Table 7 Sender Form Statistics Summary**

The results from the Sender Evaluation Form has suggested that SmilieFace users find it is quick and easy as well as intuitive to compose a SmilieFace message. They also think that the emotion tags helped express emotion in the message they sent, and most would use the application again. They are curious about how their friends would react upon viewing a SmilieFace message and are looking forward to get a SmilieFace message in return.

This section discussed and analysed SmilieFace users' experiences with composing a SmilieFace message. In the next section the Viewer Evaluation Form will be discussed and analysed to establish what SmilieFace users thinks after viewing a SmilieFace message.

## 7.4 Viewer Evaluation Form

This form asked SmilieFace message recipients whether they are able to understand the SmilieFace message sent to them and experience the emotion within. Users were also asked whether they would continue to use SmilieFace to exchange messages with their friends. The purpose for the Viewer Evaluation Form is to test Sub-hypothesis 1: “A robust SmilieFace client for creating and viewing affective videos as an alternative Facebook messaging service can be designed, developed and implemented” and Sub-hypothesis 2: “A robust and scalable SmilieFace server for producing affective videos can be developed and implemented”.

SmilieFace users were asked whether the SmilieFace message is interesting and the result is as shown in Figure 73. A five point Likert Scale was used as a unit of measurement. (0 = Highly Disagreed, 1 = Disagreed, 2 = Neutral, 3 = Agree, 4 = Highly Disagreed). It can be seen that 14 users agreed and 4 users highly agreed with the statement while 7 users are neutral and 1 user highly disagreed. The numbers suggested that the majority of SmilieFace message recipients agreed with the opinion that it is interesting.

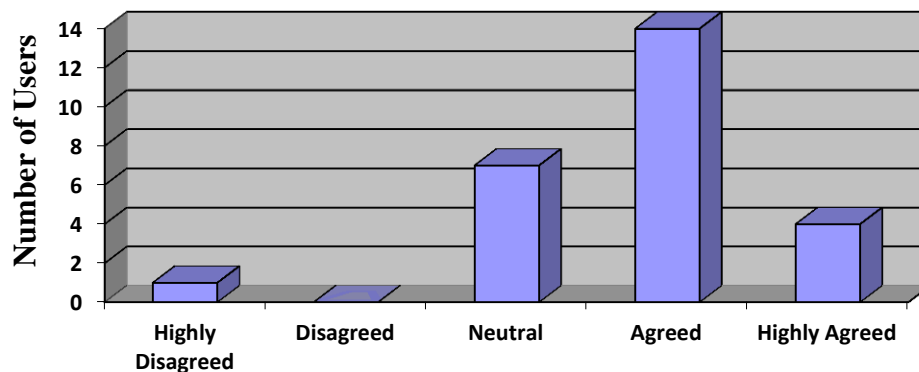


Figure 73 The SmilieFace Message is Interesting

Evaluators' comments on whether the SmilieFace message is interesting are shown below.

3: if people can make their own gif that would be great
6: fun concept. the smiley talks but lack of expression.
18: Needs more choices
19: the choices are good
20: it caught my eye
21: i'm new to it, so it take awhile to get used too
23: can send voice message from text we type is interesting
24: It's an innovative way to communicate with offline message.

Quote 7.10: Comments on whether the SmilieFace message is interesting

Figure 74 showed that 13 users agreed and 3 users highly agreed that they are able to understand the emotion within the SmilieFace message. While 6 users are neutral, 3 users disagreed and 1 user highly disagreed with the statement. The numbers suggested that the majority of users are in agreement with the statement.

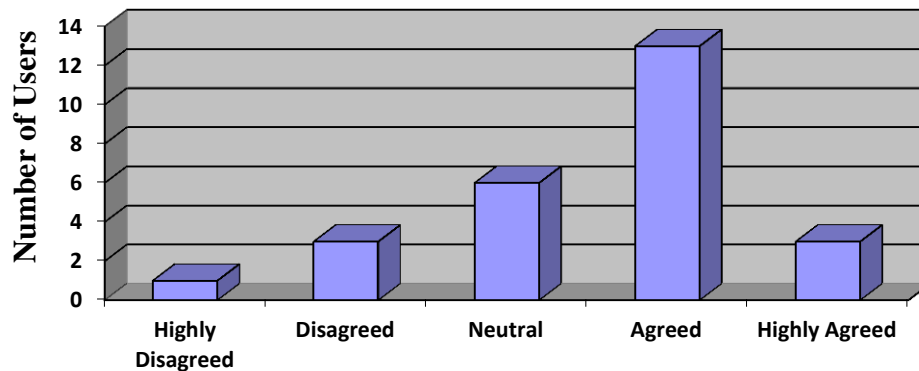


Figure 74 I Can Understand the Feeling That the Sender is Trying to Convey

The quotes below are evaluators' comments on whether they can understand the feeling the sender is trying to convey. Some users commented that the selection of avatars might not be appropriate to convey certain message or emotion while some commented that SmilieFace was able to convey emotion within the message.

2: smilie face icon is too small. I cant differentiate the expresion of being happy and being surprised esp black penguin.
6: a sender can choose the face but it may be different from what he/she feels
8: Honestly, who do you thing will send a "SmilieFace" msg when he is angry?
17: it seems 'natural'
18: Messages with emoticons made it easier to understand
19: the emoticons convey the emotions well
20: with added emoticons
21: the feelings are clear
23: I can understand, sometimes i can't
24: The smiley clearly conveys the message.

**Quote 7.11: Comments on whether they can understand the feeling within the message**

Users were asked whether they looked forward to receiving more SmilieFace messages and 10 users agreed and 4 users highly agreed with the statement, while 10 users are neutral, 1 user disagreed and another user highly disagreed with the statement.

As shown in Figure 75, it is suggested that the majority do look forward to receive more SmilieFace message. The users also commented that they will use it more if more of their friends are using it as well.

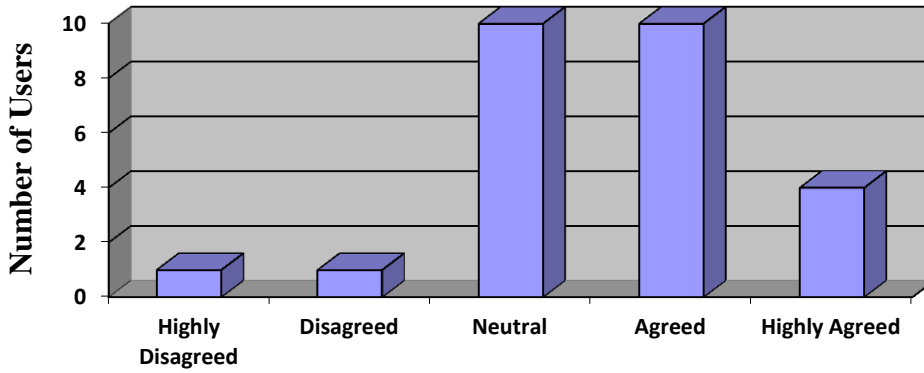


Figure 75 I Look Forward to Receiving More SmilieFace Messages?

Figure 76 showed 12 users agreed and 3 users highly agreed that they would like to send a SmilieFace message in return, while 10 users are neutral and 1 user highly disagreed. It indicated that the majority of users would like to send a SmilieFace message in return.

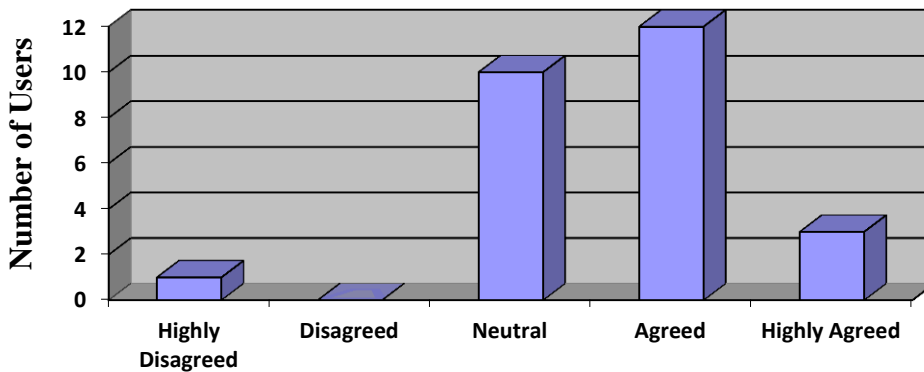


Figure 76 I Look Forward to Send a SmilieFace Message in Return

The Viewer Form statistics summary is shown in Table 8. Where N represent the number of evaluators and a mean of 2 represent a neutral position while a mean less than 2 represent a disagreement and a mean more than 2 represent an agreement. The means in Table 8 suggested that on average, SmilieFace users are in agreement that they find SmilieFace interesting, and they are able to understand the emotion within the message and they wanted to receive more as well as send a SmilieFace message in the future.

	N	Mean		Std. Deviation
	Statistic	Statistic	Std. Error	Statistic
interesting	26	2.77	.169	.863
understand	26	2.54	.194	.989
look4Receive	26	2.58	.185	.945
look2send	26	2.62	.167	.852
Valid N (listwise)	26			

Table 8 Viewer Form Statistics Summary



SmilieFace users commented that SmilieFace is entertaining and they liked how the message is read to them, and how easy it is to view a message without installing any plugins. However they do wished that the application will load faster in the future.

This section discussed and analysed SmilieFace users' experiences after viewing a SmilieFace message. In the next section the Summative Evaluation Form will be discussed and analysed to establish the overall opinion that SmilieFace users have about SmilieFace.

### 7.5 Summative Evaluation Form

The Summative Evaluation Form collects SmilieFace users' assessment of the application's effectiveness to test the Hypotheses: "*SmilieFace will be an innovative and engaging Facebook application which will enhance its users' experience in Social Networking*". The collective comments and feedback given by users in the Evaluation Forms were used to conclude the overall effectiveness of the application.

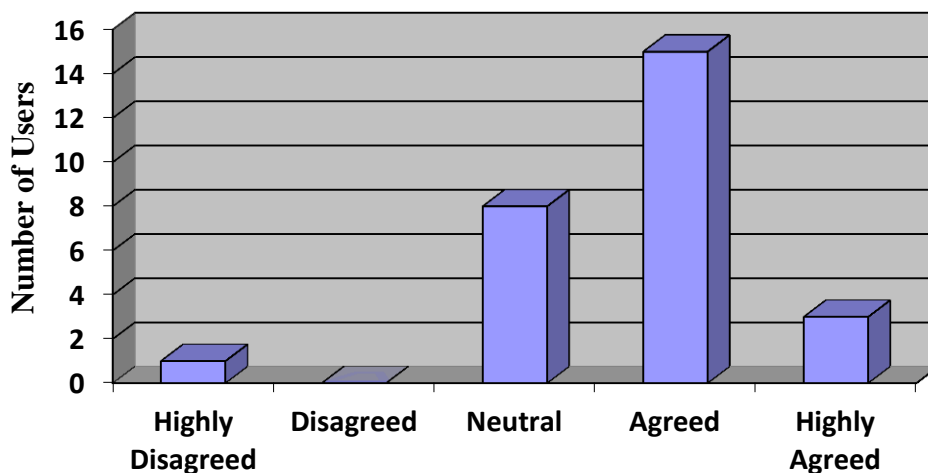


Figure 77 SmilieFace is an innovative way to communicate on Facebook

SmilieFace users were asked whether SmilieFace is an innovative way to communicate with their friends on Facebook and the result is as shown in Figure 77. 15 users have agreed and 3 users highly agreed with the statement while 8 users are neutral and 1 user highly disagreed. The numbers suggested that the majority of SmilieFace users agreed with the statement. Therefore, even given the small sample size, the hypothesis was proven to be true.

Figure 78 showed that 12 users agreed and 4 users highly agreed that SmilieFace is an effective way to communicate on Facebook, while 8 users are neutral, 2 users disagreed and 1 user highly disagreed. It indicated that the majority of users agreed that the statement is true.

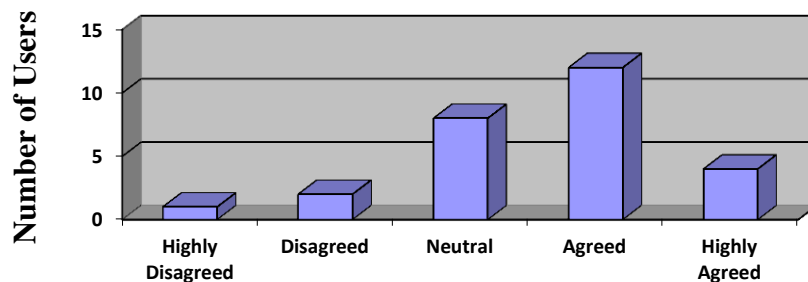


Figure 78 SmilieFace is an Effective Way to Communicate on Facebook

In the quotes below, user commented that SmilieFace added more meaning to a message, while some pointed out that it can only reach people in Facebook with SmilieFace installed.

6: i don't think so.
10: It does enable me to add a little more meaning to a message.
18: quick and easy
19: Not much since they use facebook and not smileface much
20: added features in the message will make more effective
21: if they use it frequently
22: express yourself in a new way
24: Sometimes i can't use facebook
25: Being an FB app, it can only reach people in facebook

**Quote 7.12: Comments on whether SmilieFace is an effective way to communicate**

Figure 79 indicated 17 users agreed and 3 users highly agreed that SmilieFace allowed them to express their emotion in the message they created. While 5 users have a neutral opinion, 1 user disagreed and another highly disagreed with the statement. It is evident that the majority of users agreed that SmilieFace helped them in expressing emotions in their messages.

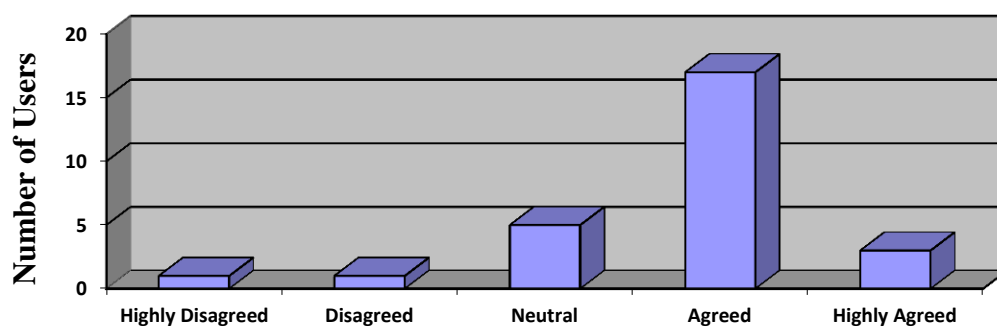


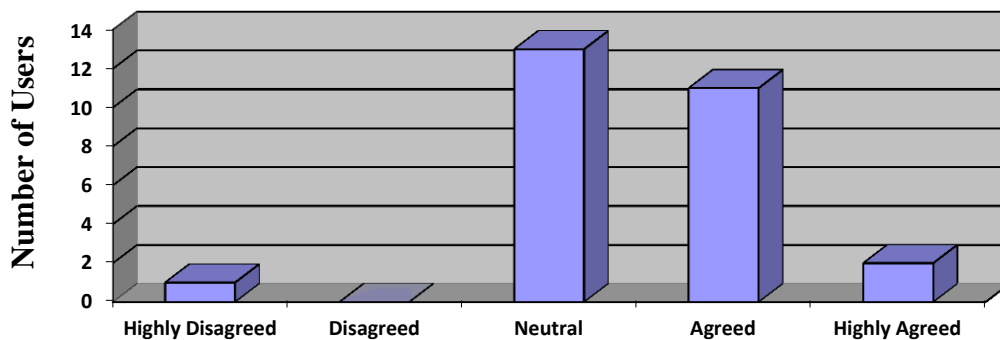
Figure 79 SmilieFace Allowed Me to Express My Emotion

However as shown in the quotes below, some users commented that more emotion tags would be needed to compete with the more widespread and commonly used emoticons.

6: i think need more emoicon. some of the icon are not clear
17: most emotions were covered
18: could add some more (adult themes could be fun and useful)
20: emoticons will do it well
21: added emoticons made it more interesting
24: It can express emotion indeed
26: with smilies u can show easily your mood express your feelings and have fun with your friends at chat

**Quote 7.13: Comments on whether SmilieFace helped them express emotion**

In Figure 80, 11 users agreed and 2 users highly agreed that SmilieFace improved their interactions with their friends on Facebook, while 13 users are neutral and 1 user highly disagreed with the statement.



**Figure 80 SmilieFace Improved My Interactions With Friends on Facebook**

In the quotes below, users commented that SmilieFace introduced a communication barrier since they can only exchange messages with their friends who have installed SmilieFace and if none of them are willing to install SmilieFace then it will not improve their interactions.

6: slightly agree. e.g. saying happy birthday and showing a emoicon with a birthday cake. a emoicon have more value then just some plain text.
8: On the contrary, it just introduced another barrier to communication
18: easier to get points across
19: Not much since they dont use the app
21: very much improved my interactions
22: still have to wait and see how it works out
24: Less people use it
25: To be able to interact with friends using SmilieFace, our friends need to have it on as well. And, I think just a few of them using this app at the moment.

**Quote 7.14: Comments on whether SmilieFace improved their interactions**

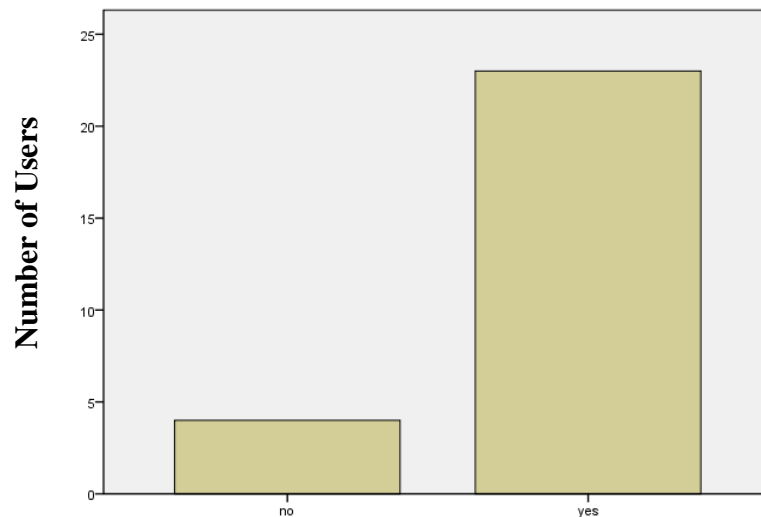


Figure 81 Would You Use SmilieFace Again?

Figure 81 showed that the majority which consisted of 23 users would use SmilieFace again while 4 users would not. As shown in the quotes below, users commented that SmilieFace is something new and different, also fun and interesting as well as easy to use and useful. They are also curious in seeing how people would react.

3: just want to try out and see how people react :)
6: depends if other people is using it
11: i like it
12: because it's something different
16: because its funny enough
18: easy to use and useful
19: Trying other forms of sending messages aside from the usual facebook message
20: it is interesting
21: it fun
22: need to send messages with meaning and speech, Smilieface is a excellent choice
24: I would like to
26: There is some potential

**Quote 7.15: Comments from evaluators who would like to use SmilieFace again**

Users were also asked about the changes or improvement they wanted to see in SmilieFace and as shown in the quotes below, users in general wanted to have more emotion tags and more avatars to choose from.

6: more more more smiley. better interface. load faster.
10: Not familiar enough with it yet to comment.
11: everything is great
12: make it more kind of smiley
13: Well, maybe to improve the look of the emoticons and that.

15: pointers more smiley option
16: more animated icons and cartoon icon faces
17: more choices?
19: Increase message length
20: add more emoticons
21: increase the emoticons
22: That it has a IM feature as well
23: less on screen at once, have top part as splash screen for example
24: More emotion
27: more funny icons smilies animated

**Quote 7.16: Comments on the changes or improvement they wanted to see**

Figure 82 indicated that 21 users would recommend SmilieFace, while 6 users would not.

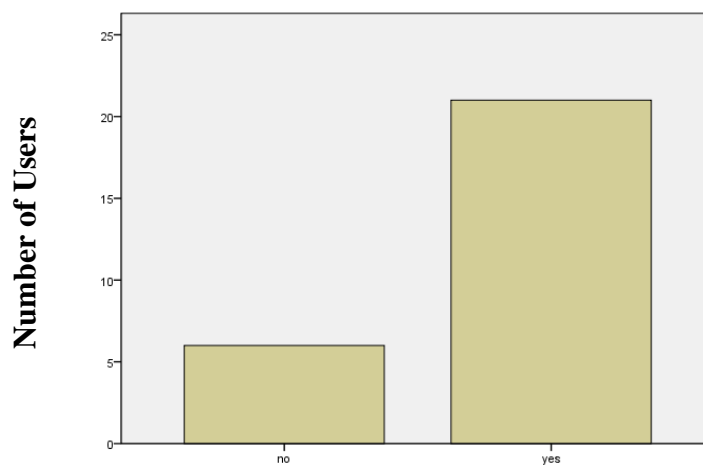


Figure 82 Would You Recommend SmilieFace?

As shown in the quotes below, users who would not recommend commented that the app still needs improvement and unsure whether people would respond.

1: not yet... need improvement...
14: cause most people will not respond..

**Quote 7.17: Comments from users that would not recommend SmilieFace**

The quotes below are comments from evaluators that would recommend SmilieFace and they thought that the application is unique and some users might find it appealing as well. The ability to send a SmilieFace message to more people will help to promote the application to their friends. Some think it is an easy and useful way to express oneself.

2: its unique application
10: Yes i would as there are people i know that would like this extra way of communicating and expressing themselves.
12: they can choose if they want or not to use it
13: Well, people have different tastes, someone likes all kinds of apps and might love this one.
17: ease of use

18: easy to use and useful
19: If I need a reply from it, I would need to promote it to my other friends
20: if it interests me, it will also interest my friends
21: i need to encourage my friend to use it too
22: has more than the other message apps out there
24: I would like to
25: Maybe, because i'll use it if a lot of my friends use as well
26: It's worth trying
27: of course already my friends asked me to show them the application and want more info for it

**Quote 7.18: Comments from users who would recommend SmilieFace**

In Figure 83, 22 users said they did not know of any other application that is similar to SmilieFace while 5 users have knowledge of a similar app. One particular user pointed out an app called “sweetpacks” which is an instant messaging app with animated emoticons similar to msn messenger or yahoo messenger.

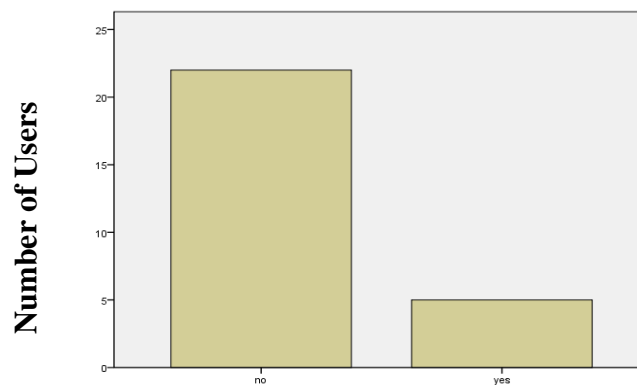


Figure 83 Do You Know of a Similar Application?

Figure 84 showed that 17 users, which represents the majority, thought that SmilieFace has enhanced their social networking experience on Facebook while 10 users disagreed.

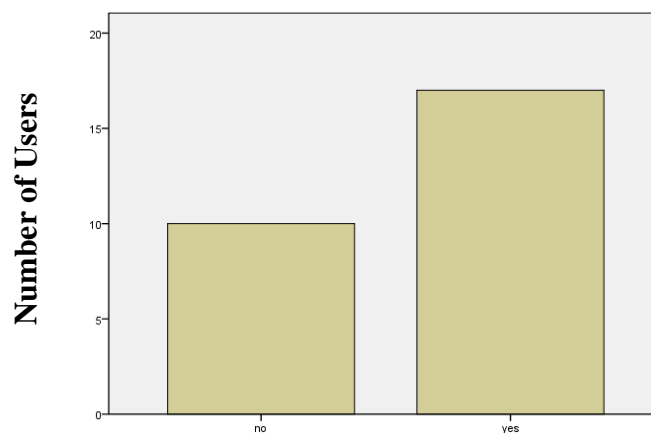


Figure 84 Did SmilieFace Enhanced Your Social Networking Experience on Facebook?

In the quotes below, one user commented that by expressing emotions through speech instead of in a written format, they have added another dimension to their interaction with friends.

2: theres a potential as smilieface app is entertaining to convey expected expression of the sender.
4: Expressing emotions through speech instead of just typing it down, adds another dimension of interaction with computer/friends
6: more emotion to text
11: i installed it and played with it
18: easy to use and useful, no need to try to explain
19: It enhanced it a bit
20: it gave various ways on how to send a message
21: a new approach to sending messages is always appreciated
25: Yes, it helps us to convey the emotion in our message.
26: Something new to try out, a new app!
27: of course people is intersted about the new app and many of em search for it too!

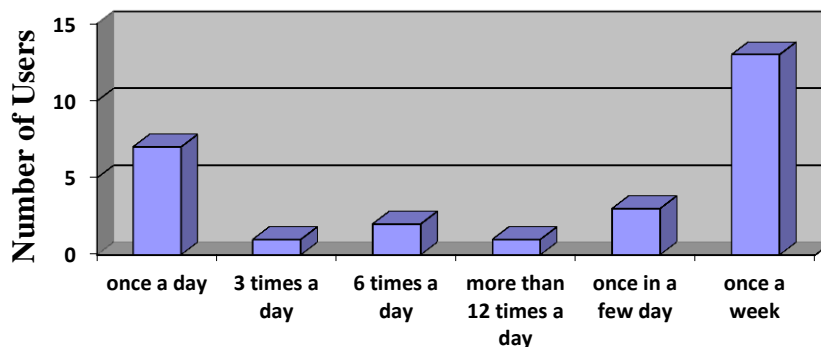
**Quote 7.19: Comments from users who thought SmilieFace enhanced Social Networking**

The quotes below are comments from people who disagreed and thought it was faster just to send a private message and since it is relatively new there a small amount of people who use the application and are unable to say for certain that the statement is true.

10: Just started using it so have to answer no.
12: faster only send PM
22: still very new to the app so to early to say definitively
24: Less people use it

**Quote 7.20: Comments from users who did not thought SmilieFace enhanced Social Networking**

Figure 85 indicated that the majority of users, which is 13 users, checked their SmilieFace message once a week. 7 users checked in a day, while 1 user checked in 3 times in a day. 2 users checked their SmilieFace messages 6 times in one day, while 1 user logged in more than 12 times in a day and 3 users checked their messages once in a few days.



**Figure 85 How Often Did You Check Your SmilieFace Messages?**

Figure 86 showed that 11 users, which are the majority, used SmilieFace once a week. 7 users used it once a day and 1 user used the app 3 times in a day. While 2 users used SmilieFace 6 times in one day and 6 users used SmilieFace once in a few days.

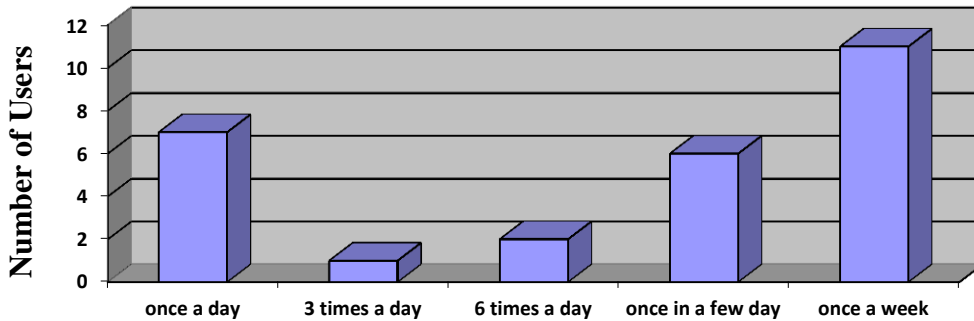


Figure 86 How Often Did You Use SmilieFace?

In Figure 87, 19 SmilieFace users which is the majority have received at least one SmilieFace message, while 2 users received at least 3 messages and 6 users have received 6 messages.

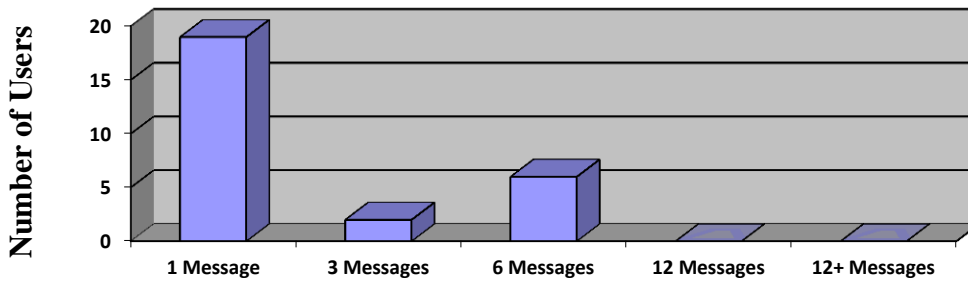


Figure 87 How many SmilieFace Message Did You Received?

Figure 88 showed that the majority which is 12 users have sent at least 1 SmilieFace message. 7 users sent 3 messages and 6 users sent at least 6 messages. While 1 user claimed to send around 20 messages and another user claimed to send more than 20 messages.

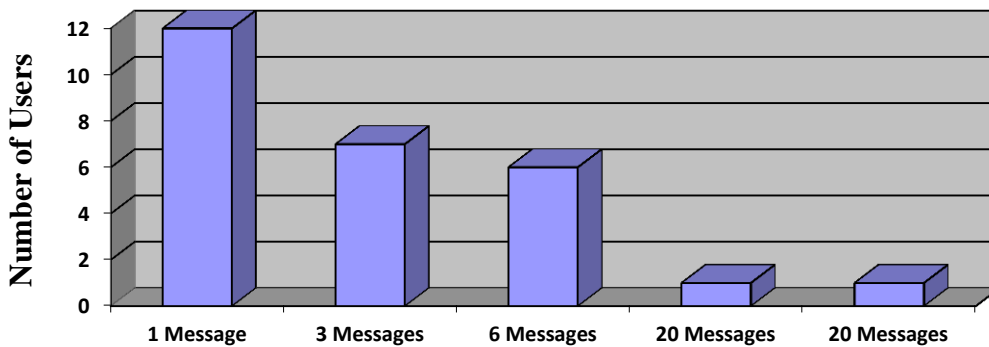


Figure 88 How Many SmilieFace Did You Send Out?



Figure 89 revealed that 20 users which represented the majority have agreed that SmilieFace has met their expectation for a Messaging Application, while 7 users disagreed.

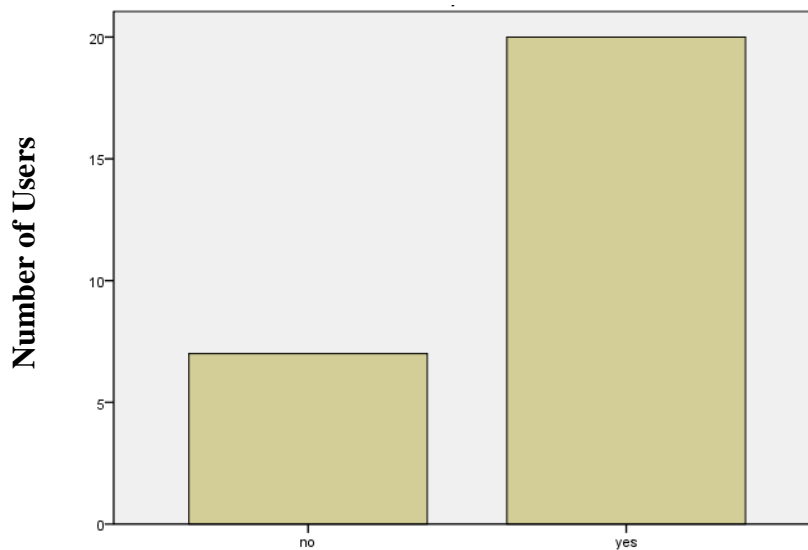


Figure 89 Does it Meet Your Expectation for a Messaging Application?

The quotes below are comments from users who disagreed that SmilieFace has met their expectation for a messaging application.

2: Not yet
3: actually i dont really now because i dont get any messages back from my messages i sent out.
11: its ugly
12: need to make it more simpler
24: Still has flaw on it

**Quote 7.21: Comments from users who disagreed that SmilieFace has met their expectation**

Comments from users who thought SmilieFace has met their expectation for a messaging application are shown below.

4: Ease of use
6: it works as a messaged
13: well, it obviously does what it's ment to. I guess it's okay for an app. :)
14: emotions are more lively now.
17: Better than an emoticon to set 'tone'
18: already explained in other forms
19: Replies are sent without any hassle
20: it sends me the intended message i wanted to send
21: new ways to send messages make me excited to use it
22: was enable to send a message
25: Most important thing is the message itself is sent.

**Quote 7.22: Comments from users who thought SmilieFace has met their expectation**

Figure 90 indicated that the majority of SmilieFace users, which comprised 19 users, have agreed that the application has met their expectation of a messaging application in the future while 8 users disagreed with the statement.

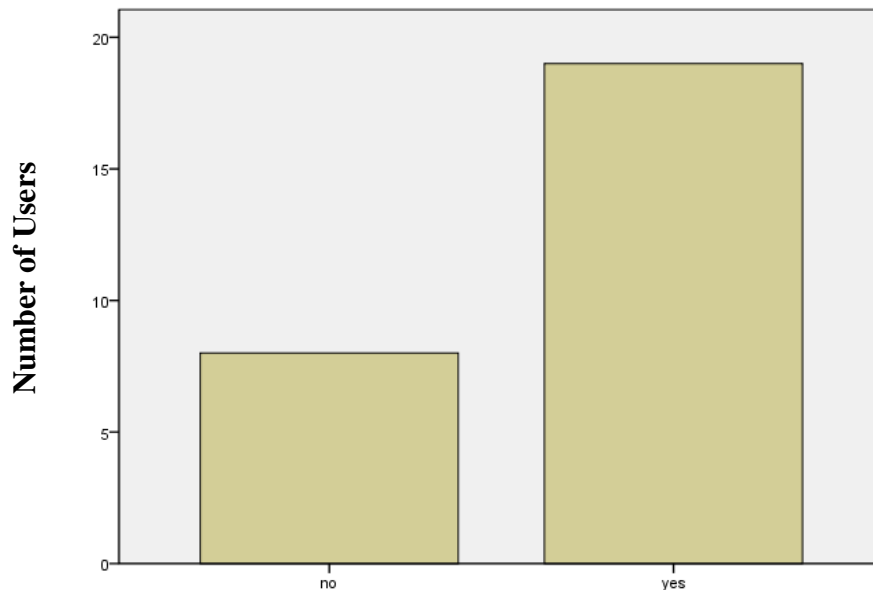


Figure 90 Does it Meet Your Expectation for a Messaging Application in the Future?

As shown in the quotes below, users further commented that the text to speech function is a rarity among messaging application and they would like the app to be developed even further, by using a 3D or 360 degree avatars and other graphical updates.

4: Adds the use of speech function which is rare for an application
6: maybe. but i was hoping to see more. like a 3D 360 degree emoicon
14: coz, i dont have much requirements
17: hopefully enhancements will drive the application forward
18: already explained in other forms
19: It conveys more emotion thru message
20: makes it interesting to send messages
21: interesting way to send messages
22: It has more than what i'm currently using
27: yes but i like to see some graphic updates in the future !

**Quote 7.23: Comments on SmilieFace as future messaging application**

When asked what part of the application that failed to meet their expectations, the users commented that the numbers of emotions to choose from are limited, the app takes some time to load, a preview of the message they have created would be nice and it looked like a spam/rogue app. They also wanted a quicker processing time for the message they sent. The quotes for the comments are shown below.

2: The smilieface is not obvious enough in expressing feeling.
5: too complicated and now user friendly
6: lack of emoicon choice and speed.
8: Already explained in other questionnaires. The UI, the process, the concept in general
10: Had no expectations.
12: frinds choosing
13: I guessed it would be maybe more colourfull.
14: still havent notice anything but take long time to install.
16: none. all are perfect
17: it is good right now and should remain so
18: minor - more choices
19: the processing time of messages
20: the limit
21: limit and the waiting time
22: failed to load on the first try
23: it kind alooks like a spam/ rogue app
24: Less emotion, a bit confusing.
25: Message Viewer, it needs to view the original message, not just the smiley.
26: Instant receipt of message?
27: noone all the application is good enough for me

**Quote 7.24: Comments on part of the application that failed to meet users' expectations**

On what part of SmilieFace did they find enjoyable, the users commented that they liked the selection of avatars and the penguin avatars in particular. They also enjoyed the various voices and expressions that the avatars are able to produce. Comments are shown below.

1: see the avatar...
2: black penguin
3: differnt kind of faces
4: Voice and emotion
5: able to works
10: Choice of faces on offer.
12: choosing the smiley
13: Penguins.
14: most of them, nothing specific
16: all :D
17: setting the combination of emotion and message
18: ease of use, choices available
19: the emoticons
20: emoticons
21: the choosing of emoticons
22: the voices and different expressions
23: easy to use

24: I can send voice message from message i type, seems cool.
25: Message Viewer
26: The emoticons.
27: smilies :D:D:D

**Quote 7.25: Comments on what part of SmilieFace did they find enjoyable**

As a closing comment, users also mentioned that it would be better if the app refrained from posting on people's wall as it might cause people to consider it as spam and block the app. They also wanted a better way to select the recipient instead of going through a list of friends. As shown in the quotes below.

4: More friends to send/receive messages to/from!
10: I would think it would be better if the smilie faces wre not coming up on people's walls as it may cause people to block the app.
13: Maybe you could put a little box in which you start to type a friends name and it shows you possible results, it would make it easier to find someone? like a dropping box or however it is called?
14: thanx to the app makers
17: pretty cool app, and looks like it can grow
18: as stated several times, could use some extra choices but some would need to be 'regulated'
19: good to use but the processing time is the only bothersome thing
20: after improvements it will become interestin
21: improve the overall function of the message sending
22: easy to use. would be cool to upload your own voice and send with the emoticon.
24: Keep making and improving more interesting application.
27: its very good app and i like to see at future what the creator has in his mind for updates ! :D

**Quote 7.25: Further Comments on SmilieFace**

## 7.6 Conclusion

The previous sections have discussed the comment and feedback provided by SmilieFace users via the submission of 4 web-based Evaluation Forms. The understanding of the data collected in the evaluation period will serve as a mean to test the sub-hypothesis set at the beginning of the research and to prove or disprove the hypothesis that drives this research.

The Viewer Evaluation Form was used to test “Sub-hypothesis 1: *A robust SmilieFace client for creating and viewing affective videos as an alternative Facebook messaging service can be designed, developed and implemented*”. This sub-hypothesis has proved to be true as the application is a functioning third party messaging application on the Facebook platform that is able to meet its users' expectation of a messaging application.

The Viewer Evaluation Form was also used to test “Sub-hypothesis 2: *A robust and scalable SmilieFace server for producing affective videos can be developed and implemented*”. This sub-hypothesis has proved to be true as SmilieFace was able to handle and process all the SmilieFace messages composed by users and consistently generate the SmilieFace message upon request.

The Sender Evaluation Form was used to test “Sub-hypothesis 3: *SmilieFace will be easy to use and engaging for its users, capable of attracting a substantial number of users, and become a popular application*”. This sub-hypothesis has partly proven to be true as comments and feedback from the users revealed that the majority of the evaluators agreed that SmilieFace is an easy and engaging application. However, the application has failed to attract a substantial amount of users and did not manage to become a popular application.

All the collective comments and feedback from the Evaluation Forms are used to test the “Hypotheses: *SmilieFace will be an innovative and engaging Facebook application which will enhance its users’ experience in Social Networking*”. The hypotheses has been proven to be true as the various comments and feedback have revealed, concluding that the majority of evaluators do find the application easy and intuitive to use, interesting as well as engaging and would like to continue to use and recommend the application to their friends. However, there are some flaws and certain improvement would be necessary to meet the users’ expectations. These will be discussed in the next chapter as areas of future research.

It should again be noted that the small sample size of participants limits the generalisation of the conclusions that can be drawn from this study but the overall results are positive for the SmilieFace System.

# Chapter 8

## Conclusion

### 8.1 Conclusion for Research Objectives

This research had the following objectives:

- |                                                                                                                                                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Integrate Smiliemail with Facebook in the form of a third party application implemented on the Facebook Platform.                              |
| 2. Develop a robust and scalable SmilieFace environment, capable of producing <i>affective videos</i> in a timely manner.                         |
| 3. Enlist a substantial number of users to evaluate the ease of use and the enjoy-ability of the SmilieFace application within Social Networking. |

The first objective was achieved through the successful development and implementation of the SmilieFace Facebook Client Application, which was built upon the Smiliemail System (Mutale 2005), an affective messaging web application. As described in Chapter 4, SmilieFace acts as a client application by replacing Smiliemail's web interface with a specifically designed interface that enables the SmilieFace user to create and send affective video messages to their Facebook friends, as well as view the affective videos sent to them. SmilieFace's user interface was designed so it is easy and intuitive to use whilst conforming to Facebook's strict policy for third party applications. Therefore the successful integration of Smiliemail into the Facebook platform as the SmilieFace Client Application has signified that the first research objective has been met.

To achieve the second objective, the SmilieFace Server must be able to produce a SmilieFace video upon every user's request, the video must be generated in a timely manner and the server itself must be able to handle the workload as required by multiple users. Details on the SmilieFace Server's Architecture and major components can be found in Chapter 5. In accordance to quantitative data recorded in the SmilieFace Database, the SmilieFace server

managed to produce a SmilieFace video for every user's requests in under a minute. Hence the second objective of the research was met.

The third objective required SmilieFace to gather a significant number of users that actively used the application as well as participated in the evaluation process. As stated in Chapter 6, the evaluations were purely voluntary and were conducted through a series of web questionnaires, aimed specifically at gathering feedback from SmilieFace users to assess the effectiveness of the application. Considering the number of potential users that Facebook was able to provide, the research considered and targeted to obtain a significant number of users and evaluators in the range of a thousand users. However, the number of SmilieFace users and evaluators did not meet the research's target, and hence it is not possible to assert that the third objective has been met. Details on the difficulties of enlisting users and evaluators for the research as well as measures taken to fix the issues are specified in Chapter 6.

Even though the research was not able to achieve its targeted number of users and evaluators, the qualitative data from existing users that have evaluated SmilieFace have provided some valuable insights. Chapter 7 provided an analysis of all the qualitative and quantitative feedback provided by SmilieFace users via the evaluation forms and concluded that most evaluators agreed that the application was easy to use and they also find it enjoyable and interesting. Hence a part of the research's third objective was met.

## **8.2 Conclusion for Each Hypothesis**

Hypothesis: SmilieFace will be an innovative and engaging Facebook application which will enhance its users' experience in Social Networking

As concluded in Chapter 7, the various comments and quantitative feedback from SmilieFace's users have revealed that the majority of evaluators did find the application easy and intuitive to use, they considered the application to be interesting as well as engaging, and hence would welcome the opportunity to continue using and recommending the application to their friends. Due to the small number of SmilieFace users and evaluators, 300 users and 30 evaluators, the hypothesis cannot be unconditionally asserted to be true, although the feedback from the evaluators did suggest that the hypothesis is true.

Sub-hypothesis 1: A robust SmilieFace client for creating and viewing affective videos as an alternative Facebook messaging service can be designed, developed and implemented

Sub-hypothesis 2: A robust and scalable SmilieFace server for producing affective videos can be developed and implemented

Sub-hypothesis 3: SmilieFace will be easy to use and engaging for its users, capable of attracting a substantial number of users, and become a popular application

From the quantitative data collected in Chapter 6 and the qualitative data collected and analysed in Chapter 7, Sub-hypothesis 1 was proven as SmilieFace has been successfully implemented as a fully functional third party affective messaging application on the Facebook platform capable of meeting its users' expectation for a messaging application.

Sub-hypothesis 2 was proven as the SmilieFace Facebook Client Application was able to handle and process all its users' requests and consistently produce a SmilieFace video for every SmilieFace message sent.

Sub-hypothesis 3 was partly proven when comments and feedback during the evaluation period revealed that the majority of the evaluators agreed that SmilieFace was an easy and engaging application. However, the application has failed to reach and attract the desired number of users and did not manage to become a popular application.

Even though Smilieface did not attract the number of users required to give these findings any statistically significant meaning for extrapolation into results for the general Facebook community. Overall, the Smilieface project is seen as a success given that the majority of the evaluators are happy and satisfied with the application.



### **8.3 Implications for Theory**

As discussed in Chapter 2, the fields of Social Media, Digital Representation and Computer Mediated Communication (CMC) are the parent theories that drove this research. The research problem revolved around the use of avatars as a digital representation for people in Facebook, to enhance its users' interactions with each other by providing an improvement in the field of CMC. The primary objective was to investigate the use of avatars in conveying *affective* messages to improve CMC between users on a Social Media platform which was Facebook. How each parent theories are affected by the research will be as follows:

The research used a 2 Dimensional avatar to digitally represent the author of the SmilieFace message. The avatars available were mostly cartoon like characters, which articulated text messages imbued with emotion tags. The avatar is able to convey emotions through the changes in the intonation of its voice as well as changes in its facial expressions. The use of avatars as a digital representation of a user is quite common, however the additional ability to express emotions made SmilieFace avatars unique. As shown in Chapter 7, the expressiveness of SmilieFace avatars represents an improvement over other generic avatars.

As covered in Chapter 2, there are various types of Social Media and the research have focused on the Social Networking branch of Social Media and in particular Facebook. Whilst a number of research projects conducted on Facebook existed, few specialized in the development of a third party application such as SmilieFace. The research's evaluation process which required voluntary participation from its users and conducted purely via web questionnaires has delved into the problems and possibilities of getting research participants from the Facebook user community.

SmilieFace has provided an innovative way for people to communicate by providing an application capable of sending *affective* messages. The application is platform free and able to work on any operating system and via any type of communication device, although users would need to have a Facebook account before they can use the application. Its ability to send *affective* messages represents an improvement over the cold nature characteristic commonly associated with typical Computer Mediated Communication.

### **8.4 Future Research**

As previously mentioned, despite receiving numerous positive feedback and responses from evaluators during the evaluation period, SmilieFace still have its flaws and certainly a number

of ways to improve the app have been mentioned. Increasing the number of avatars that the users can choose from as well as increasing the number of emotion tags were the most popular suggestions. Looking further into the future, it is possible to implement SmilieFace in other forms of Social Media, not limiting it as an affective messaging application but more towards being used as a digital assistance. Using it in conjunction with Twitter might allow an avatar of the users' preference to read Tweets from the people they followed.

Given the difficulties experienced in the research in getting participants and evaluators, there is a potential for future research to delve deeper into this area. A deeper investigation on:

- How to encourage users to adopt a newly developed application or technology?
- What application would be popular among Facebook users?
- What are users' fears, tendencies and expectations when installing and using a new type of application or service on Facebook?

would prove beneficial not only to future avatar related or CMC related research, but for other research which involved acquiring users participation on Facebook or the development and propagation of a newly developed application in general.

SmilieFace was not able to become a popular Facebook application and was not able to gather a substantial number of users. However, the SmilieFace System has met its design goals and fulfilled its research objectives whilst receiving positive feedback from its existing users. Most of the evaluators agreed on SmilieFace's potential and its usefulness and looked forward for its improvement in the future.

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

































































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# Appendices

## Smiliemail User Database

Server: smilie.smiliemail.org ▶ Database: Smiliemail ▶ Table: SmileyUsers

Browse
  Structure
  SQL
  Search
  Insert
  Export
  Import
  Operations
  Empty
  Drop





























































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<input type="checkbox"/>	Password	varchar(254)	latin1_swedish_ci		No			     
<input type="checkbox"/>	Contact	varchar(254)	latin1_swedish_ci		No			     
<input type="checkbox"/>	SessionID	varchar(254)	latin1_swedish_ci		No			     
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<input type="checkbox"/>	LoginCount	int(11)			No	0		     
<input type="checkbox"/>	AddDate	datetime			No	0000-00-00 00:00:00		     
<input type="checkbox"/>	privileges	mediumtext	latin1_swedish_ci		No			     
<input type="checkbox"/>	message	longtext	utf8_unicode_ci		No			     
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Check All /  Uncheck All With selected:      

## SmilieFace User Database

Server: smilie.smiliemail.org ▶ Database: Smiliemail ▶ Table: SmileyFB

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  Structure
  SQL
  Search
  Insert
  Export
  Import
  Operations
  Empty
  Drop
















































































































































































	Field	Type	Collation	Attributes	Null	Default	Extra	Action
<input type="checkbox"/>	ID	int(11)			No		auto_increment	     
<input type="checkbox"/>	fbUserName	varchar(254)	latin1_swedish_ci		No			     
<input type="checkbox"/>	fbID	varchar(254)	latin1_swedish_ci		No			     
<input type="checkbox"/>	SessionID	varchar(254)	latin1_swedish_ci		No			     
<input type="checkbox"/>	MessageCount	int(11)			No	0		     
<input type="checkbox"/>	LoginCount	int(11)			No	1		     
<input checked="" type="checkbox"/>	AddDate	datetime			No	0000-00-00 00:00:00		     
<input type="checkbox"/>	privileges	mediumtext	latin1_swedish_ci		No			     
<input type="checkbox"/>	message	longtext	utf8_unicode_ci		No			     
<input type="checkbox"/>	flags	text	utf8_unicode_ci		No			     

Check All /  Uncheck All With selected:      

# Smiliemail Messaging Database

Server: smilie.smiliemail.org ▶ Database: Smiliemail ▶ Table: SmileyMessaging

[Browse](#)
[Structure](#)
[SQL](#)
[Search](#)
[Insert](#)
[Export](#)
[Import](#)
[Operations](#)
[Empty](#)
[Drop](#)

	Field	Type	Collation	Attributes	Null	Default	Extra	Action
<input type="checkbox"/>	ID	int(11)			No		auto_increment	      
<input type="checkbox"/>	State	int(1)			No	0		      
<input type="checkbox"/>	Message	longtext	latin1_swedish_ci		No			      
<input type="checkbox"/>	Voice	varchar(254)	latin1_swedish_ci		No			      
<input type="checkbox"/>	Vx	int(11)			No	0		      
<input type="checkbox"/>	fmt	varchar(12)	latin1_swedish_ci		No	a		      
<input type="checkbox"/>	FromID	int(11)			No	0		      
<input type="checkbox"/>	ToName	varchar(254)	latin1_swedish_ci		No	0		      
<input type="checkbox"/>	ToEmail	varchar(254)	latin1_swedish_ci		No			      
<input type="checkbox"/>	FromName	varchar(254)	latin1_swedish_ci		No			      
<input type="checkbox"/>	FromEmail	varchar(254)	latin1_swedish_ci		No			      
<input type="checkbox"/>	MessageSubject	varchar(254)	latin1_swedish_ci		No			      
<input type="checkbox"/>	MessageLinkID	mediumtext	latin1_swedish_ci		No			      
<input type="checkbox"/>	Filename	varchar(254)	latin1_swedish_ci		No			      
<input type="checkbox"/>	Face	varchar(254)	latin1_swedish_ci		No			      
<input type="checkbox"/>	GIFTimesRead	int(11)			No	0		      
<input type="checkbox"/>	AVITimesRead	int(11)			No	0		      
<input type="checkbox"/>	FLVTimesRead	int(11)			No	0		      
<input type="checkbox"/>	MPEGTimesRead	int(11)			No	0		      
<input type="checkbox"/>	MP4TimesRead	int(11)			No	0		      
<input type="checkbox"/>	DateAdded	datetime			No	0000-00-00 00:00:00		      
<input type="checkbox"/>	DateProcessed	datetime			No	0000-00-00 00:00:00		      
<input type="checkbox"/>	DateRead	datetime			No	0000-00-00 00:00:00		      
<input type="checkbox"/>	flags	varchar(254)	utf8_unicode_ci		No			      
<input type="checkbox"/>	emailText	longtext	utf8_unicode_ci		No			      

# SmilieFace Messaging Database

Server: smilie.smiliemail.org Database: Smiliemail Table: SFmsg

Field	Type	Collation	Attributes	Null	Default	Extra	Action
<input type="checkbox"/> ID	int(11)			No		auto_increment	
<input type="checkbox"/> State	int(1)			No	0		
<input type="checkbox"/> Message	longtext	latin1_swedish_ci		No			
<input type="checkbox"/> Voice	varchar(254)	latin1_swedish_ci		No			
<input type="checkbox"/> Vx	int(11)			No	0		
<input type="checkbox"/> fmt	varchar(12)	latin1_swedish_ci		No	a		
<input type="checkbox"/> FromID	int(11)			No	0		
<input type="checkbox"/> ToName	varchar(254)	latin1_swedish_ci		No	0		
<input type="checkbox"/> ToEmail	varchar(254)	latin1_swedish_ci		No			
<input type="checkbox"/> FromName	varchar(254)	latin1_swedish_ci		No			
<input type="checkbox"/> FromEmail	varchar(254)	latin1_swedish_ci		No			
<input type="checkbox"/> MessageSubject	varchar(254)	latin1_swedish_ci		No			
<input type="checkbox"/> MessageLinkID	mediumtext	latin1_swedish_ci		No			
<input type="checkbox"/> Filename	varchar(254)	latin1_swedish_ci		No			
<input type="checkbox"/> Face	varchar(254)	latin1_swedish_ci		No			
<input type="checkbox"/> GIFTimesRead	int(11)			No	0		
<input type="checkbox"/> AVITimesRead	int(11)			No	0		
<input type="checkbox"/> FLVTimesRead	int(11)			No	0		
<input type="checkbox"/> MP4TimesRead	int(11)			No	0		
<input type="checkbox"/> DateAdded	datetime			No	0000-00-00 00:00:00		
<input type="checkbox"/> DateProcessed	datetime			No	0000-00-00 00:00:00		
<input type="checkbox"/> DateRead	datetime			No	0000-00-00 00:00:00		
<input type="checkbox"/> flags	varchar(254)	utf8_unicode_ci		No			
<input type="checkbox"/> emailText	longtext	utf8_unicode_ci		No			
<input type="checkbox"/> fromFbID	varchar(24)	latin1_swedish_ci		No			
<input type="checkbox"/> toFbID	varchar(24)	latin1_swedish_ci		No			
<input type="checkbox"/> toFbName	varchar(24)	latin1_swedish_ci		No			

# SmilieFace Terms of Service



## Terms of Service

By using SmilieFace, you are agreeing that you have read, understood and agree to be bound by this agreement for all past, present and future uses by you of the SmilieFace application. If you do not agree to be bound by this agreement please do not access or use any part of this application. SmilieFace reserve the right to make changes to this agreement at any time. Continued use of any part of this application constitutes your acceptance of such changes. Accordingly, you should review this agreement from time to time to become familiar with such changes.

### 1. Definitions:

- 1.1 "SmilieFace" refers to the Facebook application that provide an "affective" messaging service.
- 1.2 "Affect" means have an effect upon; for example, "Will the new rules affect me?".
- 1.3 "Affective" means pertaining to affect.
- 1.4 "Appealing" means attractive or interesting.
- 1.5 "Engage" means to interest someone in something and keep them thinking about it.
- 1.6 "Believable" means if something is believable, it seems possible, real or true.

### 2. General Rules:

- 2.1 You will comply with all of the terms and conditions of this Agreement and all applicable laws, regulations and rules when you use SmilieFace, when you use its freely-available services to send and view SmilieFace messages.
- 2.2 SmilieFace may modify the SmilieFace application at any time with or without notice to you.

### 3. Your Conduct

- 3.1 Generally, you must use the SmilieFace application in a manner that demonstrates good taste and respect for the rights of SmilieFace, and other Facebook users.
- 3.2 You will not "spam" other users or send messages that advertise or promote other services.
- 3.3 You will not create accounts with similar names for the sole purpose of imitating other Facebook users and it is strictly forbidden.
- 3.4 You will not use any third party tools to modify the application, or falsify information being transmitted to or from our servers.
- 3.5 You will not attempt to gain access to restricted content without proper permissions.

### 4. Disclaimers, exclusions and limitations

4.1 SMILIEFACE PROVIDES THE SMILIEFACE SERVICE ON AN "AS IS" BASIS. SMILIEFACE DOES NOT REPRESENT OR WARRANT THAT THE SMILIEFACE APPLICATION OR ITS USE (i) WILL BE UNINTERRUPTED, (ii) WILL BE FREE OF INACCURACIES OR ERRORS, (iii) WILL MEET YOUR REQUIREMENTS, OR (iv) WILL OPERATE IN THE CONFIGURATION OR WITH THE HARDWARE OR SOFTWARE YOU USE. SMILIEFACE MAKES NO WARRANTIES OTHER THAN THOSE MADE EXPRESSLY IN THIS AGREEMENT, AND HEREBY DISCLAIMS ANY AND ALL IMPLIED WARRANTIES, INCLUDING WITHOUT LIMITATION, WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY AND NON-INFRINGEMENT.

4.2 SMILIEFACE WILL NOT BE LIABLE TO YOU OR ANY THIRD PARTY FOR ANY CONSEQUENTIAL, INCIDENTAL, INDIRECT, PUNITIVE OR SPECIAL DAMAGES (INCLUDING DAMAGES RELATING TO LOST PROFITS, LOST DATA OR LOSS OF GOODWILL) ARISING OUT OF, RELATING TO OR CONNECTED WITH THE USE OF THE SMILIEFACE APPLICATION, BASED ON ANY CAUSE OF ACTION, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

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# SmilieFace Privacy Policy



## Privacy Policy

Welcome to SmilieFace. SmilieFace respects the privacy rights of our users and is committed to protecting the information collected on its application and website. We have adopted this privacy policy to explain how we collect, store and use the information collected. All of these policies and disclosures are collectively referred to in this document as the "Privacy Policy".

### What does this Privacy Policy apply to?

This Privacy Policy applies solely to SmilieFace Facebook application.

By using and submitting personal information SmilieFace, you signify your assent to this Privacy Policy. If you do not agree to this Privacy Policy, please do not use SmilieFace. We reserve the right to make changes to this Privacy Policy.

### How does SmilieFace collect information?

In connection with its application, SmilieFace collects information from you in three ways.

1. When you use SmilieFace, information about your usage (frequency of use) may be collected and transmitted to SmilieFace.
2. You may choose to voluntarily provide us with various personal information and non-personal information through your use of SmilieFace.
3. You may choose to evaluate and provide comments on the application in connection with your use of SmilieFace.

### What information does SmilieFace collect?

SmilieFace may receive information regarding your usage without any additional notice to you or actions taken by you. SmilieFace will also receive personal information such as your name and your email address, or other information and statistics regarding your usage of the application.

When you use SmilieFace, you may voluntarily provide, and SmilieFace may collect, personal and non-personal information in the form of a web form (name, email, etc), and other data necessary to fulfill your requests. SmilieFace may also passively collect certain information about your use of SmilieFace, such as number of SmilieFace messages sent and viewed (see "Cookies" below).

### E-mail Correspondence

We may collect personal information about you, such as your e-mail address or any other personal data required by SmilieFace. We will never sell your email address; we only use the information for the functionality SmilieFace application. If you do not wish to receive emails, you may set it in the preferences.

### What happens if I refuse to provide my personal information?

Your refusal to submit personal information may limit your ability to use the SmilieFace.

### Does SmilieFace use cookies, or use other passive means to collect information?

SmilieFace may use cookies and similar tracking devices. A "cookie" is a small bit of record-keeping information that websites often store on a user's computer. Cookies generally do not include people's names, e-mail addresses, or other information that is personally identifiable; they are typically used to quickly identify a user's computer and to "remember" things about the user's visit (such as the user's use of various features on the application). You can always disable cookies or set your browser to alert you when cookies are being sent to your computer; however, disabling cookies may affect your ability to use certain portions of SmilieFace.

Other information that may be passively collected by SmilieFace includes log files that record website activity, including how many "hits" a particular web page is getting (a.k.a. "navigational data"). These entries are generated anonymously and enable SmilieFace to assess overall online activity and a user's browsing habits, and troubleshoot technical concerns. We also use the log file entries for our demographic studies, so we can constantly improve the online services we provide you.

### Who is collecting my information and how will it be used?

When you submit information on SmilieFace, or information is automatically collected as described in this Privacy Policy, SmilieFace uses the submitted information to provide you with access to our services, and to respond to questions or technical problems. We also use your personal information for our demographic studies, so we can constantly improve the products and services we provide you and to better meet your needs.

### With whom does SmilieFace share my personal information?

SmilieFace does not share your personal information with any third parties. We also may share your information with third parties as required by law enforcement or other government officials in connection with an investigation of fraud, intellectual property infringements, or other activity that is illegal or may expose you or us to legal liability. In addition, in the event of a merger, acquisition, reorganization, bankruptcy, or other similar event involving all or a portion of SmilieFace, SmilieFace's customer information may be transferred to our successor or assign.

### What safeguards does SmilieFace use to protect my personal information?

To protect your personal information, SmilieFace maintains reasonable safeguards to attempt to ensure the security, integrity and privacy of the information you have provided. SmilieFace has security measures in place designed to protect against the loss, misuse and alteration of the information under our control. Personal information collected by SmilieFace is stored in secure operating environments that are not available to the public (e.g., locked rooms). To prevent unauthorized electronic access to personal information, SmilieFace maintains information collected online behind a firewall-protected server. However, no system can be 100% secure and there is the possibility that despite our reasonable efforts, there could be unauthorized access to your information. By using our services, you assume this risk.

### How do I ask a question or file a complaint?

Any questions or complaints about this Online Privacy Statement can be resolved by contacting us via email at

[hengkyl@postgrad.curtin.edu.au](mailto:hengkyl@postgrad.curtin.edu.au)

or my Supervisor: Andrew Marriott

[ravtrace@cs.curtin.edu.au](mailto:ravtrace@cs.curtin.edu.au)

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# SmilieFace Privacy Policy



## SmilieFace Information Sheet

The purpose of this questionnaire is to get valuable feedback from you. You will send affective messages using the SmilieFace application in Facebook. SmilieFace is an application that was developed to send affective messages or messages that are able to relay its sender's emotion via a video message of an avatar. The avatar would convey the emotions associated within the text-based message through changes in the intonation of its voice and changes in its facial expressions. The feedback will be used to evaluate the hypotheses of this research.

You will be required to evaluate SmilieFace and fill in the questionnaire. The questionnaire has 3 parts: You need to fill in the first part before using the application. This will take you about 5 minutes. The second part will appear after you use the application to send an affective message. This should take around 5 minutes. Part 3 will appear after you receive and view an affective message sent to you and this part can take another 5 minutes.

The application will ask you to set your preferences or use the default settings and go straight to using the application. It is hoped you will use the application to send and receive as well as view the message. If you do not wish to partake in the evaluation, you can still use the application.

However, you would not be able to make use of all the application's features or have any access to any additional features other than the basics. This evaluation is purely voluntary, you do not have to take part in this research and you are free to withdraw from it anytime.

Note: - It is **NOT** you that is evaluated, it is the application.

- SmilieFace can send and receive as well as view affective messages, so please try all the features and fill in the related parts.
- The individual data collected will remain strictly confidential.
- The questionnaires are anonymous, as your name would not be recorded.

If you have any questions, then feel free to ask them via email later.

I can be contacted via: [hengky@postgrad.curtin.edu.au](mailto:hengky@postgrad.curtin.edu.au)

And my supervisor (Andrew Marriott) can be contacted via: [ravtrace@cs.curtin.edu.au](mailto:ravtrace@cs.curtin.edu.au)

This study has been approved by the Curtin University Human Research Ethics Committee. Ethics Approval Number: **RD-24-11**. If needed, verification of approval can be obtained either by writing to the Curtin University Human Research Ethics Committee, c/- Office of Research and Development, Curtin University of Technology, GPO Box U1987, Perth, 6845 or by telephoning 9266 2784.

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## SmilieFace Contact Us



If you have any questions,  
then feel free to ask them via email.

I can be contacted via: [hengky@postgrad.curtin.edu.au](mailto:hengky@postgrad.curtin.edu.au)

And my supervisor (Andrew Marriott) can be contacted via: [ravtrace@cs.curtin.edu.au](mailto:ravtrace@cs.curtin.edu.au)

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# SmilieFace Demographic Form



## Demographic Form

This would take approximately 10 to 15 minutes of your time.

Page 1/2 (12 Questions total)

1. Do you primarily communicate in English on a day to day basis?
  - Yes
  - No
2. Gender:
  - Male
  - Female
3. Age:
4. Highest Education:
5. How experienced are you at:
 

5a. <b>Emails</b>	<input type="radio"/> No Experience	<input type="radio"/> Little Experience	<input type="radio"/> Average	<input type="radio"/> Experienced	<input type="radio"/> Highly experienced
5b. <b>Short Messaging Service (SMS)</b>	<input type="radio"/> No Experience	<input type="radio"/> Little Experience	<input type="radio"/> Average	<input type="radio"/> Experienced	<input type="radio"/> Highly experienced
5c. <b>Instant Messenger (yahoo, live messenger, etc)</b>	<input type="radio"/> No Experience	<input type="radio"/> Little Experience	<input type="radio"/> Average	<input type="radio"/> Experienced	<input type="radio"/> Highly experienced
5d. <b>YouTube</b>	<input type="radio"/> No Experience	<input type="radio"/> Little Experience	<input type="radio"/> Average	<input type="radio"/> Experienced	<input type="radio"/> Highly experienced
5e. <b>Video Games</b>	<input type="radio"/> No Experience	<input type="radio"/> Little Experience	<input type="radio"/> Average	<input type="radio"/> Experienced	<input type="radio"/> Highly experienced
5f. <b>Avatars (Digital Representation)</b>	<input type="radio"/> No Experience	<input type="radio"/> Little Experience	<input type="radio"/> Average	<input type="radio"/> Experienced	<input type="radio"/> Highly experienced
5g. <b>Second Life</b>	<input type="radio"/> No Experience	<input type="radio"/> Little Experience	<input type="radio"/> Average	<input type="radio"/> Experienced	<input type="radio"/> Highly experienced
5h. <b>Cell Phones</b>	<input type="radio"/> No Experience	<input type="radio"/> Little Experience	<input type="radio"/> Average	<input type="radio"/> Experienced	<input type="radio"/> Highly experienced
5i. <b>Smart Phones (iPhone, Android, etc)</b>	<input type="radio"/> No Experience	<input type="radio"/> Little Experience	<input type="radio"/> Average	<input type="radio"/> Experienced	<input type="radio"/> Highly experienced
5j. <b>iPad type devices</b>	<input type="radio"/> No Experience	<input type="radio"/> Little Experience	<input type="radio"/> Average	<input type="radio"/> Experienced	<input type="radio"/> Highly experienced
5k. <b>Facebook</b>	<input type="radio"/> No Experience	<input type="radio"/> Little Experience	<input type="radio"/> Average	<input type="radio"/> Experienced	<input type="radio"/> Highly experienced
5l. <b>Google+</b>	<input type="radio"/> No Experience	<input type="radio"/> Little Experience	<input type="radio"/> Average	<input type="radio"/> Experienced	<input type="radio"/> Highly experienced
5m. <b>Other Social Network Sites (MySpace, Friendster, etc)</b>	<input type="radio"/> No Experience	<input type="radio"/> Little Experience	<input type="radio"/> Average	<input type="radio"/> Experienced	<input type="radio"/> Highly experienced
5n. <b>Other Social Media Sites (tumblr, flickr, blogs, etc)</b>	<input type="radio"/> No Experience	<input type="radio"/> Little Experience	<input type="radio"/> Average	<input type="radio"/> Experienced	<input type="radio"/> Highly experienced

General comments on your experiences using the technologies mentioned previously.

Next Page



Demographic Form

This would take approximately 10 to 15 minutes of your time.

Page 2/2 (12 Questions total)

Back

Submit

6. Which of the following technology do you prefer to use to communicate with you friends?

- Instant Messaging
- iPad type devices
- Email
- Facebook
- Short Messaging Service (SMS)
- Smart Phone

Any specific reason?

7. Do you use Facebook? If no then go directly to question 10

How do you normally access Facebook?

Computer

8. What do you mainly use Facebook for?

9. On average, how much time do you spent on Facebook per day?

15 mins

10. On average, how much time do you spent online per day?

Less than 1 hour

What do you normally do online?

11. What features do you expect from a messaging application?

12. What features do you expect from a messaging application in the future?

Back

Submit

# SmilieFace Sender Evaluation Form



## Sender Evaluation Form

This would take approximately 10 to 15 minutes of your time.

Page 1/1 (10 Questions total)

1. It is easy to create a SmilieFace message.

- Highly Disagree     Disagree     Neutral     Agree     Highly Agree

Comments

2. The SmilieFace application is intuitive.

- Highly Disagree     Disagree     Neutral     Agree     Highly Agree

Comments

3. It is quick and easy to create a SmilieFace Message.

- Highly Disagree     Disagree     Neutral     Agree     Highly Agree

Comments

4. The tags helped me to express my emotion in my message.

- Highly Disagree     Disagree     Neutral     Agree     Highly Agree

Comments

5. What do you like about the "compose a message" component of SmilieFace?

6. What do you dislike about the "compose a message" component of SmilieFace?

7. Any change / improvement you would like to see in the composing of the message?

8. Would you use the SmilieFace application again in the future?

- Yes     No

Why / why not?

9. I look forward to seeing how my friends react to the Smilieface message I sent to them.

Highly Disagree     Disagree     Neutral     Agree     Highly Agree


Comments

10. I look forward to receiving a Smilieface message in return.

Highly Disagree     Disagree     Neutral     Agree     Highly Agree

Comments

## SmilieFace Receiver Evaluation Form

 *SmilieFace*

---

**Receiver Evaluation Form**

**This would take approximately 10 to 15 minutes of your time.**

**Page 1/1 (7 Questions total)**

1. The SmilieFace message is interesting.

Highly Disagree     Disagree     Neutral     Agree     Highly Agree

Comments

2. I can understand the feeling that the sender is trying to convey through the SmilieFace message.

Highly Disagree     Disagree     Neutral     Agree     Highly Agree

Comments

3. I look forward to receiving more SmilieFace messages in the future.  
 Highly Disagree     Disagree     Neutral     Agree     Highly Agree  
Comments

4. What do you **like** about the "view the message" component of the SmilieFace?

5. What do you **dislike** about the "view the message" component of the SmilieFace?

6. Any change / improvement you would like to see in viewing the message?

---

7. I look forward to send a Smilieface message in return  
 Highly Disagree     Disagree     Neutral     Agree     Highly Agree  
Comments

# SmilieFace Summative Form



## Summative Form

This would take approximately 20 to 30 minutes of your time.

Page 1/2 (18 Questions total)

1. The SmilieFace application is an innovative way to communicate with my friends on Facebook.

Highly Disagree     Disagree     Neutral     Agree     Highly Agree

Comments

2. The SmilieFace application is an effective way to communicate with my friends on Facebook.

Highly Disagree     Disagree     Neutral     Agree     Highly Agree

Comments

3. The SmilieFace application allowed me to express my emotion on the SmilieFace message I created.

Highly Disagree     Disagree     Neutral     Agree     Highly Agree

Comments

4. The SmilieFace application improved my interactions with my friends on Facebook.

Highly Disagree     Disagree     Neutral     Agree     Highly Agree

Comments

5. Any change / improvement you like to see in the SmilieFace application?



6. Would you use the SmilieFace application again?  
 Yes  No  
Why / why not?

7. Would you recommend the SmilieFace application to someone else?  
 Yes  No  
Why / why not?

8. Do you know of any application that is similar to the SmilieFace application?  
 Yes  No  
Comments

9. Did the SmilieFace application enhanced your Social Networking experience in Facebook?  
 Yes  No  
How / why not?

[Next Page](#)



**Summative Form**

This would take approximately 20 to 30 minutes of your time.  
**Page 2/2 (18 Questions total)**

[Back](#)

[Submit](#)

10. How often did you check your SmilieFace Messages?

Once a week ▼

11. How often did you use the SmilieFace Application?

Once a week ▼

12. How many SmilieFace message did you received?

1 message ▼

13. How many SmilieFace message did you send out?

1 message ▼

14. Does it meet your expectation for a messaging application?

Yes

No

How / why not?

15. Does it meet your expectation for a messaging application in the future?

Yes

No

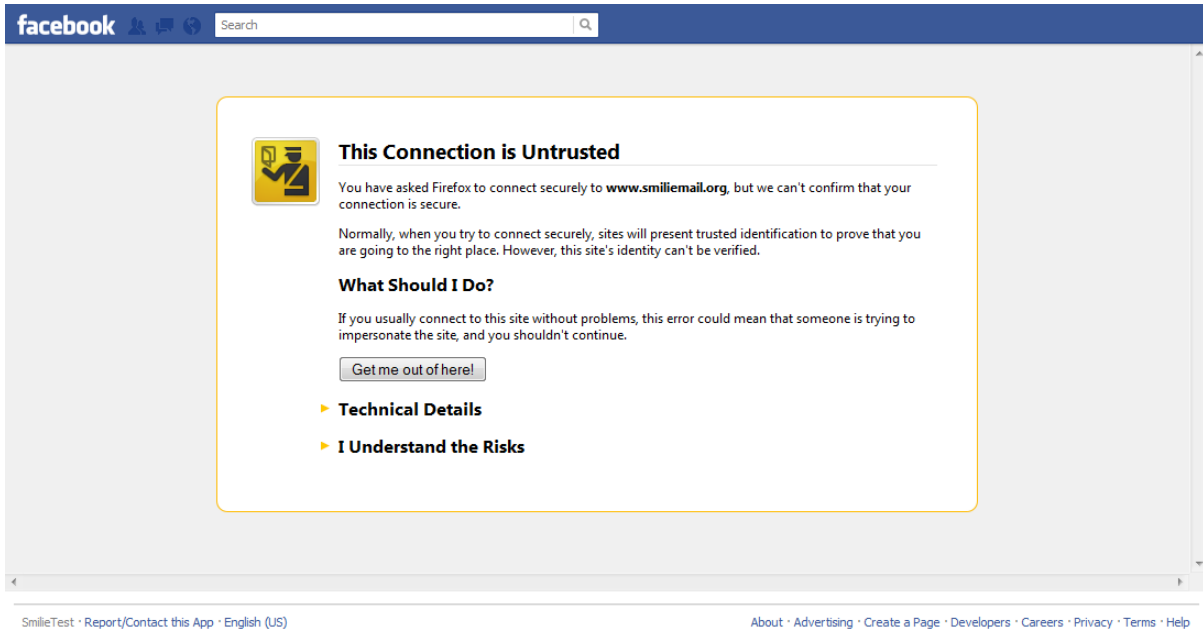
How / why not?

16. What part of the SmilieFace application failed to meet your expectation?

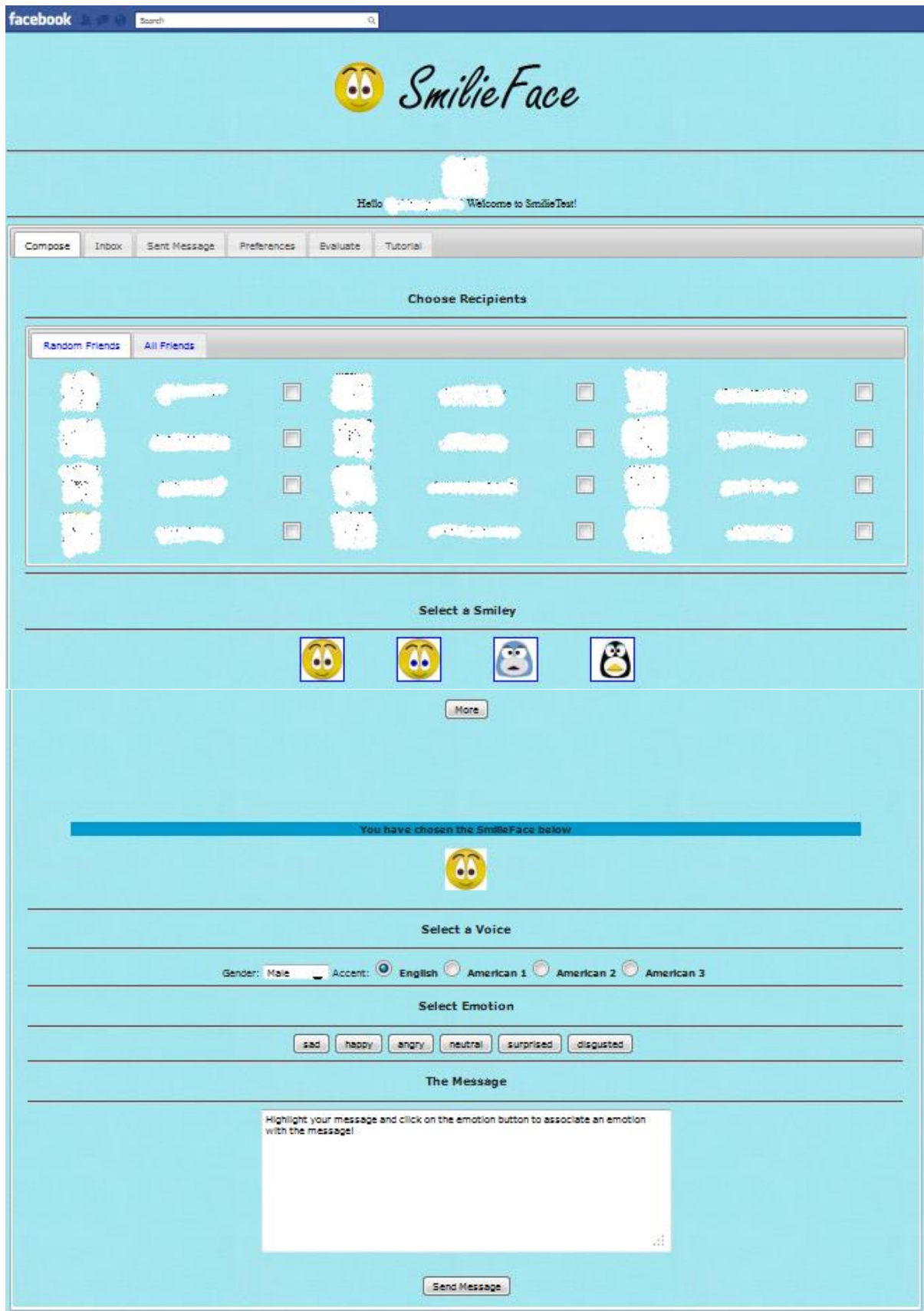
17. What part of the SmilieFace application did you enjoyed the most?

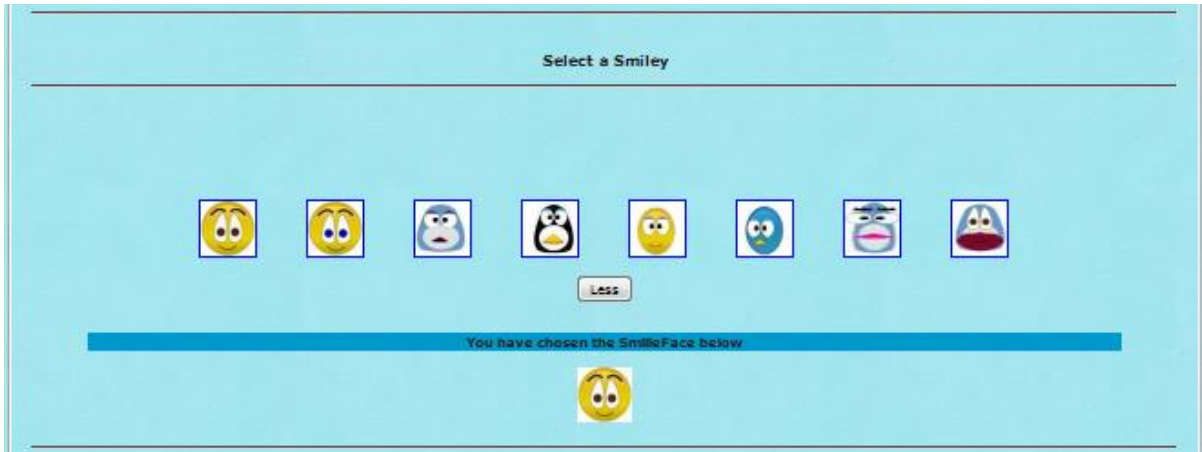
18. Further comments you liked to make regarding the SmilieFace application?

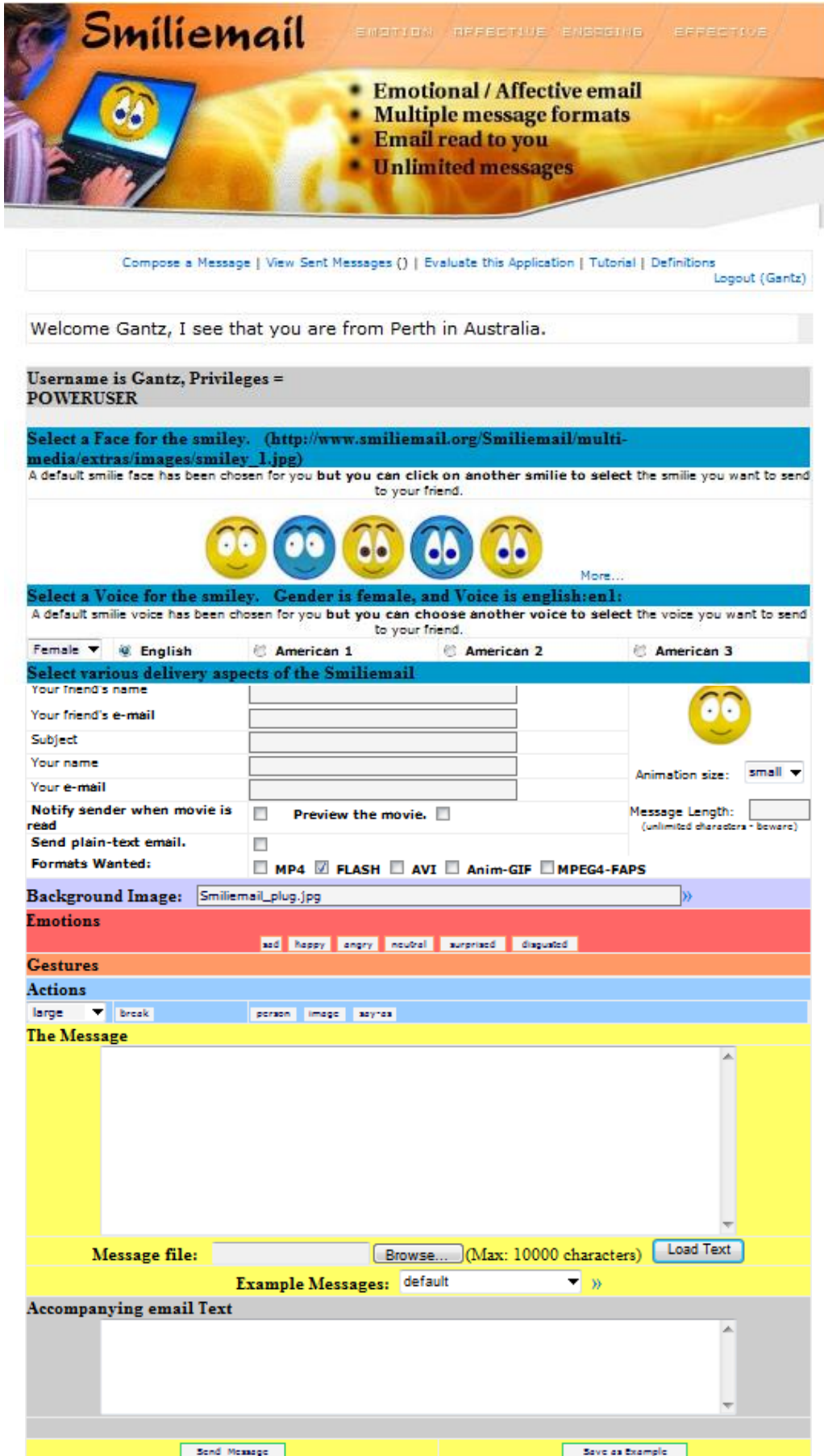
Back Submit



The screenshot shows a Facebook browser window with a blue header bar containing the Facebook logo and a search bar. The main content area displays a security warning box with a yellow border and a warning icon. The warning text reads: "This Connection is Untrusted". Below the icon, it states: "You have asked Firefox to connect securely to [www.smilemail.org](http://www.smilemail.org), but we can't confirm that your connection is secure." It further explains that normally sites present trusted identification, but this site's identity cannot be verified. A section titled "What Should I Do?" advises that if the user usually connects without problems, this error could mean someone is impersonating the site. A button labeled "Get me out of here!" is provided. At the bottom of the warning box, there are two expandable sections: "▶ Technical Details" and "▶ I Understand the Risks". The footer of the browser window shows "SmilieTest · Report/Contact this App · English (US)" on the left and "About · Advertising · Create a Page · Developers · Careers · Privacy · Terms · Help" on the right.







**Smiliemail**    EMOTION   AFFECTIVE   ENGAGING   EFFECTIVE


- Emotional / Affective email
- Multiple message formats
- Email read to you
- Unlimited messages

Compose a Message | View Sent Messages ( ) | Evaluate this Application | Tutorial | Definitions    Logout (Gantz)

Welcome Gantz, I see that you are from Perth in Australia.

Username is Gantz, Privileges = POWERUSER

Select a Face for the smiley. ([http://www.smiliemail.org/Smiliemail/multi-media/extras/images/smiley\\_1.jpg](http://www.smiliemail.org/Smiliemail/multi-media/extras/images/smiley_1.jpg))  
A default smileie face has been chosen for you but you can click on another smileie to select the smileie you want to send to your friend.

 More...

Select a Voice for the smiley. Gender is female, and Voice is english:en1:  
A default smileie voice has been chosen for you but you can choose another voice to select the voice you want to send to your friend.

Female   English   American 1   American 2   American 3

Select various delivery aspects of the Smiliemail

Your friend's name:   
Your friend's e-mail:   
Subject:   
Your name:   
Your e-mail:

Animation size: small  
Message Length:   
(unlimited characters - bowers)

Notify sender when movie is read:  Preview the movie:   
Send plain-text email:   
Formats Wanted:  MP4  FLASH  AVI  Anim-GIF  MPEG4-FAPS

Background Image:  >>

**Emotions**  
sad happy angry neutral surprised disgusted

**Gestures**

**Actions**  
large   break   person   image   say-as

**The Message**

Message file:  Browse... (Max: 10000 characters) Load Text

Example Messages: default >>

**Accompanying email Text**

Send Message    Save as Example