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Groupster: Narrowcasting on Social Networking Sites

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ABSTRACT

This thesis presents the implementation of *Groupster*, a narrowcasting tool on Facebook based on friend list separation using information obtained from their profile. This is accomplished by using the Graph API from Facebook and sorting the users' friends automatically by specific categories, thus making narrowcasting content through Facebook effectively work as a category-driven filter. Groupster's design was derived from a set of guidelines and principles proposed in literature, and it was tested by a group of diverse participants in a two-week study. The analysis and discussion presented here focus on system acceptance, the way it was appropriated by participants, the effect of demographics on its usage, and the strong and weak aspects of its implementation.

KEYWORDS

Social media, sharing, privacy, security, narrowcasting

RESUMO

Esta tese apresenta a implementação do *Groupster*, uma ferramenta de difusão selectiva no Facebook baseada na separação da lista de amigos usando informação obtida a partir do perfil. Isto é conseguido através do uso da API Graph do Facebook e organizando os amigos dos utilizadores de maneira automática em categorias específicas, fazendo assim a difusão selectiva de conteúdo no Facebook funcionar como filtro guiado por categorias. A implementação do Groupster derivou de um conjunto de normas e princípios propostos em trabalhos anteriores e foi testado por um grupo diverso de participantes num estudo que durou duas semanas. A análise e discussão aqui presente foca-se na aceitação do sistema, a maneira como foi assimilado pelos participantes, o efeito de demografias na sua utilização e os pontos fracos e fortes da sua implementação.

PALAVRAS-CHAVE

Médias sociais, partilha, privacidade, segurança, difusão selectiva

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Finally I would like to dedicate this thesis to my father who passed away during the time of its elaboration, this is for you dad.

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1. INTRODUCTION

In this thesis we explore the notion of narrowcasting on social media. We do this by implementing an actual Facebook application that applies narrowcasting techniques in order to assess fundamental principles that can be more broadly applicable to social media. A study is conducted in order to discover peoples' acceptance of narrowcasting, figure out which features are most useful and also how people use it across the different demographics. Finally we will discuss those results and conclude which parts of the solution were successful.

Narrowcasting involves targeting media messages at specific segments of the public defined by values, preferences, or demographic attributes. Narrowcasting is based on the postmodern idea that mass audiences do not exist (Flera, 2003), and such an approach is focused on a specific (narrow) topic, whereas broadcasting has a wider coverage of broad topics. Narrowcasting, in contrast to broadcasting, implies certain conditions:

- ***Disseminate your message to different demographics***, tweaking each of those messages to comply better with each one of those demographics values, interests, preferences, etc.
- ***Make sure content is only available to specific groups of people***, this can be done by the sender who chooses who is best suited to receive said message or by the receiver that chooses which content he wishes to receive.
- ***High levels of relevance of content to the receiver***, by using techniques to select to whom to send plus combined with the possibility the receiver can also choose what to get, makes for much more relevant content overall.

When referring to narrowcasting, the first thing one may ask is "Why?" How accepting would people be of narrowcasting mechanisms on their social networks? Is narrowcasting enough to **guarantee total privacy and security** on these social networks? In order to understand these issues, one has to understand the differences between narrowcasting and broadcasting.

Over the years, various techniques for grouping people on your social network depending on which role they play on your life have been tried in order to facilitate to whom to send the content you post (Lampinen et al, 2009). Narrowcasting consists of the **dissemination of information** to a **narrow audience** as opposed to the general public. The term narrowcasting can also apply to the spread of information to an audience (private or public) which is by nature geographically limited — a group such as office employees, military troops, or conference attendees — and requires a localized dissemination of information from a shared source (Legendre et al, 2008).

Narrowcasting has been proposed in response to the increase of information shared through social media in recent years and its associated privacy concerns. Though first launched in 1997, the popularity of social networking sites exploded in the United States between 2002 and 2004, with many geared towards specific audiences (Boyd & Ellison, 2008; Ellison et al., 2006). MySpace was aimed towards teenagers, Facebook towards college students, and LinkedIn towards professionals (DiMicco & Millen, 2009). Facebook began in 2004 as a social networking site which its sole purpose was for the use of college students (Mazer et al., 2007) and slowly began to be marketed to

high school students and then large corporations and finally, was open to the general public in 2006 (Lampe et al., 2008; Tufekci, 2008; Tuunainen et al., 2009). Within a year's time, Lampe et al. (2008) found that students' use of Facebook nearly doubled (by roughly 21 minutes a day) and their amount of Facebook friends grew by 50%.

These emerging communication technologies are fundamentally changing the way we behave, interact, and socialise (Kostakos et al., 2005). Information sharing is governed by the social norms of a given context following i) **Norms of appropriateness**: what information about persons is appropriate to reveal in a context, and ii) **Norms of distribution**: movement of information from one party to another. Privacy problems occur when information appropriate for one context is inappropriately shared in another.

Online users must judge context from perceived information flows (Nissenbaum, 2004). Unfortunately, we as human beings have an inherent tendency and need to publicise our thoughts, what we do and more preoccupying of all, private information about ourselves (Palen & Dourish, 2003). Research shows posting about current activity and implying location is a common practice on social networking site users (Patterson et al., 2008). This leads to oversharing to a great degree and to make matters worse this is done over online social networks which are denser and have a greater diversity of members then offline networks (Lenhart, 2009; Kostakos & Venkatanathan, 2010).

Such behaviour goes against the expectation that users would avoid disclosing private information to complete strangers since social networking website are primarily used to stay in touch with existing friends instead of being used to engage in new relationships (Lampe et al, 2006). Many Facebook users befriend other users even if they are precarious acquaintances or absolute strangers, something that they would not do in a non-cyber environment (Majmudar, 2005). In the case of Facebook, we have the added problem of confusing privacy settings mechanisms which in some cases have not ideal default settings, which may allow an even greater number of friends of friends of a person to be able to see their content (Gross & Acquisti, 2005; Govani & Pashley, 2005). It is possible that thousands of users may be classified as friends of friends of an individual and be able to access shared personal information (DiMicco & Millen, 2009).

Although a considerable number of users restrict their profiles, they do not seem to fully understand that their level of privacy protection is relative to the number of friends, their criteria for accepting friends, and the amount and quality of personal data provided in their profiles, which they tend to divulge quite generously. In other words, users are unaware of or unconcerned about temporal boundary intrusions, threats to privacy due to data persistence (Tufekci, 2008b). While Internet users may feel safe behind their computers, they have "zero privacy" (Reagan, 2003).

This thesis discusses, designs, implements and evaluates a narrowcasting solution in response to the concerns associated with broadcasting on social media. The next section in this thesis talks about related work, and subsequently our tool entitled Groupster is introduced. The studies involving Groupster are then presented, the results are summarised, and finally a discussion concludes our findings and understanding of narrowcasting on social media.

2. STATE OF ART

2.1 Privacy settings on Facebook

Privacy settings on Facebook have suffered numerous changes over the last couple of years and although most of these changes have made it easier for users to alter their privacy settings, there are still a considerable number of people not using them at all or very scarcely. Research suggests that a total of 60% of adult Internet users are not concerned about the information available about them for others to view on the Internet (Madden et al., 2007). Furthermore, when it comes to social networking sites, 60% of users put no restrictions on their profiles and allow anyone to view personal information (Madden et al., 2007).

In terms of research specific to Facebook, Acquisti and Gross (2006) found that 30% of current members of Facebook did not know if there was any way to manage who can search for and find their profiles, while 18% do not know if Facebook allows them to control who can read their profile, which is possible. In a study conducted by Strater and Lipford (2008) it was verified that 72% of their participants took an "all or nothing" approach to privacy: they made their profiles either completely open or restricted them to only their friends. Only five participants used fine-grained controls to restrict access based on relationships and the type of information that was to be accessed.

Govani and Pashley (2005) found that more than 80 per cent of participants knew about the privacy settings, yet only 40 per cent actually made use of them. More than 60 per cent of the users' profiles contained specific personal information such as date of birth, hometown, interests, relationship status, and a picture. A study by Jones and Soltren (2005) showed that 74 per cent of the users were aware of the privacy options in Facebook, yet only 62 per cent actually used them. At the same time, users willingly posted large amounts of personal information, over 70 per cent posted demographic data, such as age, gender, location, and their interests demonstrating a disregard for both the privacy settings and Facebook's privacy policy and terms of service. Eighty-nine per cent admitted that they had never read the privacy policy and 91 per cent were not familiar with the terms of service. A study by Young and Quan-Haase (2009) also showed that only 64% of their participants had restricted their profiles to friends. One of the technical strategies to resolve this problem may involve the use of privacy settings to regulate content distribution to select audiences (Stutzman & Kramer-Duffield, 2003), while research done by Wellman & Wortley (1990) showed that considering tie strength is also a viable strategy for developing rules for disclosure.

2.2 Alternative privacy settings interfaces

Researchers have proposed alternative privacy settings interfaces for social networking websites in an attempt to solve some of the issues with the current system in place and facilitate future narrowcasting solutions with mixed results. Below we will go into further detail regarding some of those aforementioned solutions.

2.2.1 AudienceView

Watson et al. (2009) proposed AudienceView, which allows users to configure settings while viewing effective permissions. Its main objectives were to provide an accurate and concrete mental model for information sharing and also an instant visual feedback on privacy settings. Not only did participants perform more accurately in less time with this prototype, they also preferred the prototype interface to the existing Facebook interface with very positive comments such as: "I like the new design. I did not feel frustrated." (Lipford et al., 2008). In other words, users can modify privacy settings faster and with greater confidence than Facebook. In **Figure 1** we can see the interface used by AudienceView.

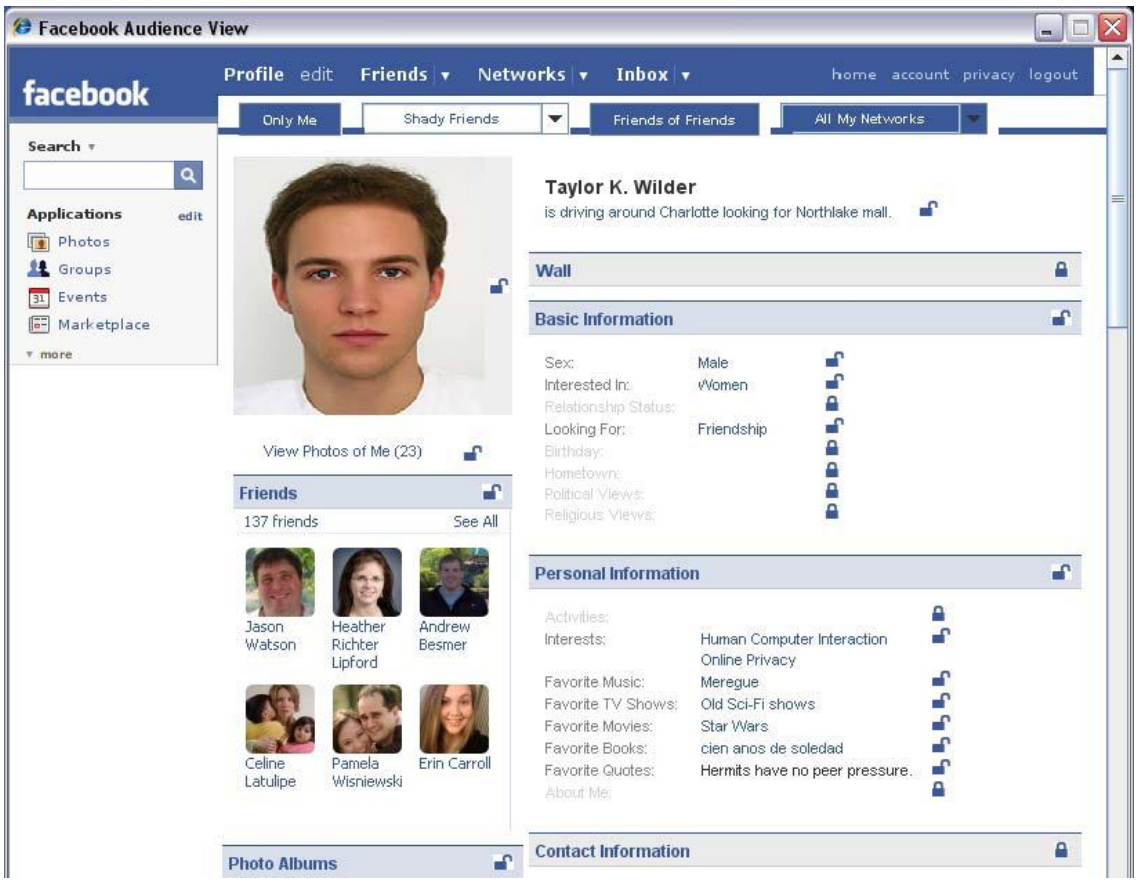

Figure 1 – AudienceView interface

2.2.2 Lockr

Tootoonchian et al. (2008) proposed Lockr, which is based on access control lists (ACLs). Lockr separates social networking information from the content sharing mechanisms, thereby eliminating the need for users to maintain many site-specific copies of their social networks.

Lockr was implemented on Flickr with positive results. To illustrate how Lockr works, the authors provided an example of a person wanting to restrict access to their family

photos on Flickr. The owner creates an access control list indicating that access to the photos is restricted to family-only. Family members must present their social attestations to Flickr issued by the photos' owner before gaining access. To allow access, Flickr must verify that the attestations were issued by the original owner and that "family member" is the social relationship encapsulated by the attestation. Note that the family members' social attestations can be reused by any online site without requiring users to register.

Lockr allows users to express access control policies based on social relationships. This eliminates the need to manage many site-specific social networks online. Users need to manage a single social network that can be stored in an address book on their own machines. We can see an example of the process above in **Figure 2**.

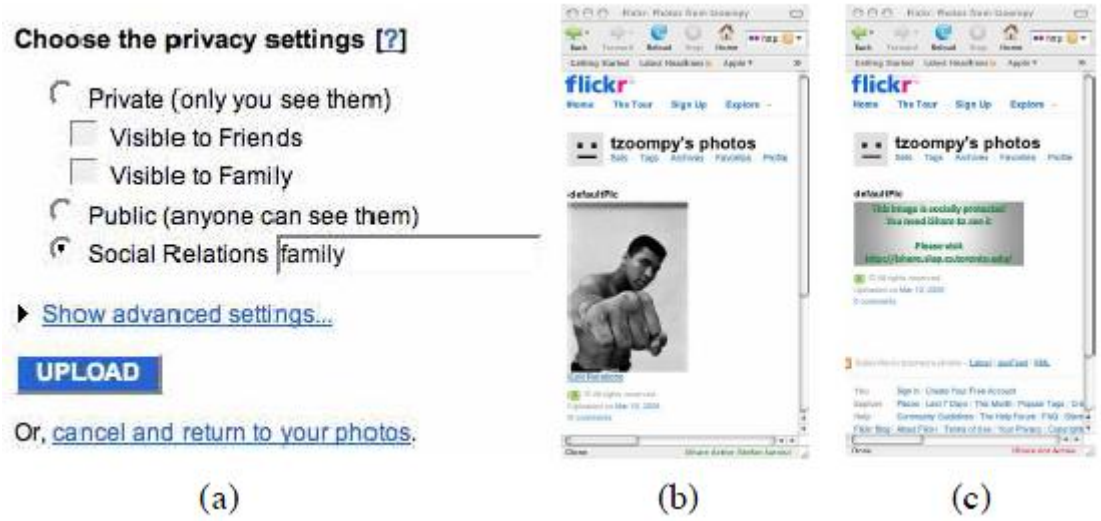

Figure 2 – Lockr for Flickr. In part (a), a user creates a social ACL. In part (b), a user views the protected image with the appropriate attestation. In part (c), a user without the appropriate attestation sees a dummy image.

2.2.3 Venn Diagram Interface

Egelman et al. (2011) proposed a Venn Diagram Interface approach to manage social networking websites privacy settings. During their study the researchers concluded that when using a Venn diagram interface, participants made equal or fewer errors than when using the Facebook interface which was expected since it was easier for the users to see how their networks overlapped. Overall, users of this interface introduced 55% of the errors that those using the existing Facebook interface introduced. However they did raise the issue that not everyone might be familiar with how a Venn Diagram works making this solution only viable to computer science majors or people with a similar education.

In order to confirm that this interface would be viable across multiple users they recruited 92% of their participants from outside the computer science department, which indicates bright prospects to the future of an interface of this type although further study

is needed to determine if Venn diagrams are intuitive to Facebook users without a college education.

Another issue with a Venn diagram interface is that it is only usable if participants have three or fewer overlapping sets (i.e., two networks plus a list of friends). Of the 73 participants across their study, they observed that 20 (27%) belonged to only one Facebook network, 50 belonged to two networks (69%), and three belonged to three networks (4%). Taking the 95% Confidence Interval (CI), this implies that their solution is usable by at least 88% of our target demographic.

In **Figure 3** we have an example of this interface with the overlapping of the friend list with two other networks (Conglomi and Brown) in which for each subset, participants could select "allow" or "deny" from a drop-down box, which caused the selected subset and all the nested subsets to change permissions. The colour of each subset also changed to reflect the effective permissions: red for deny, green for allow.

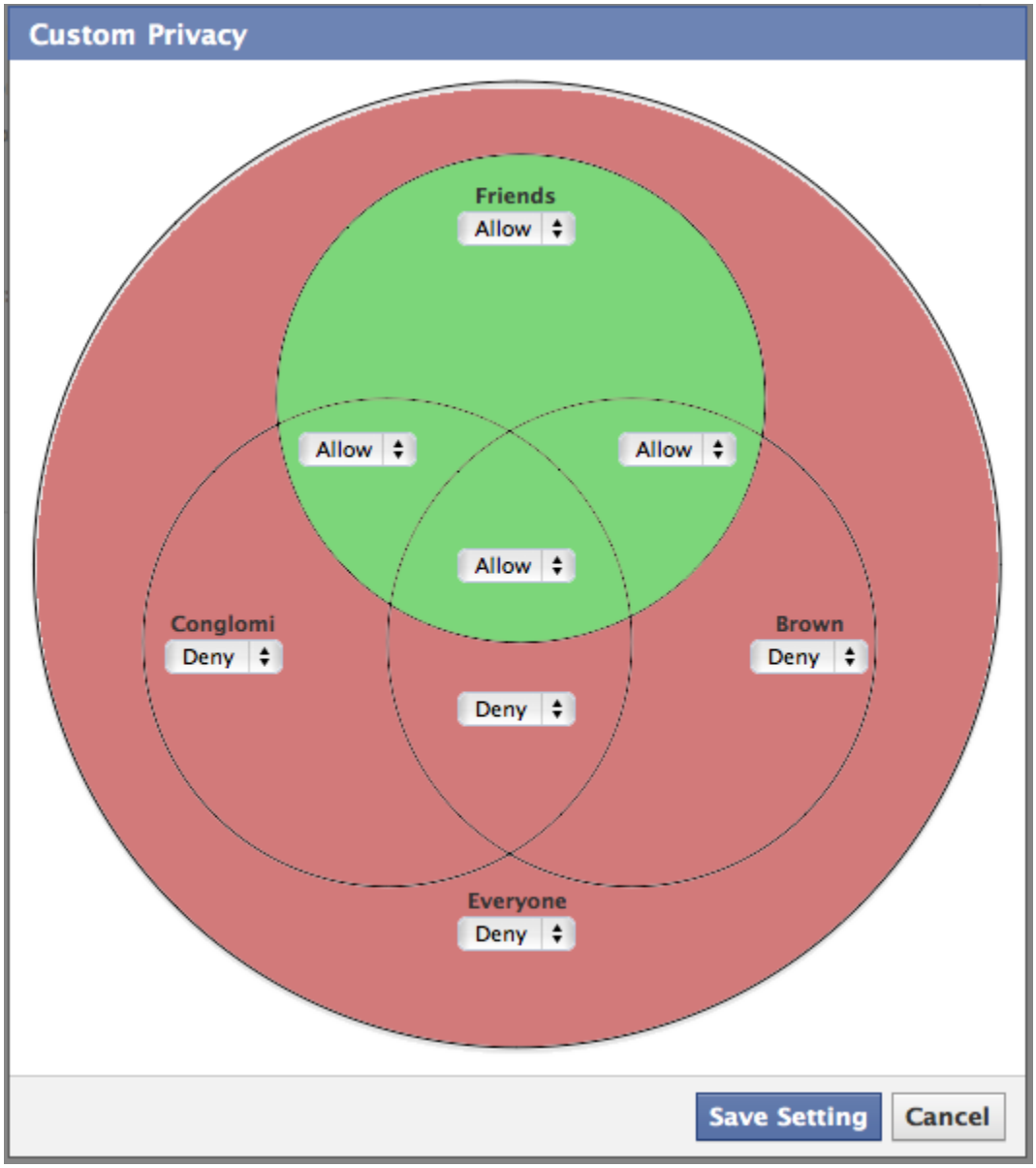

Figure 3 – Venn diagram permissions interface for Facebook

2.3 Alternative contact grouping methods

Researchers have suggested using automated algorithms that use information such as network measures or tie strength to automatically determine distinct groups within a social network. The implementation of privacy controls based on tie strength has the potential to help segment the user's social network into meaningful groups (Gilbert & Karahalios, 2009). Clauset, et al. (2004) and Xu, et al. (2007) proposed partitioning networks into clusters through the use of algorithms that analyse a network structure. In a study done by McCarty (2002) it was shown that network clustering generated clusters that were subsequently verified as meaningful by their respective network owners. Below we have two widely known algorithms in more detail.

2.3.1 CNM Algorithm

Most of these algorithms cluster vertices within the social network such that there is a dense set of many ties within each cluster and few ties between clusters. A network with this property is said to be highly modular. Modularity (Newman & Girvan, 2004) is a property of a network and a specific proposed division of that network into communities. It measures when the division is a good one, in the sense that there are many edges within communities and only a few between them. Widely used modularity-based clustering algorithms, such as the CNM algorithm (Clauset et al., 2004), cluster vertices in the network such that modularity is maximized.

2.3.2 SCAN Algorithm

The SCAN (Structural Clustering Algorithm for Networks) algorithm detects clusters, hubs and outliers in networks. It clusters vertices based on a structural similarity measure. The algorithm is fast and efficient, visiting each vertex only once (Xu et al., 2007). To achieve this, it uses the neighbourhood of the vertices as clustering criteria instead of only their direct connections. Vertices are grouped into the clusters by how they share neighbours. Doing so makes sense when you consider the detection of communities in large social networks. Two people who share many friends should be clustered in the same community. Jones and O'Neill (2010) implemented and tested this algorithm and discovered that the detection of outliers within the network has strong potential to offer a real advantage in identifying potentially problematic contacts when using group based sharing in a social network.

2.4 Types of online narrowcasting

In order to develop some narrowcasting ideas for the current social networks available, it is important to explore which techniques exist on the internet on different kinds of websites (even those that have little or no relevance for social networks but are still means of online narrowcasting). By doing so, we can better understand these current mechanisms that are in place on the internet and see which would adapt themselves better to social networking sites.

So here are some existing narrowcasting techniques (Maki, 2010):

- **Email Newsletters.** Opt-in subscription newsletters are a terrific way to expand your website's reach and are particularly useful if you want to zero in and expand on topics that currently explored on your blog. They are a good add-on for all retail or service businesses and can be used to blast out product updates/special online offers as well.
- **Premium Content.** Provide excerpts of your content in the broadcast channel in order to get people to purchase your premium content in the narrowcast channel. This is often used by academic journals and online newspapers. You can also offer premium content for free as well, in the form of a value add-on for long term visitors or customers.
- **Members-Only Networks.** Private members-only forums or social networks are a useful way for businesses to leverage the brand interest of existing and potential customers. By providing a channel for readers/customers to provide feedback, you are allowing them to talk about your brand. This added activity and interaction has the benefit of developing visitor loyalty.
- **Social Media Mullets.** The Mullet is a social media marketing strategy which involves the creation of targeted content away from your main channels, in order to appeal to specific social media websites or communities. Your regular users are not able to access this content as it will only be narrowcasted to social media community.
- **RSS-Only Articles.** This involves the production of content only viewable by users who subscribe to your web feed. This is useful if you want to encourage subscriptions and it can be combined with the mullet for extra promotional strength.
- **User-Generated News.** Social news elements can be added to existing websites to provide relevant news for the community. Visitors can participate in the organization of content by voting for news which they find interesting. User-generated news and individualized customization will also allow you to promote your site as a resource hub.

2.4.1 Email Newsletters

Currently used all over the internet on many important websites (like CNN, Amazon, Ebay). These are especially powerful if they are used as an **opt-in by the users**, that way the companies have an **excellent way to disseminate their messages** making sure that those they do it to actually consider those messages relevant and are interest in that content.

However most people might select this option **without even realizing it** (especially if it is defined as such on the default settings), making it **obsolete** if that particular individual has no interest on that content. Also many people have **spam filters** they are not aware off or just forget, **blocking these email newsletters** without the user ever realizing it.

In conclusion, this is one of the oldest forms of narrowcasting on the internet that can be very useful to companies but also has its problems. As for using it in a social network context, **it is not really an option**.

2.4.2 Premium Content

Website content that is available for a fee or free of charge (making long term users subscribe to access this content). This is currently used on many websites like ACM, IEEE and other prominent academic research websites. Pretty simple context as the people that will actually subscribe are people that will for sure be interested on the content they receive.

It could be a good idea to **implement a variation of this on current social media networks.** However it would require a way to categorize posts after which users would "subscribe" to specific categories of posts from their friends, greatly minimizing the volume of content and reduce spam.

2.4.3 Members-Only Networks

Recently implemented as a narrowcasting tool (amongst other things) on **Facebook by the feature of Groups**.

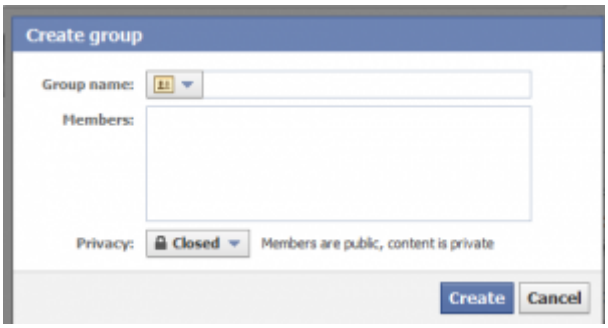

Figure 4 – Create group popup on Facebook

In **Figure 4** you can see the main interface to create a group in which you can select an icon, the name of your group, the members that are going to be part of it and more importantly the type of privacy which can be (this can be changed after the group is formed at any time):

Open -> Content and member are public and can be viewed by everyone.
Closed -> Members are public, but content is private. (Default setting)
Private -> Members and content are private.

After you have created your group you can access it on the left column as you can see on the picture, and then allows you to "narrowcast" posts, images, links, videos, events and documents to people on that particular group working essentially as **a forum in which you cannot register and need to be invited**. In **Figure 5** you can see this feature's main navigation interface.

Figure 5 – Groups' main interface

Current problems with Facebook Groups:

- Unlike a friend request, you do not have to agree to be added to a group. Once you are added you are in, unless you remove yourself. This was made apparent when TechCrunch editor Michael Arrington created a fake NAMBLA (North American Man/Boy Love Association) group and added Facebook CEO Mark Zuckerberg as a member (as seen in **Figure 6**). Zuckerberg quickly removed himself from the group, but if he had not, someone could have gotten the wrong impression (Arrington, 2010). He also tried to defend his "baby" as seen on **Figure 7**.
- Everyone can invite members without anyone else having a say, only the administrator can remove them.
- People that join the group can read past posts, which may have details/information that some people that belong to the group might want not to be known by said person.
- You still have your main page getting spammed, groups does not solve this. Just makes a different place to go and check only the people you want to see posts from.
- What happens if a person in your group posts things you are interested about but also things you do not care about? There is no way to filter these out.

Figure 6 - Picture of Mark Zuckerberg "joining" the NAMBLA group

Figure 7 - Mark Zuckerberg defending his "baby"

So one could say that although it was a nice idea from Facebook with some good features that solve some of the issues, it is still a **clutch approach** to narrowcasting, and should be seen as more of a collaborative tool where people discuss a certain topic that is relevant at the time and after that the group fades or ceases to exist.

2.4.4 Social Media Mullets

The biggest sites on the web are all embracing the "**mullet strategy**". User generated content is all the rage but most of it totally useless. That is why sites like YouTube, MySpace, CNN, and HuffPost are all embracing the mullet strategy. They let users party, argue, and vent on the secondary pages, but professional editors keep the front page looking sharp. The mullet strategy is here to stay because the best way for web companies to grow traffic is to let the users have control, but the best way to sell advertising is a slick, pretty front page where corporate sponsors can wistfully admire their brands (Peretti, 2008).

How do they do this? By using **"Link baits"** which can be available to every user on main content or on a secondary page only visible to particular people. **Where you choose to place your link bait matters**. Do you want your regular site visitors or readers to see it among other content? Or would you prefer to only get the attention of a specific social media audience? (Maki, 2010) This Mullet is an analogy to the actual hair style "**Business in the front, party in the back**". What does this mean? It means that you should avoid having these link baits on the main content page, which goes against conventional thinking. However link baits on "back end" sections of your website can be very successful tools to increase traffic and disseminate a specific message, redirect people to a specific place or even publicize one of your services.

The Mullet strategy is useful for several reasons (Maki, 2010b):

- **Creating Divergent Content**. The Mullet allows you to place an incredible assortment of content types or genres on the same domain. For example, let's say your site is about car loans. A political or humour link bait would not fit well in the front pages of your site. It would however fit perfectly on a separate page on your website.
- **Appealing to a Different Audience**. A website about comic books will not appeal very well to a social media audience that is primarily interested in technology and programming. Want to target that crowd for some quick traffic,

cross-over attention or possible links? Throw on a tech link bait on a separate page on your site and push it out to the specific social media audience.

- **Going Under the Radar**. Sometimes you just do not want your regular audience to know that you are creating content of a specific nature (NSFW/Political etc.) and the Mullet will keep most audiences oblivious to it. This may work better if the niche you are targeting is far removed from the specific theme of your site.
- **Push Multiple Link baits**. Afraid that excessive link baiting will irritate regular readers and other bloggers? The Mullet strategy allows putting out as many link baits as you want on as many pages as possible without breaking the overall content structure or feel of your website. Cater to the needs of your loyal audience but push alternative versions of your content on a separate page.

Always try to use a **distinctive design**, **avoid all ads** and **do not try to sell anything**. These 3 notions will avoid scaring away potential visitors to the website you are currently trying to push with your link baits. One way to implement a variation of this would be in regard of adding a **new dimension** to the way we currently post on social networks. That dimension would be time in which you can make it so your posts expires after some a determined period. This could be done by hosting posts on a server producing a shortened URL to the appropriate website; this shortened URL would then be published to social networks expiring and becoming no longer visible after the allotted time has passed. The message on the social networking website would be cut (i.e. "Hello guys I have… (Click here to read the whole message") working as a link bait for people interested in viewing the whole post. This would be a great way to prevent excess information to be stored while augmenting privacy of the users.

2.4.5 RSS-Only Articles

Subscribing to particular content you want to see in the form of RSS feeds has always been an awesome way to guarantee you only receive stuff you are interested about without even having to see what does not interest you at all. In a way, the wall feature on Facebook does this, although it would need some improvements in order to work flawlessly. One idea would be to implement some sort of tagging systems for the type of content being published so that people can effectively chose from each of their friends which type of content they wish to have filtered out and which content they wish to see. This however would lead to additional steps needed to actually post content through a social networking site but would greatly reduce spamming and oversharing with the increased control from the users. One could argue that the benefits would outweigh the costs.

2.4.6 User-Generated News

Allows your users to vote or decide in some way some type of news for you to have on your website. This will make it so people will go to your site to get their "sports news", "local news", "global news". Although this is considered to be a type of narrowcasting, it is one that does not really fit in to the social networking dilemma.

3. APPLICATION (Groupster)

Groupster is a narrowcasting tool implemented as a Facebook App designed to facilitate focused posting on Facebook. In its current implementation it automatically groups your friend list by Age, Home Country, Relationships (family and significant other), Current Location, Relationship Status and Gender with the objective of facilitating the process of choosing to whom to send your posts.

While analysing the state of art and other means of narrowcasting currently available on social networking websites and after many discussions on how to approach the problem, it was decided to implement a Facebook App that would work as category-driven filter. Usually people tend to make decisions on how to share information based on the identity of the recipient rather than on the situation within which the information was sought (Lederer et al., 2002). This was backed up by a study performed by Davis et al. (2005) in which it was established that people decide with whom to share information based on the type of relationship (e.g. significant other, friend, colleague, etc.).

The motivation for implementing a category-driven system came from the studies performed by Jones et al. (2004) and by Olson et al. (2005) in which they showed that people want to be able to specify groups and basic categories centred on relationships that they could then assign specific privacy settings for each one. This showed the importance of making sure there was a relationships category (family and significant other separate from rest of friends) within the application while also making other category based separations of the users' friends. Further relationship ties like work colleagues or people from the same school/university are also important categories that can be implemented in the future.

It was also important to make sure that the solution provided the user with these privacy mechanisms with the least amount of effort needed since managing groups can be a significant burden that worsens with the expansion of their network (more friends) and the popularity of the social networking website (Lederer et al., 2004). Also, although privacy is highly valued, it should not be the users' primary task and making it an explicit, tenuous task to the user could lead to problems such as the disregard of the solution by them (Ackerman & Mainwaring, 2005).

Therefore, it was decided to make the application automatically categorize users' friends in order to minimize the workload needed facilitating their job when the time to narrowcast comes while also making it dynamically update whenever something changes (e.g. a friend leaves Facebook, you add a new friend, a friend changes something on their profile that impacts the category sorting, etc.). Another thing taken into account was to make sure that configuration time was kept to a minimum to further lessen the burden upon the users of this application.

3.1 Design Principles and Guidelines used

Based on Reynold's (2011) work, we derived design principles and guidelines that were mostly used in order to make sure that the application had the features and capabilities that people would want in such a tool. With the use of technological design refinements and innovations, one can actually greatly reduce the amount of problems that surface

with the interaction, communication and privacy of most ubiquitous computing systems (Bellotti & Sellen, 1993).

The design principles were identified by the author after the study of the quantitative data he garnered with the help of a Facebook application which worked as data crawler software and collected information about participants' posts, status updates, friends, privacy preferences over posts and basic user details. The guidelines on the other hand were identified from the technical translation from the qualitative data he obtained through an extensive online survey. Next we have all the principles and guidelines that were taken into account when building the application also following a couple of practices during its implementation (Feiler, 2008).

3.1.1 Principles

P1: Demographics shape behaviour towards privacy
This was an important principle to have in mind when first trying to figure out what to do with the application. Reynolds (2011) claims that there are divergent privacy concerns and practices across gender and age, being these two demographics important factors that influence the way that people actually post. Although no data was shown to prove that other demographics like country of origin, computer skill, education and others it was assumed that they would also affect these posting decisions, leading to all of them being taken into consideration when building the application.

P2: Usage patterns shape behaviour towards privacy
Partially disregarded because it was considered not as relevant to execution of the application and also it would not be something easy to implement. So the main concern was to make a very simple and clean application in a way to broaden the spectrum of people that can use it efficiently.

3.1.2 Guidelines

G1: Consider diversified usage and demographics
As seen on the principles above, this was a concern when build the application, although the aim was more on making it usable by everyone instead of having a lot of settings that a more experienced user could change. This was a confirmation of what previous work on this subject had already suggested (Boyd & Hargittai, 2010; Joinson, 2008; Lewis et al, 2008; Stuntzman & Kramer-Duffield, 2010).

G2: Minimize time of configuration
The results showed that the willingness from the users to spend time configuring such a tool was very low, with the majority only wanting to spend a few seconds. With this in mind, the current version of the application has zero configuration time, being ready to use from the get go.

G3: Minimize frequency of configuration
As seen on the guideline above since there is no configuration time then obviously there will not be any configuration frequency to minimize.

G4: Support both an optimistic and a pessimistic interaction pattern

In order to test both interaction patterns the decision was made to do this within the same application (not having two distinct applications with different interaction patterns) and also not relying on the user to switch between them. So the solution reached was to make it so Facebook users with an odd User ID would have a pessimistic interaction pattern by default (which can be seen in **Figure 18** on the Relationships category) while Facebook users with an even User ID have an optimistic interaction pattern by default (which can be seen on **Figure 19** with the Age category). This way we can cover both without added "work" needed by the user, in an attempt to reach better and more accurate results. Also, home country and current location for every user have a direct posting method without using an optimistic or pessimistic interaction pattern (as seen in **Figures 20** and **21**). This was done in order to achieve a more concise study with multiple types of interaction present in order to see how people feel about each one of them and perhaps reach a conclusion on which of them would be ideal for this specific tool.

Figure 18 – Relationships category with a pessimistic interaction pattern by default (odd number ID Facebook users)

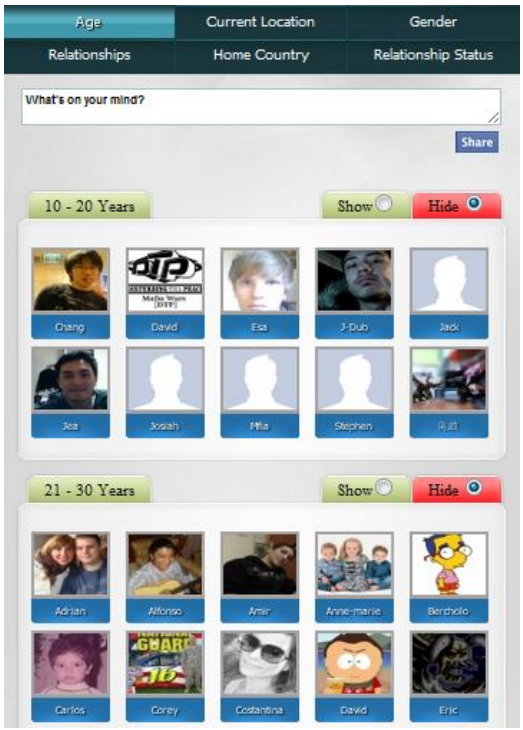

Figure 19 – Age category with an optimistic interaction pattern by default (even number ID Facebook users)

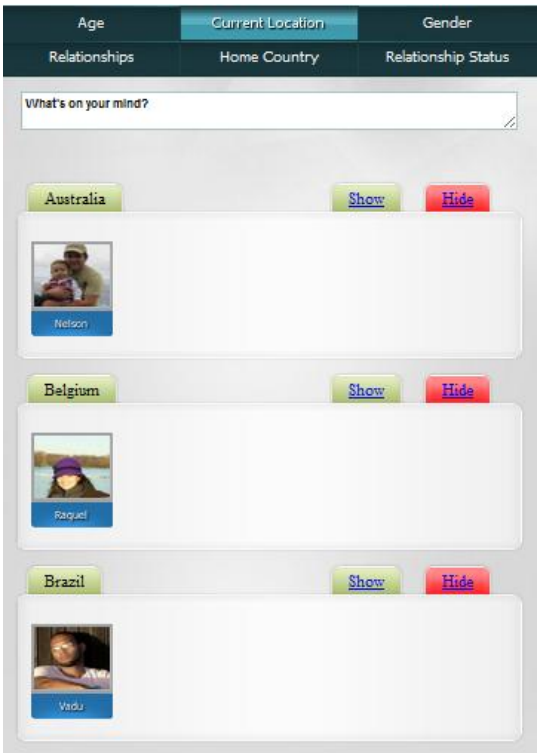

Figure 20 – Current location category with a direct posting method, no interaction pattern used.

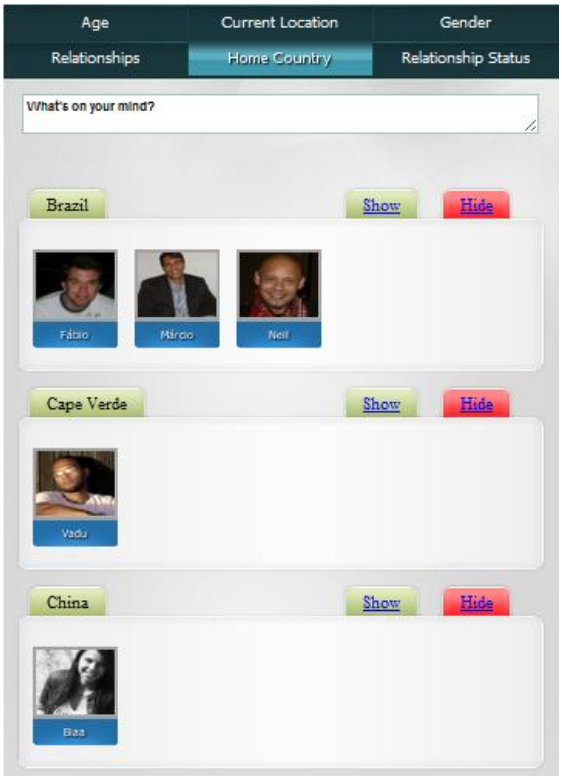

Figure 21 – Home country category with a direct posting method, no interaction pattern used.

G5: Minimize configuration burden to group contacts

This comes from the failure of the friend lists implemented by Facebook as it is a feature that is very rarely used by their users. In other words, a way to automatically separate people into different groups, that have something in common, of people inside the users' network was an essential part of this tool. This way the user would not have the hassle to actually create his owns lists and also their lists dynamically update themselves whenever someone changes something on their profile, a friend leaves Facebook or you add a new friend. This lead to a category-driven filter kind of tool with its categories being: Age (sorted by subcategories of decades: 10-20, 21-30, 31-40, 41-50, 51-60), Current Location (country where the user currently is), Gender (male and female separation of friends), Relationships (contains the family and the girlfriend/boyfriend subcategories), Home Country (country of origin of the user) and finally Relationship Status (sorted by: Single, Married and In a relationship. Other statuses were disregarded as they were deemed not important). Binder et al. (2009) performed a survey of Facebook users to examine how differing social spheres interact and found that privacy concerns were directly correlated with the number of family members a user had friended, hence the concern in having a way to narrowcast by showing only to family or hiding from family.

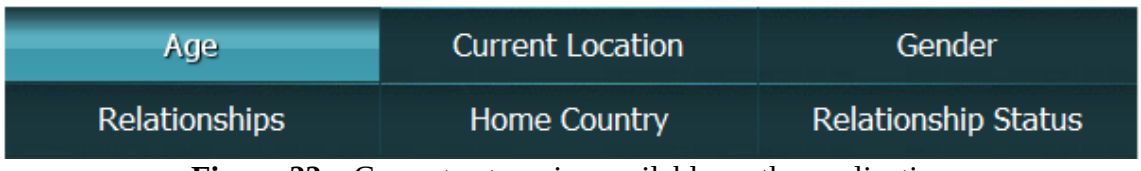

Figure 22 – Current categories available on the application

3.2 Application Architecture

3.2.1 Session/Authentication (Facebook Developer Website, 2010)

Facebook Platform uses the OAuth 2.0 protocol for authentication and authorization (Hammer-Lahay et al, 2011). The implementation of the OAuth 2.0 involves three different steps: **user authentication**, **app authorization** and **app authentication**. This session creation is achieved through the following code snippet on this application. Each step will be explained further down.

```
$session = $facebook->getSession();

// Session based API call.
if ($session)
{
  try {
        $user_id = $facebook -> getUser() ;
        $access_token = $facebook -> getAccessToken() ;
      }
  catch (FacebookApiException $e)
     {
        error_log($e);
      }
}
else
{
      $loginUrl = $facebook -> getLoginUrl( array('next' => APP_URL , 'req_perms' =>
                              ' friends_location, friends_birthday, friends_hometown,
                                user_relationships, user_relationship_details,
                                friends_relationships, friends_work_history,
                                friends_relationship_details, publish_stream ' ) );
      echo '<script>window.parent.location="'.$loginUrl.'"</script>' ;
}
```

Figure 8 – Session being generated

The getSession() function is defined in the facebook.class library.

User authentication ensures that the user is who they say they are. App authorization ensures that the user knows exactly what data and capabilities they are providing to the app. App authentication ensures that the user is giving their information to the app and not someone else.

Once these steps are complete, the app is issued a **user access token** that enables the access the user's information and take actions on their behalf. The first two steps, user authentication and app authorization are done by redirecting the user to the appropriate OAuth Dialog Box. This is done by setting the URL that the browser will redirect to when the app is authorized by means of the **redirect_uri** parameter.

Next we have both dialog boxes generated by this process, the login dialog box (seen in **Figure 9**) which will only appear if the user is not currently logged on to Facebook and the app authorization dialog box (as seen on **Figure 10**).

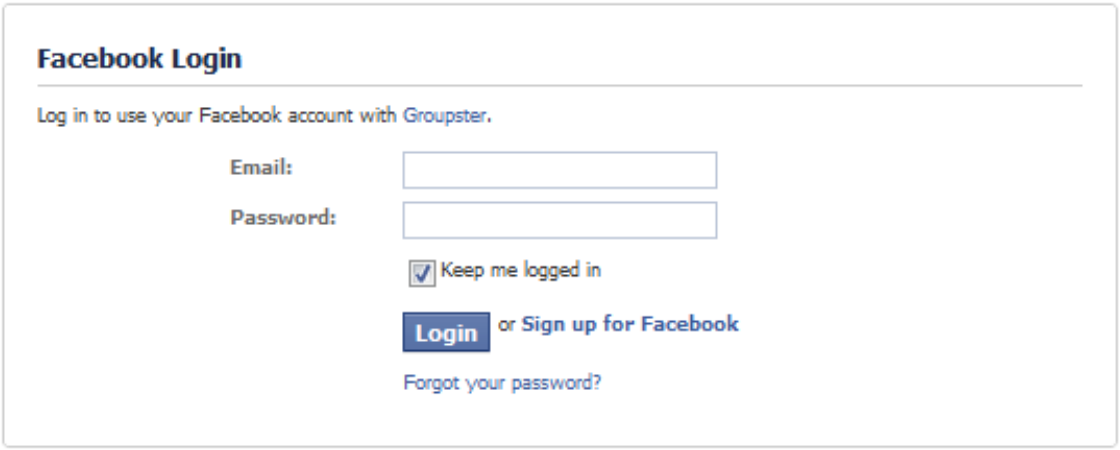

Figure 9 – Login dialog box used for user authorization

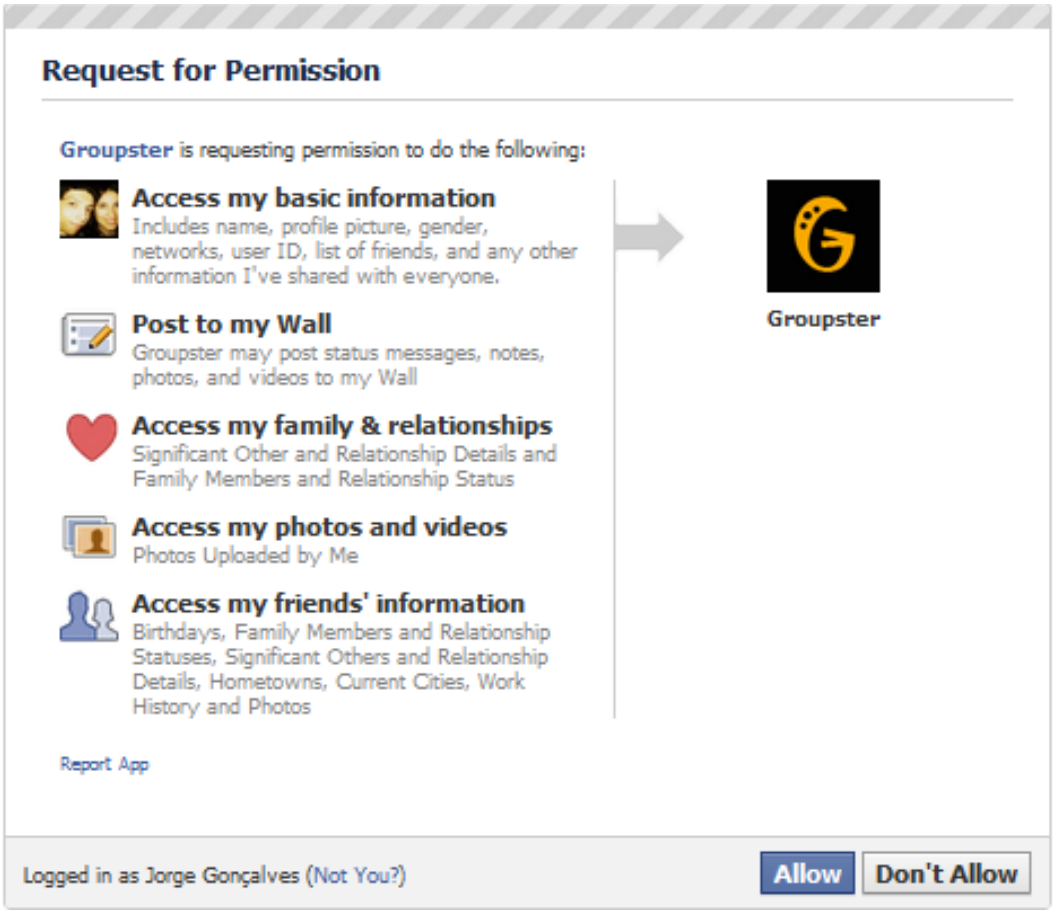

Figure 10 – App authorization dialog box

By default, the user will always be asked to authorize the app to access basic information that is available publicly or by default on Facebook. However for this specific application **Extended Permissions** were needed. The extended permissions needed to access the information required for the application is set on the header page, as we can see in the code snippet of **Figure 8** in the $loginUrl variable. Things like friends_location and friends_birthday are needed as extended permission in order to have all the information needed to build the application. This of course means that the

user of the application is required to allow all these permission when they first run the application. After those two steps are complete, we can finally begin the process of app authentication in order to gain the access token you need to make API calls. For this application the access token was saved in a PHP variable as seen also in the code snippet of **Figure 8** in the $access_token variable. The getAccessToken() function is also defined in the facebook.class library.

3.2.2 IFrame Vs. FBML

When starting to implement some ideas on a Facebook application, the first question we had to deal with was should an IFrame canvas be used or a FBML canvas. So it was decided to compare the advantages and drawbacks of each type of implementation.

First of all and one of the most important things to compare is speed. FMBL based pages have tended to be faster as most of them do not require to make any API calls but also when there actually are API calls, it makes one less round-trip in order to get the information you need. One other thing that really benefits FBML canvas is that Facebook servers are directly peered with most large hosting companies that serve application pages making the latency for each round-trip to be lower leading to an overall increase in performance. With this information, one could assume that FBML would be the correct choice to start implementing a narrowcasting tool on, however a few years ago Facebook introduced two key features: Facebook Chat and XFBML. Facebook Chat involves a lot of scripting and CSS which needs to be loaded from scratch every time a page is loaded even if the files are cached on your browser. What this means is that when a user loads the application for the first time, both a FBML app and an IFrame app will have to endure this initial load but the crucial difference is on subsequent page loads, the FBML application will need to load the whole page including the chat box, while the IFrame application will only reload the content inside the actual IFrame. In summary, the addition of Facebook Chat made additional loads of FBML canvas pages slower while not interfering at all with IFrame canvas pages with the exception of the first load.

As for the other feature introduced by Facebook, XFBML, this can make all IFrame canvas pages even faster. It accomplishes this by permitting you to avoid having to make an API call to Facebook before the content is sent back to the user's browser. With XFBML, you can embed some simple FBML tags like <fb:name> and <fb:profile-pic> directly into the HTML that your app sends to the user's browser, and when you include some JavaScript from Facebook, code will execute that scans the DOM for those tags and then figures out all the data needed to render that content and batch that up into one API call from the user's browser to Facebook. The rest of the page that is not social content can render to the user before this happens, and in XFBML, we cache data on the browser so that in many cases, it is not even necessary to make any API call to Facebook at all (Cheever, 2008). Since the application we built required multiple page loads within one session the decision was made to use an IFrame canvas based application and also because FBML canvas apps will become deprecated by the end of 2011, so it is preferable to implement using IFrame with all the benefits that come with it.

Next we have a diagram of how the IFrame canvas page using XFMBL will work on the first page the user loads on the application:

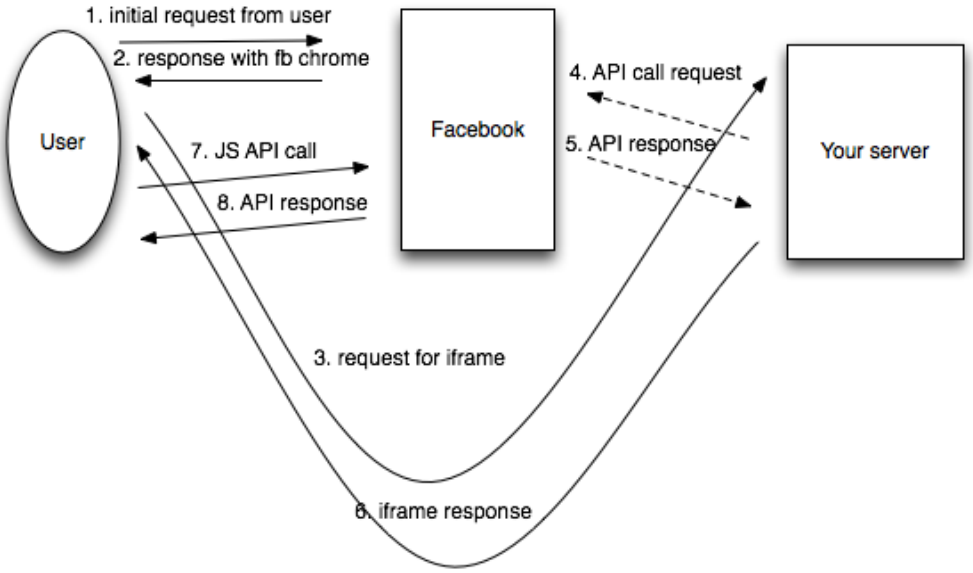

Figure 11 - IFrame Canvas Page with XFBML - First Page Load by a User

By using XFMBL, the application will not need to make an API call for everything to Facebook from my server, meaning that points 4. and 5. will not always happen and the user's browser will be able to start rendering most of the page, everything except the XFBML content its waiting to get from Facebook, right after point 6..

The next diagram shows the application architecture on subsequent page loads by the user:

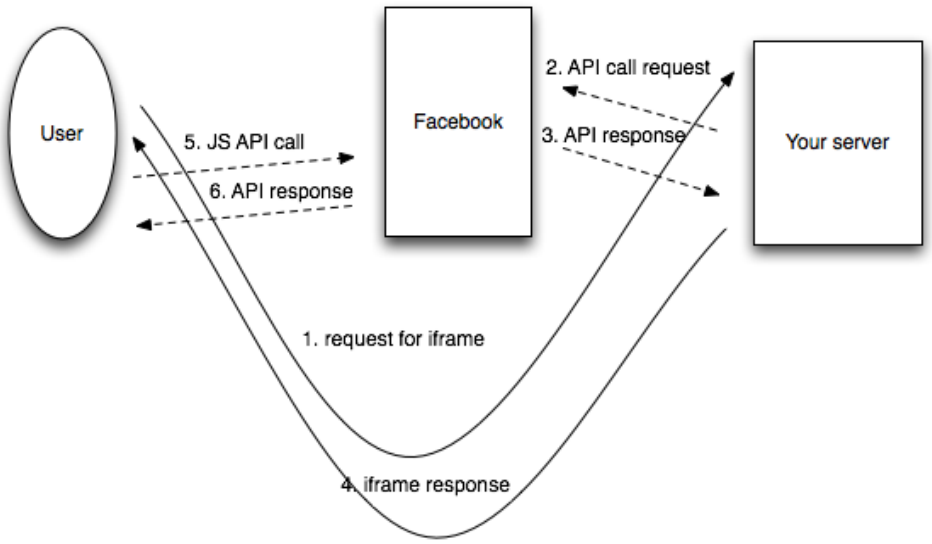

Figure 12 - IFrame Canvas Page with XFBML – Subsequent page loads by a User

The initial request to Facebook and its response to the browser obviously are not needed anymore. Also the JS API calls are sometimes unnecessary as well if the necessary data has been cached at the client-side. In other words, on subsequent page loads the application will be as fast as a normal website with the slight change of the social content that will be filled in just after the whole page is rendered.

3.2.3 **JavaScript SDK** (Facebook Developer Website, 2010)

The JavaScript SDK allows access to all of the features of the Graph API and Dialogs via JavaScript, providing a rich set of client-side functionality for authentication and rendering of XFBML applications as is the case with the one I implemented. Since most functions in the JavaScript SDK require an app id, I had to register my application at the developer Facebook website.

So in order to load the JavaScript SDK on every page, the appropriate code was set on the header file which is included on every page. The most efficient way to load the SDK is to load it asynchronously so it does not block loading other elements of the application. This is particularly important to ensure fast page loads for users. This can be seen on the following code snippet.

```
<script type="text/javascript">
window.fbAsyncInit = function() {
    FB.Canvas.setAutoResize();
    FB.init({appId: '<?php echo APP_ID ; ?>', status: true, cookie: true, xfbml: true});

    /* All the events registered */
 FB.Event.subscribe('auth.login', function(response) {
     login();
 });
 FB.Event.subscribe('auth.logout', function(response) {
     logout();
 });
 FB.getLoginStatus(function(response) {
     if (response.session) {
         login();
     }
 });
};
(function() {
    var e = document.createElement('script');
    e.type = 'text/javascript';
    e.src = document.location.protocol +
        '//connect.facebook.net/en_US/all.js';
    e.async = true;
    document.getElementById('fb-root').appendChild(e);
}());
```

. **Figure 13 –** Asynchronous loading of the JavaScript SDK

As we can see in **Figure 13**, we have the ***window.fbAsyncInit*** function which will be responsible for loading the SDK asynchronously. The first method, ***FB.Canvas.setAutoResize***, is useful when you know the content will change size, but you do not know when which is the case on my application. This is then followed by

FB.init which basically initializes the library, having as arguments my application ID which was obtained through the registering of the application on the Facebook Developer Website, followed by the status set to true in order to check the login status, then cookie set to true which enables cookies to allow the server access to the session and finally xfbml also set to true in order to parse xfbml.

This application is heavily dependent on events, which are fired by various interactions with the authentication. The two events used here are the following:

auth.login
This event is fired when the application first notices the user (in other words, gets a session when it did not already have a valid one).

auth.logout
This event is fired when the application notices that there is no longer a valid user (in other words, it had a session but can no longer validate the current user).

This is then followed by the ***FB.getLoginStatus*** function which will find out the current session status from the server, and get return session object if the user is logged in and connected to the application. Furthermore, we need to load the appropriate locale file which in this case is en_US and set ***e.async*** to true in order to make the script load asynchronously as that was the main objective. This process is done on the bottom function. Finally we need to implement the login and logout functions used on the above Event functions. We can see the implementation on **Figure 14**.

```
    function login(){
                FB.api('/me', function(response) {
                    document.getElementById('login').style.display = "block";
                    document.getElementById('login').innerHTML = response.name + " successfully logged in!";
                });
            }
    function logout(){
                document.getElementById('login').style.display = "none";
            }

</script>
```

Figure 14 – Login and logout functions implementation

As we can see on the login function, an API call to the Graph API is made by using the ***FB.api*** method using the '/me' argument which if an authenticated user is logged in to the application will provide their **User Object** that contains all the information needed to build the content of the application. Server-side calls like this one are available via the JavaScript SDK and are useful so we can make API calls against the Facebook servers directly from the user's browser. This can improve performance in many scenarios, as compared to making all calls from my server. This way it is possible to get the information needed when the user logs in to the application automatically fetching public data like their name or profile pictures.

As noted previously, extended permissions were needed in order to get more detailed information.

3.2.4 Graph API (Facebook Developer Website, 2010)

The Graph API is the core of Facebook Platform, enabling the reading and writing of data to Facebook. It provides a simple and consistent view of the social graph, uniformly representing objects (like people, photos, events, and pages) and the connections between them (friendships, likes, and photo tags). This permits quick fetching of public data which is something I require a lot on this application in order to get parameters like age, gender, relationship status, family members and relationships. Below we have an example of such an API call used.

```
$result = $facebook -> api('/me/friends?fields=id,name,picture,birthday,location,gender&access_token='.$access_token) ;
```

Figure 15 – Graph API call fetching information from the users friends

As we can see we have an API call with '/me/friends' which basically means all the friends of the current authenticated user logged onto the application, fetching the fields that show (Id, name, picture, birthday, location, gender) with the appropriate access token for the session. This is then changed from case to case depending on which information is required.

3.2.5 FQL (Facebook Developer Website, 2010)

Facebook Query Language, or FQL, uses a SQL-style interface to query data exposed by the Graph API. It provides for some advanced features not available in the Graph API, including batching multiple queries into a single call and also access to specific data not available by a simple API call in some cases. In the specific case of this application, the use of FQL was required in order to access friends' home country and current location. Below is code used to gather information for the users' friends' current location.

```
$user_id = $facebook -> getUser() ;
$sql = "SELECT  uid, first_name, last_name, pic_square,birthday,current_location,sex
        FROM user where uid IN ( SELECT uid2 FROM friend where uid1 = '$user_id'  )
        and current_location != '' order by first_name asc" ;
$data = $facebook -> api( array( 'method' => 'fql.query', 'query' => $sql ) ) ;
```

Figure 16 – FQL query gathering information needed

So here we are basically getting all the information described on the SELECT for all the friends of the specific user currently logged in, where the current location is set on their profile ordering all of them by first name.

3.2.6 Directory and file scheme

Below we have the directory and file scheme for this application. As you can see all the category/main page files are allocated on the main directory and then the backbone of it

all is allocated in the framework directory. This framework directory contains the CSS directory (which contains the style file responsible for all the pages style and the elastictextarea file which is responsible for the style of the text areas present on the app), the images directory (which contains all the images used in the application), the includes directory (which contains the Facebook libraries required for this application as well as the Facebook certificate file), the JS directory (with all the JavaScript files needed for the application), the functions file (which defines all functions needed for the execution of the application) and finally the config file (which has all the variables that are used).

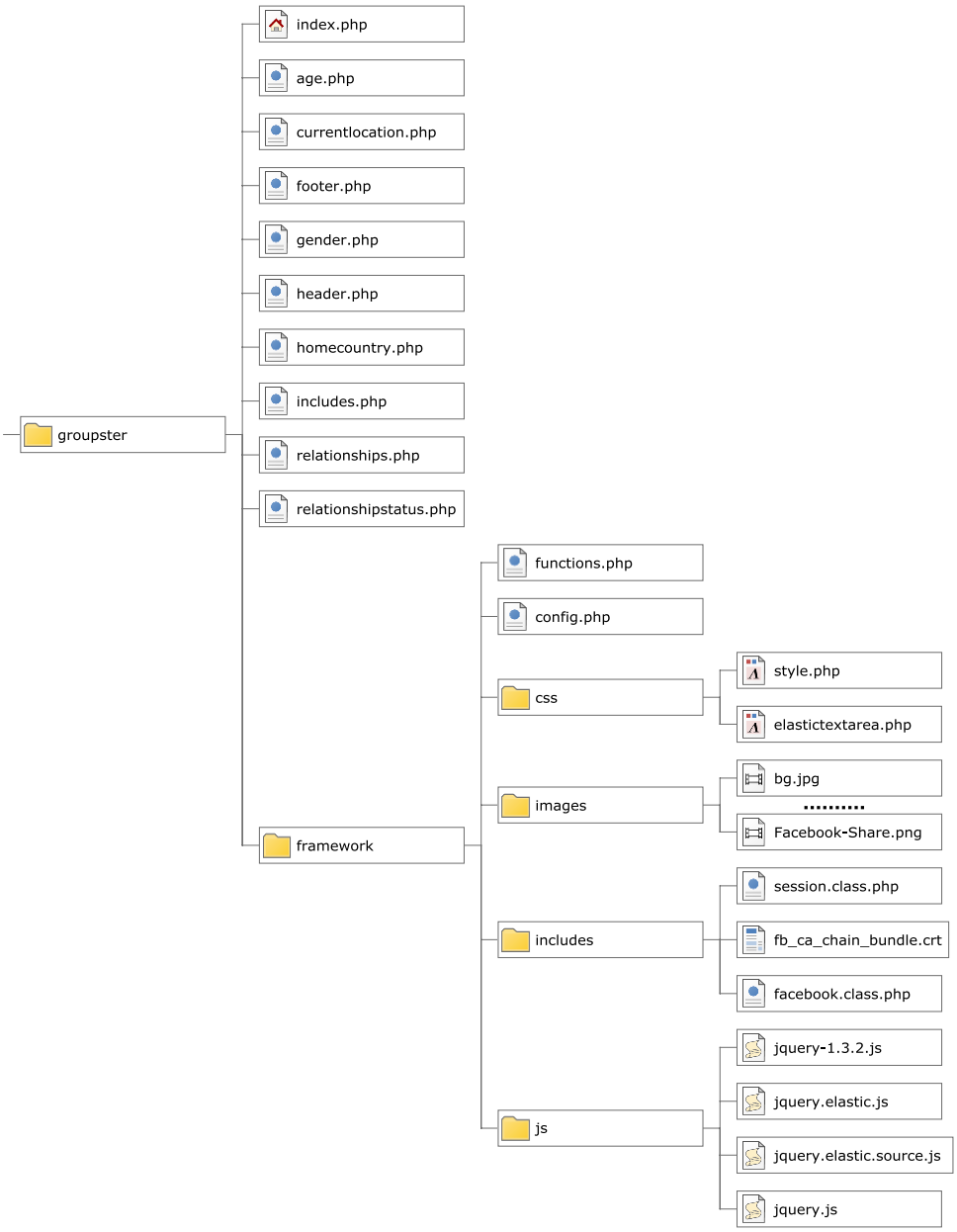

Figure 17 – Application directory and file scheme

4. STUDY

4.1 Theoretical approach

4.1.1 Statement of the problem

With the ever growing number of friends on social networking sites we lose control over who can read or not the content that is posted. Broadcasting posts has resulted in alarming privacy issues and will continuing to do so. Existing controls and privacy settings do not really address the problem; there is the option of Lists on Facebook however the amount of users that actually make use of it is dramatically low. In a study performed by Skeels and Grudin (2009) most of its participants complained about not being able to divide their Facebook friends into groups, totally oblivious to the fact that such a feature already exists. From this comes the need to figure out a simpler, quicker and more efficient way to somehow narrowcast posts providing the users with adequate controls to manage their narrowcasting.

4.1.2 Research Questions and Hypotheses

Keeping the problem above in mind we propose the following Research Questions and Hypotheses.

RQ1 – *Do Facebook Friend lists provide appropriate narrowcasting capabilities?*
It is widely believed that the current way Facebook Friend lists are implemented that they lack usability which ultimately greatly reduces its effectiveness. During this study we will see user's acceptance to other means of narrowcasting within their social networking websites, while also checking and noting current faults in the system and ways to improve on it.

RQ2 – *Will users prefer a category-driven filter over the existing friend lists on Facebook?*
This is the main question discussed in this thesis, people's acceptance of a category-driven filter to narrowcast their posts. Will they see it as tool to help them to more easily select the people to whom they which to share information with, or will they mostly disregard it? We believe this type of solution is a necessary step to be made on social networking websites in order to facilitate and encourage narrowcasting to lower the amount of information being shared, increasing privacy and safety of all their users now and in the future.

RQ3 – *Does narrowcasting reduce the amount of information being shared through Facebook?*
While usually narrowcasting reduces the amount of information being at any given instance, one has to take into consideration that people's reaction to it could be to post more often to specific groups leading to a counterintuitive increase in the amount of information shared while narrowcasting. While narrowcasting always results in increased privacy and safety in some way, it is not guaranteed to reduce the bulk of information being shared. In other words, does providing good narrowcasting capabilities increase or decrease the overall activity on a social network like Facebook.

H1 – *Users will share content more frequently when using an optimistic interaction pattern than when using a pessimistic interaction pattern.*
An optimistic interaction pattern consists in the user choosing to whom to share the content they post to, while a pessimistic interaction pattern consists in the user choosing to whom he wants to hide the content of the post. For the purposes of this study, it was decided that it would be important to evaluate how users would react depending on which interaction pattern is used, optimistic or pessimistic (Hong & Landay, 2004). With this in mind, we hypothesize that users that engage an optimistic interaction pattern will share content with more people than users that engage in a pessimistic interaction pattern.

H2 – *Males will hide more posts from family and/or significant other than females.*
Previous research has shown that males have a tendency to disclose less information about themselves than females (Chelune, 1976; Derlega & Chaikin, 1976; Dindia & Allen, 1992). Also with the differences in normal social behaviour and purpose of using social networking, we hypothesize that males will have a greater inclination to hide content from their family and/or significant other than females effectively using the hide option in our application more often in this category.

H3 – *Users not living in their native countries will use the "Home Country" and "Relationships" (family) categories more frequently than others.*
The objective of this hypothesis is to verify how people post when not present in their native country. We hypothesize that users currently not living in their native countries will naturally use the "Home Country" category (post to people from specific native countries) and the "Relationships" category (namely the family sub-category) more frequently in order to stay in contact with people that are far away as opposed to people narrowcasting to friends when they live in their native country and living near most of their family.

H4 – *When narrowcasting, users will hide posts from colleagues more often than from other friends.*
There is a separation between work environment and personal life in a sense that usually you do not want people you work with to know personal stuff about you or people from your personal life to know what goes on at work. We hypothesize that when narrowcasting, users will hide posts from colleagues more often than from other friends mainly because of a growing concern about keeping your job with several reports of people losing them, with employers more closely monitoring social media sites, and employees continuing to not use common sense when posting about work life, either by sharing sensitive corporate details, or simply by making foolish remarks about their employer (Ostrow, 2009).

H5 – *Posting content using category-driven filters will reduce errors and completion times compared to when posting content using friend lists.*
This hypothesis derives from the low use of the Facebook lists system and also its limitations. We hypothesize that when using a tool like this category-driven filter, in which the application does most of the work for you, will lead to fewer mistakes done by the users effectively increasing the overall correctness of what is posted and to whom, while also doing this in a more efficient and quicker way.

H6 - *Users who narrowcast make fewer posts per day than users who do not narrowcast.*
The tested idea here is whether people that actually have a concern about narrowcasting content over social networking websites will also make fewer posts per day as opposed to people that do not narrowcast. We hypothesize that if people take time to narrowcast specific posts to specific people they will also post less overall, as there is a lower need to broadcast content to everyone.

4.2 Method and procedures

Researchers have been conducting mixed methods research for several decades giving them a plethora of different names. Early articles on the application of such designs have referred to them as multi-method, integrated, hybrid, combined, and mixed methodology research (Creswell & Plano-Clark, 2007). The reasons to employ these types of designs vary, but they can be generally described as methods to expand the scope or breadth of research to offset the weaknesses of either approach alone (Blake, 1989; Greene et al., 1989; Rossman & Wilson, 1991). By using these distinct but complementary datasets we can achieve great level of certainty when verifying the validity of our hypotheses.

Table 1 – Datasets used to validate each hypothesis

	Usage study	**Survey**	**Lab study**
H1	x		
H2	x	x	
H3	x	x	
H4		x	x
H5			x
H6	x	x	

4.2.1 Usage study

A quantitative dataset (n=63) was gathered between April and May of 2011 with duration of 2 weeks. The duration was set to 2 weeks in order to make sure to keep people interested and with high levels of participation while also raffling a 10€ FNAC voucher every day to the participants during the duration of the study (14 total vouchers). Participants were asked to use Groupster to post messages to their Facebook accounts while also instructing them to avoid posting directly via Facebook. Instead of having two distinct applications or an option to change between interaction patterns that can skew the results, we opted to make it alternate within the same application adopting a between-groups experimental design. We did this by making the application adopt a pessimistic interaction pattern for every user that has an odd Facebook ID number, while providing an optimistic interaction pattern for every user that has an even Facebook ID number.

In addition to this, we also used a data scrapper application with each participant during the 14 days before the start of the actual study so we could know the number of posts done before the study.

4.2.2 Survey

The online survey was answered by the participants (n=54) right after the conclusion of the quantitative dataset gathering.

The online survey was deployed using Qualtrics, an online web survey platform with their analysis tools also being used to check the information but with its statistical limitations it was decided to export the data to IBM SPSS 18 to analyse the data and help provide statistical information important to validate some of our hypotheses (this was also done with the usage data required to test out hypotheses). Google Analytics was also deployed using a server-side script in order to have access to further more detailed statistics about the users while providing high-level dashboard data for better analysis.

4.2.3 Lab study

For the lab study we had 15 participants (6 female and 9 male) of which all of them had participated in the previous two studies.

This study used a third-person scenario method partially based in a study conducted by Wagner et al. (2010). The scenarios were potential posts for which participants had to select if they would like to show or hide that specific post from an array of different friends divided by the type of relationship they have with them. We also provided them with an "Other" option where they could specify from whom else they would wish to show or hide that post and explain why. We instructed the participants that even if they do not have friends on Facebook with the relationship ties present in this study, they should pretend they do and respond accordingly.

The nature of the posts was decided using Schrøder, et al. (2003) design of defining a set of guiding general categories, each of which may then be diversified by setting up subcategories as they suggest themselves to the analytic glance. We then based our scenarios on four different basic motives: diversion, social, personal and informational as they seem to be present in most of the media audience studies (Sejrup, 2009) with all categories being well represented with several overlapping within these scenarios.

In addition to the third-person scenarios, participants were asked to perform several tasks on both the normal Facebook interface and also using the category-driven filters of Groupster. The time taken to complete tasks was measured, and the mistakes made during execution of the tasks. They did not receive any additional training on the application or on how to perform the tasks on the Facebook interface. We also asked our participants to be as quick and as correct as possible.

4.3 Plan for data analysis

In order to be more specific on how each hypothesis will be tested we will now present the data and tests used for each one.

H1 – *Users will share content more frequently when using an optimistic interaction pattern than when using a pessimistic interaction pattern.*
Hypothesis 1 will be tested solely through the data gathered from the quantitative dataset. We will obtain the number of posts made by each subgroup comparing the two means using an Independent-Samples T Test in order to verify if there is a relation between the interaction pattern and the number of posts done.

H2 – *Males will hide more posts from family and/or significant other than females.*
To test this hypothesis, we will check for the gender of each user that uses the application, and contrast against their behaviour captured via the logger. The results will then undergo a Chi-Square Test and complemented by questions present on the online survey in which its results will then also undergo a Chi-Square Test. This way we can see if there is any difference between the participants' perceived and actual behaviour.

H3 – *Users not living in their native countries will use the "Home Country" and "Relationships" (family) categories more frequently than others.*
Similar to H2, we will check if the user of the application is currently in their native country or not and then compare with their actions to see how often they narrowcast to their home country and/or family and compare it to the other users. The results of the quantitative dataset will be tested using an Independent-Samples T Test and complemented by questions on the survey which will be tested via a Chi-Square Test and checked any difference between the participants' perceived and actual behaviour.

H4 – *When narrowcasting, users will hide posts from colleagues more often than from other friends.*
This hypothesis will be tested by using the data captured in the lab study, complemented by questions present on the online survey. We will compare the mean numbers in terms of disclosure of all categories to see if the "Work Colleagues" category is the one the users would want to disclose the least while also checking from our 12 proposed scenarios if there is a tendency to hide more information from work colleagues.

H5 – *Posting content using category-driven filters will reduce errors and completion times compared to when posting content using friend lists.*
This hypothesis will also be tested via the lab study, looking at the time taken to complete tasks and number of errors made when using Facebook vs. Groupster.

H6 - *Users who narrowcast make fewer posts per day than users who do not narrowcast.*
This hypothesis will be validated by counting the number of posts made by users before starting using the application (14 days before) with the help of a data scrapper application and comparing it to the number of posts made while using the application. This will then be tested using a Paired-Samples T Test and complemented by questions present on the online survey and also checked any difference between the participants' perceived and actual behaviour.

5. RESULTS

5.1 Survey

From the 63 people that started this study, 54 answered this survey. Below we have the results gathered from our questions (**See Appendix 1**).

First off, we started by checking our sample's demographics namely Gender and Age distribution:

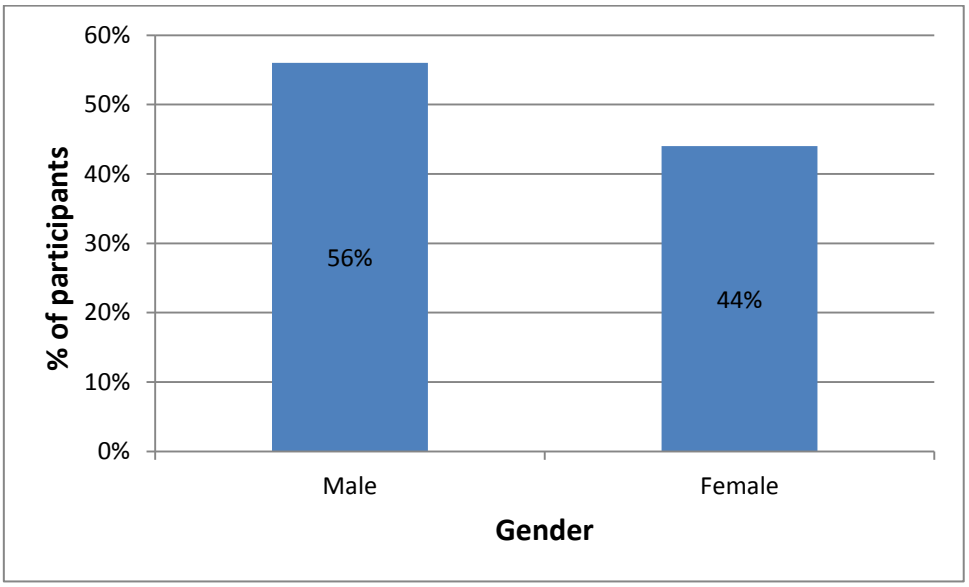

Chart 1 - Participants gender distribution

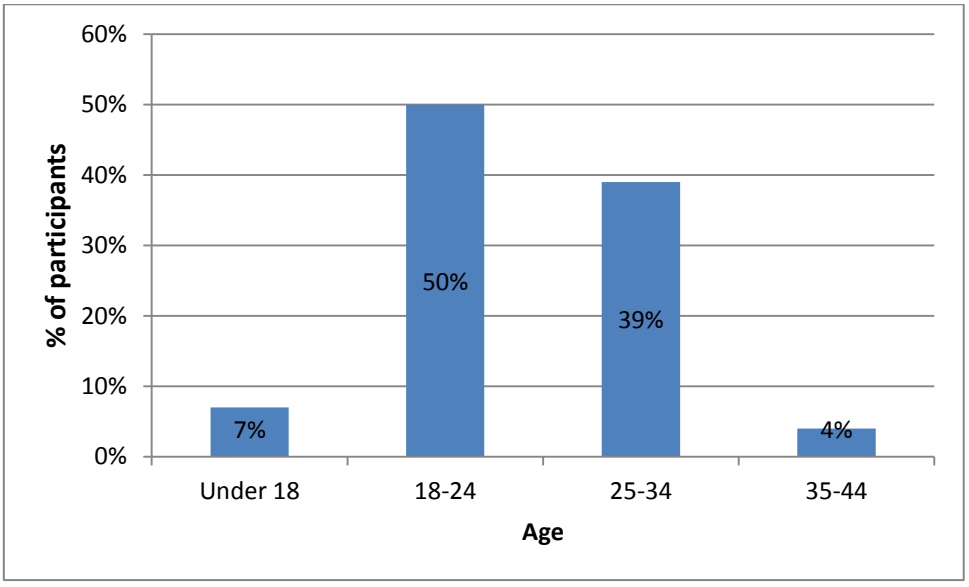

Chart 2 - Participants age distribution

Then we continued by checking which of the participants had already used the Facebook tool of narrowcasting, the lists:

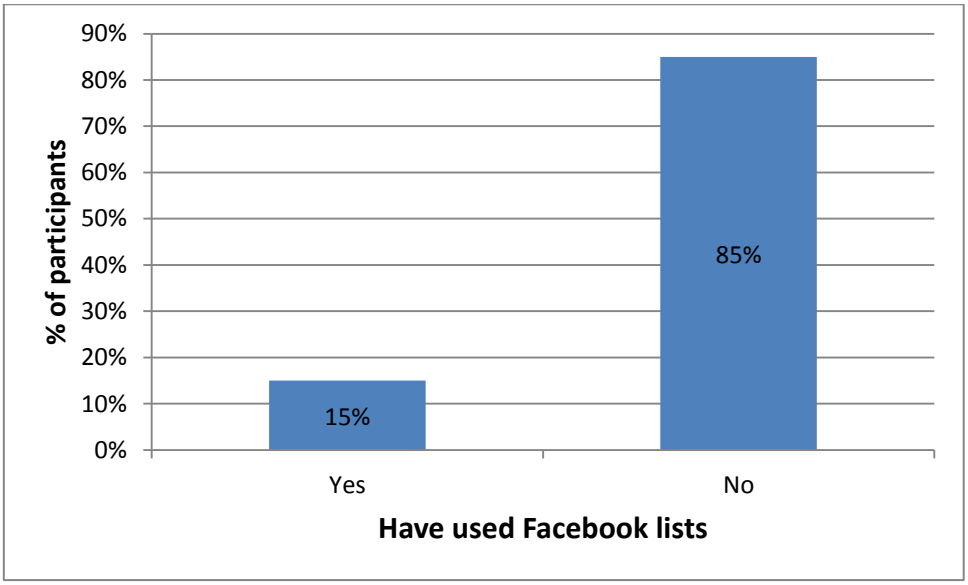

Chart 3 - Participants that have used Facebook lists

This was followed by questions regarding the participants posting behaviour before using the application and during the use of the application. Starting with their posting frequency before the study:

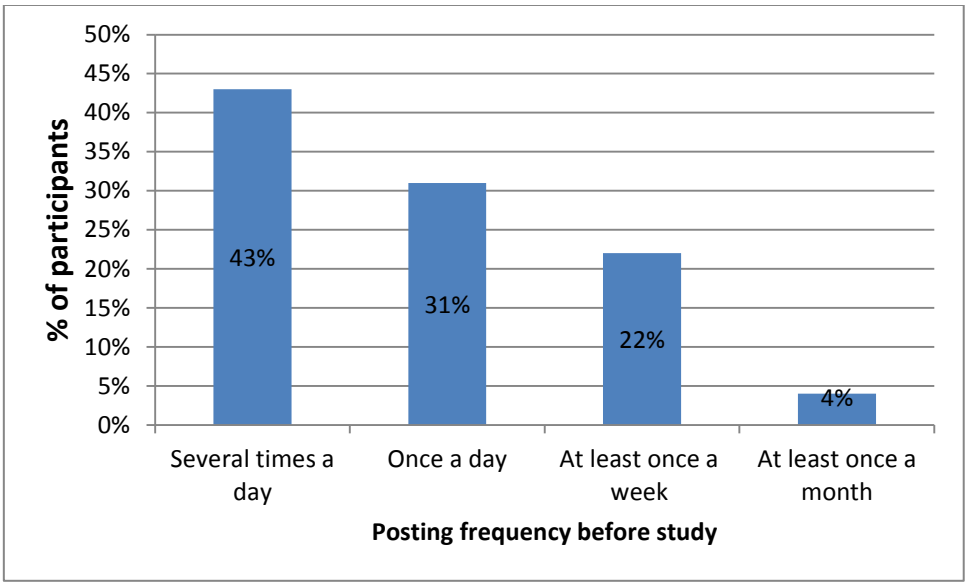

Chart 4 - Participants posting behaviour perception before the study

Followed by their perception if they were posting more frequently, less frequently or the same after the study began and they started using the application:

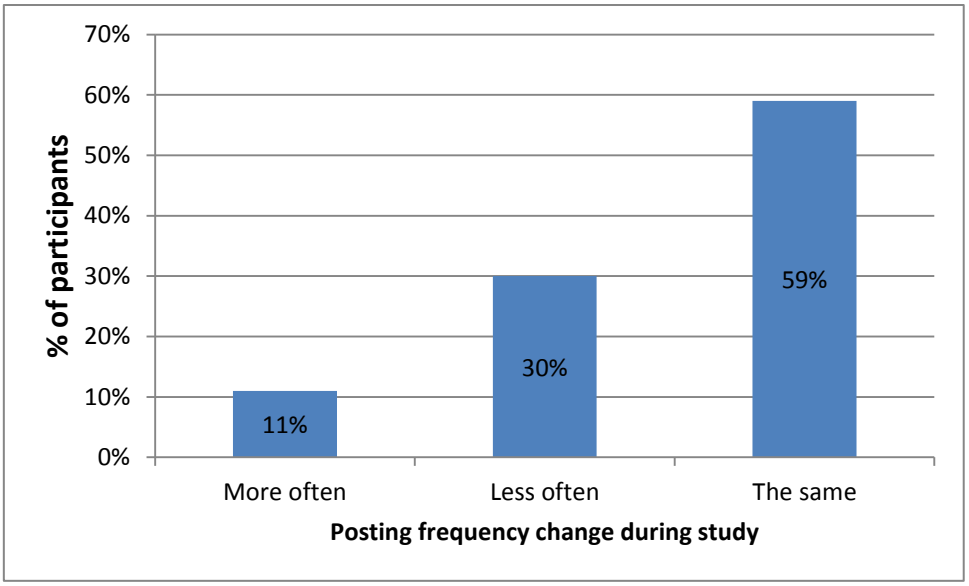

Chart 5 - Participants perception on their posting frequency behaviour change during the study

With the follow-up question that if they believed that more, less or the same amount of people could see their posts during the study compared to before the study:

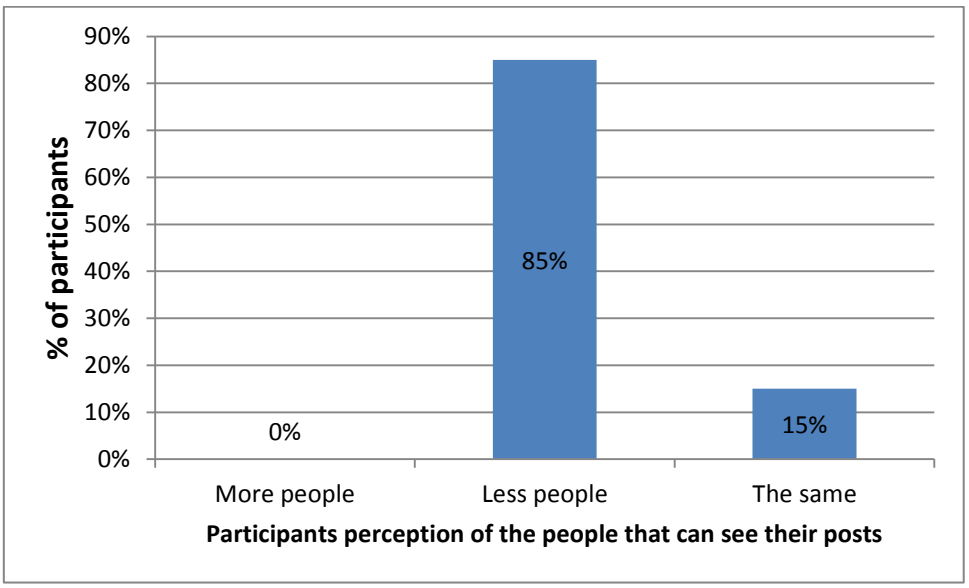

Chart 6 - Participants perception of the amount of people that can see their posts during the study compared to before the study

The next question focused on seeing if the participants felt that after having used the application their posting behaviour on Facebook had changed with a follow-up question to ask them to justify their previous answer:

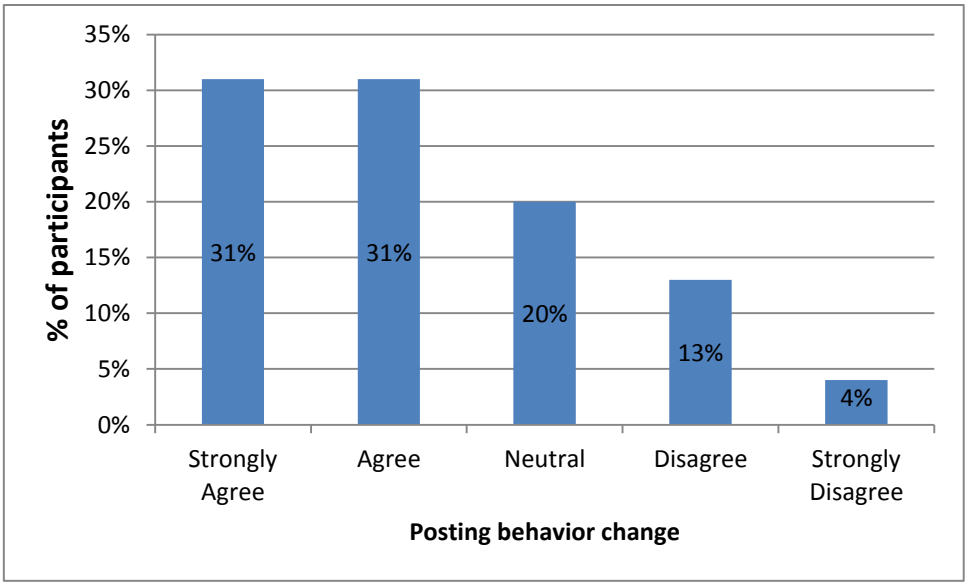

Chart 7 - Participants belief if using the application changed their posting behaviour

In order to test one of our hypotheses, it was important to check if each participant was living in their native country:

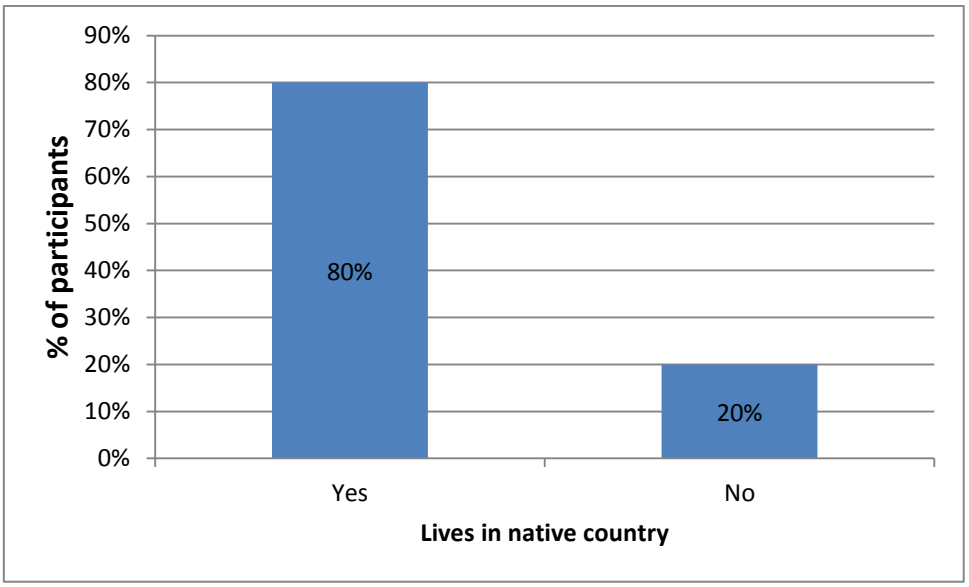

Chart 8 - Participants living in their native country

We then passed to our Likert Scale (1-5) questions to check the usefulness of our current categories and also possible future categories while also checking if the participants prefer to hide information or to show information in each of the categories, present and future. Next we have the tables and charts with the results gathered during the survey.

Table 2 – Likert scale statistical results for survey question: 8. Indicate how useful you found each category provided by the application on a 1 to 5 scale (1: least useful, 5: most useful).

	Age	Relationships	Home Country	Current Location	Gender	Relationship Status
Min Value	2	2	2	1	2	1
Max Value	5	5	5	5	5	5
Mean	3.65	4.28	3.35	3.15	3.81	2.52
Variance	1.02	0.69	1.06	0.66	0.98	1.01
Standard Deviation	1.01	0.83	1.03	0.81	0.99	1.00

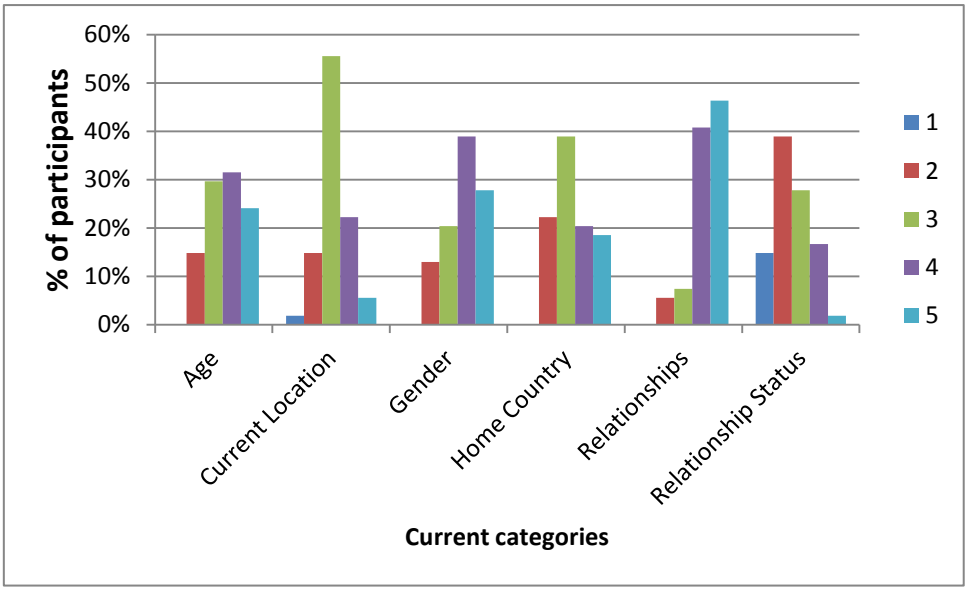

Chart 9 – Likert scale point distribution by current category usefulness

Table 3 – Likert scale statistical results for survey question: 8a. Please indicate how you preferred using each category -- to hide information or to show information -- on a 1 to 5 scale (1: only hide, 2: mostly hide, 3: neutral, 4: mostly show, 5: only show).

	Age	Relationships	Home Country	Current Location	Gender	Relationship Status
Min Value	2	1	3	3	2	1
Max Value	5	5	5	5	5	4
Mean	3.54	2.56	3.83	3.83	3.28	2.59
Variance	0.74	1.69	0.41	0.41	0.69	0.47
Standard Deviation	0.86	1.30	0.64	0.64	0.83	0.69

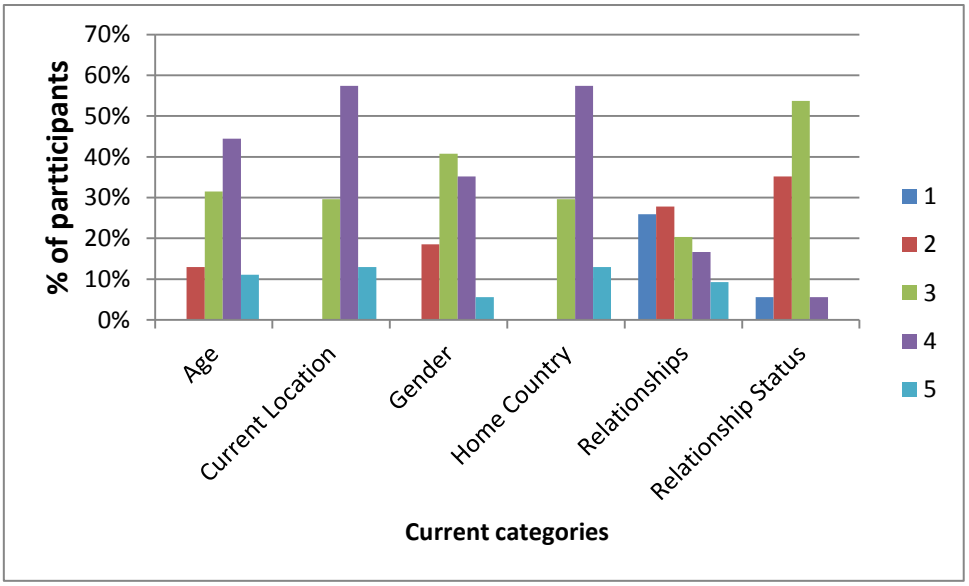

Chart 10 – Likert scale point distribution by current category usage

Table 4 – Likert scale statistical results for survey question: 9. Indicate the level of usefulness of potential future categories, 1 being the lowest and 5 the highest.

	Work Colleagues	School Colleagues	Interests
Min Value	1	1	2
Max Value	5	5	5
Mean	3.78	3.78	4.26
Variance	1.19	1.16	0.65
Standard Deviation	1.09	1.08	0.81

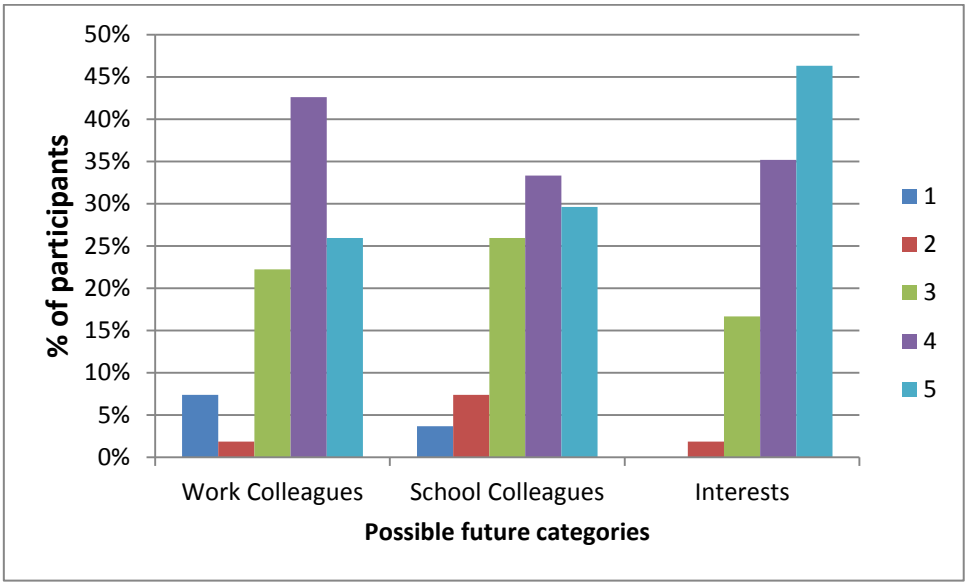

Chart 11 – Likert scale point distribution by possible future category usefulness

Table 5 – Likert scale statistical results for survey question: 9a. Please indicate how you would prefer using each of the following categories on a 1 to 5 scale (1: only hide, 2: mostly hide, 3: neutral, 4: mostly show, 5: only show).

	Work Colleagues	School Colleagues	Interests
Min Value	1	2	2
Max Value	4	5	5
Mean	2.00	3.67	4.09
Variance	0.75	0.79	0.69
Standard Deviation	0.87	0.89	0.83

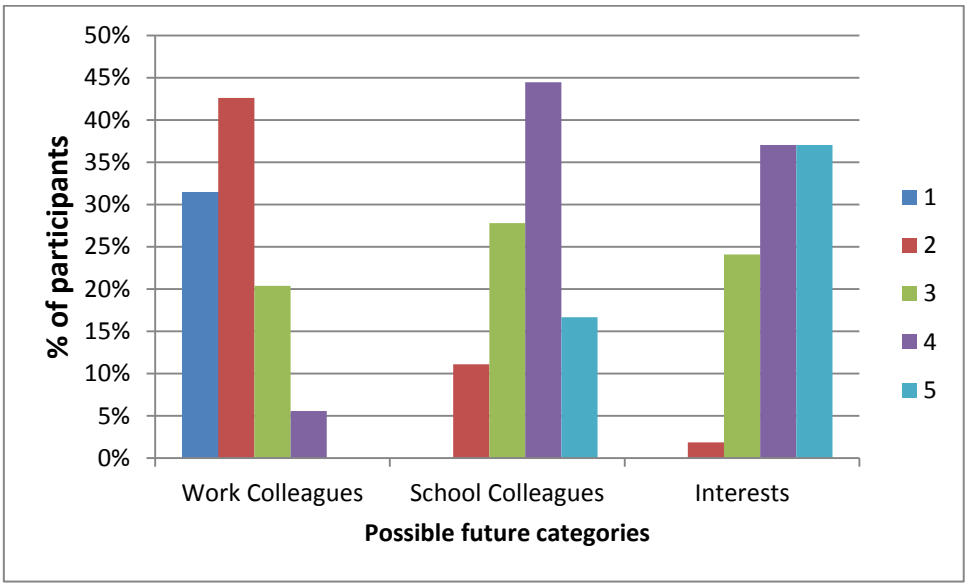

Chart 12 – Likert scale point distribution by possible future category usage

Finally, we had the questions that were made to try to assess the overall acceptance of the application and help us with de discussion section of this work.

Table 6 – Answer distribution of questions regarding overall acceptance of the application

	Yes	No	I'm not sure
Continue to use application	63%	17%	20%
Recommend to friends	72%	28%	-

Again we followed-up with a question for them to explain their reasons. At the end we also put an optional question asking the participants what they would like to be changed in future versions of the application in which we had a total of 6 responses.

5.2 Usage data

With our logger we were able to gather information from everyone that used the application throughout the duration of the study while also saving all their actions performed while using the application in order to compare their perceived behaviour with their actual behaviour in some of the cases.

Although we have data from all 63 participants that started the study plus also about a dozen more random Facebook users that found out about the application by themselves while using Facebook, we decided only to take into account the data from the 54 participants that finalised the study by answering the survey in order to ensure consistency between both sets of data. With this being said, a demographics distribution is not required here as it is equal to the data shown on the Survey section, we will then focus on posting behaviours.

During this study (14 days) we registered a total of 595 posts (avg. 42.5 posts per day) made by our 54 participants (avg. 11.02 posts per person). A detailed breakdown of those posts is shown in the following figures.

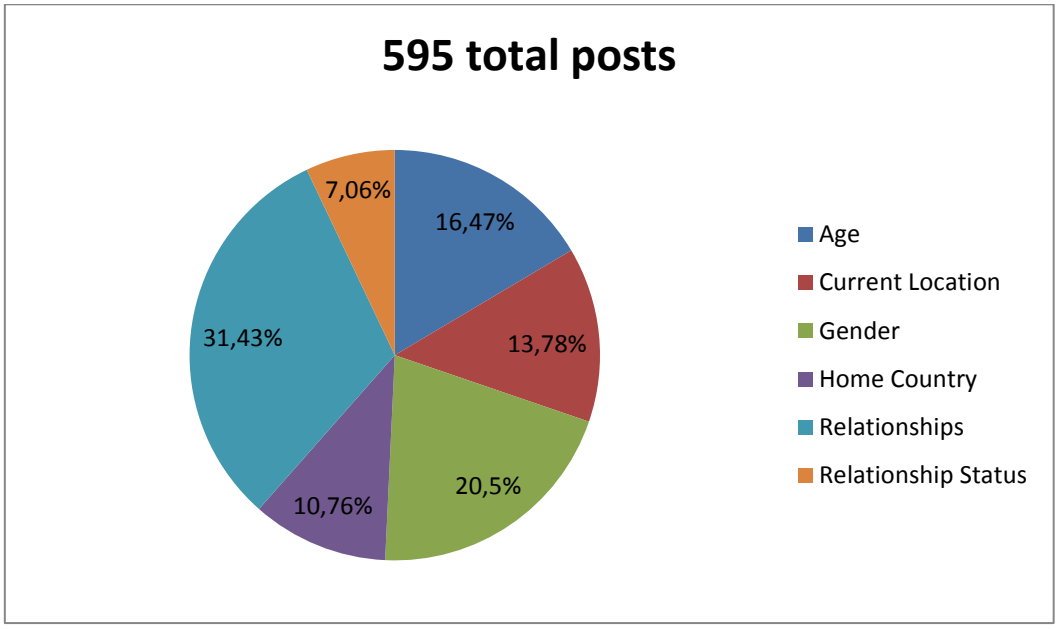

Chart 13 – Posts distribution by category

As seen on **Chart 13** the Relationships (family/significant other) category was the clear favourite among our participants further confirming the importance of tie strength when building categories, with also the Age and Gender categories performing rather well. The Home Country and Current Location categories had low numbers which can be explained by the fact that most participants live in their native country leading to a decreased usefulness of having both these categories. The category which participants used the least was Relationship Status.

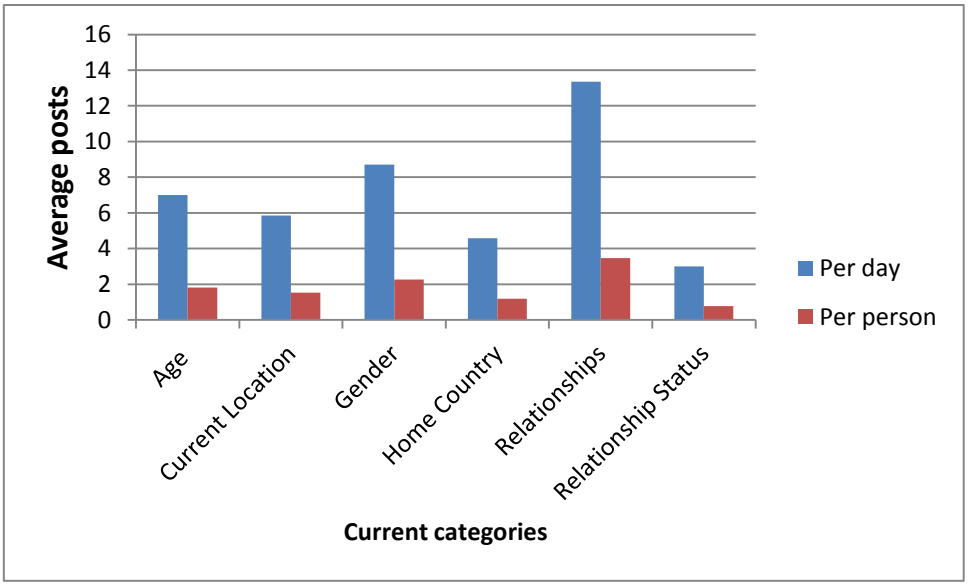

Chart 14 – Average posts per day and per person on each category

We also checked the amount of posts done every day using the application as we can see in the following chart:

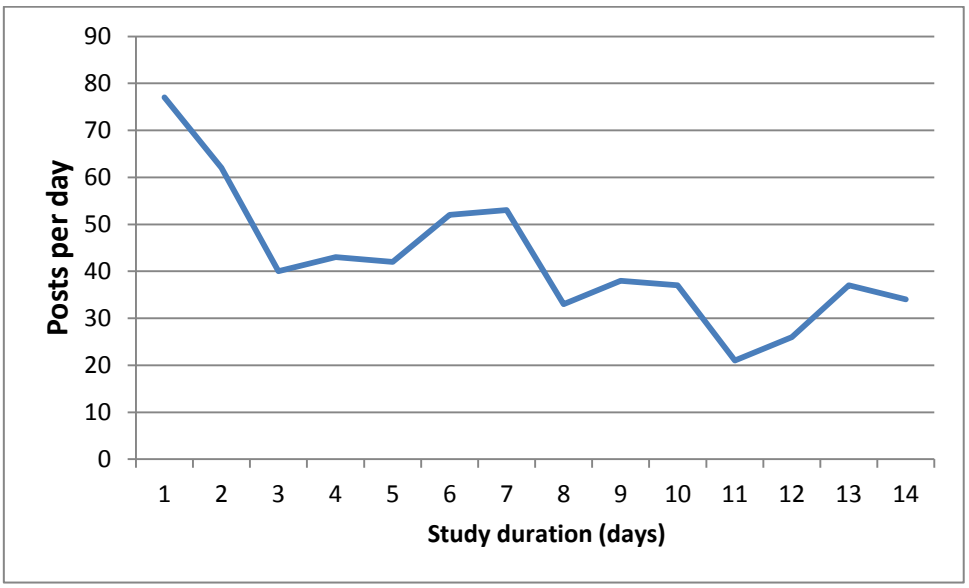

Chart 15 – Posts distribution by day

We verified a decline on the amount of posts done per day during our study which can be explained by the end of the "novelty factor" of the application. We also saw an expected spike of posts made during weekends (days 6, 7, 13, 14).

Only information needed to validate our hypotheses was taken into account and will be presented below in each individual hypotheses in which its data is required.

Hypothesis 1 – *"Users will share content more frequently when using an optimistic interaction pattern than when using a pessimistic interaction pattern."*

Within the final sample of 54 participants (started with 63), users were divided between an optimistic interaction pattern and a pessimistic interaction depending on whether their Facebook user ID was odd or even. This resulted in 29 users having an optimistic interaction pattern while 25 users had a pessimistic interaction pattern. We then checked through the quantitative dataset and obtained the following results.

The optimistic subgroup posted a total of 349 posts (avg. 12.03 posts) and the pessimistic subgroup posted a total of 246 posts (avg. 9.84 posts). Below we have the group statistics for these two variables.

Table 7 – Group statistics for optimistic and pessimistic subgroups

	Interaction Pattern	N	Mean	Std. Deviation	Std. Error Mean
Posts	Optimistic	29	12,03	3,417	,635
	Pessimistic	25	9,84	2,410	,482

We then proceeded to perform an Independent-Samples T Test (Confidence level = 95%, alpha = 0.05) in order to answer the question: "Is there a difference in the average amount of posts done by the optimistic subgroup and the pessimistic subgroup?"

Our first null hypothesis states that the variance of the amount of posts done by the optimistic subgroup is equal to the variance of the amount of posts done by the pessimistic subgroup.

Table 8 – Independent-Samples T Test for optimistic and pessimistic subgroups

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Posts	Equal variances assumed	2,193	**,145**	2,685	52	**,010**	2,194	,817	,554	3,834
	Not assum.			2,754	50,151	,008	2,194	,797	,594	3,795

With the Levene's Test for Equality of Variances we see that equal variances are assumed (second row is blank). The p-value is 0.145 which is greater than our alpha, so we failed to reject the first null hypothesis which states that the variance of the amount of posts done by the optimistic subgroup is equal to the variance of the amount of posts done by the pessimistic subgroup.

Since equal variances are assumed, we can now proceed to our second null hypothesis, which states that there is no difference between the amount of posts made by the optimistic subgroup and the pessimistic subgroup. We can now compare means checking the top row of the rest of the table since equal variances are assumed.

The mean difference between the amount of posts made by both subgroups is 2.194 and t (52) = 2.685 was statistically significant with p = 0.010. This is less than our alpha which leads us to reject our second null hypotheses that stated that there is no difference between the amount of posts made by the optimistic subgroup and the pessimistic subgroup.

So we can conclude that the answer to our initial question, "Is there a difference in the average amount of posts done by the optimistic subgroup and the pessimistic subgroup?", is yes, therefore we accept H1.

Hypothesis 2 – "*Males will hide more posts from family and/or significant other than females."*

For this hypothesis we gathered information from both the qualitative and the quantitative datasets in order to also check the difference between the perceived behaviour of the participants and their actual behaviour. For the qualitative data we cross tabulated the answers to the questions

- "1" Gender and
- "8a" Please indicate how you preferred using each category -- to hide information or to show information -- on a 1 to 5 scale (1: only hide, 2: mostly hide, 3: neutral, 4: mostly show, 5: only show).

For the 8a question obviously only the values regarding the Relationships category were taken into account.

Next we have the table in which we can see the count and expected count for each of the genders regarding each of the Likert Scale classifications given and also the Chi-square obtained, the degrees of freedom and the asymptotic significance of the value.

Table 9 – Cross tabulation between Gender and perceived behaviour using the Relationships category

			8a. Please indicate how you preferred using each category -- to hide information or to show information -- on a 1 to 5 scale (1: only hide, 2: mostly hide, 3: neutral, 4: mostly show, 5: only show) – Relationships				
			1	**2**	**3**	**4**	**5**
1. Gender	**Male**	Count	12	11	6	1	0
		Expected Count	7,8	8,3	6,1	5,0	2,8
	Female	Count	2	4	5	8	5
		Expected Count	6,2	6,7	4,9	4,0	2,2
Total		Count	14	15	11	9	5
		Expected Count	14,0	15,0	11,0	9,0	5,0

Table 10 – Chi-square tests for hypothesis 2 (perceived behaviour)

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	20,532	4	**,000**

So we obtained a Chi-Square of 20.532 with $p<0.000$, so it is statistically improbable that the difference we see between both genders occurred by chance. In other words, in the actual population, it is far more likely that the perceived behaviour of the males (avg. 1.87 on the Likert scale) is that of hiding their posts more often than the females (avg. 3.42 on the Likert scale) when using the Relationships category.

In terms of quantitative dataset we had that the males posted a total of 103 times using the relationships category of which 78 of those posts were with the Hide option selected (75.73%) while 25 of those posts were with the Show option selected (24.27%). On the other hand, the females posted a total of 84 times using the aforementioned category of which 48 of those posts was with the Show option selected (57.14%) while 36 of those posts were with the Hide option selected (42.86%).

Next we can see the cross tabulation between the two variables with the count, expected count and percentage within Gender as well as the chi-square analysis for this specific sample.

Table 11 – Cross tabulation between Gender and actual behaviour using the Relationships category

			Relationships Category		
			Show	Hide	Total
Gender	Male	Count	25	78	103
		Expected Count	40,2	62,8	103,0
		% within Gender	24,3%	75,7%	100,0%
	Female	Count	48	36	84
		Expected Count	32,8	51,2	84,0
		% within Gender	57,1%	42,9%	100,0%
Total		Count	73	114	187
		Expected Count	73,0	114,0	187,0

Table 12 – Chi-square tests for hypothesis 2 (actual behaviour)

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	21,007	1	**,000**

So we obtained a Chi-Square of 21.007 with p<0.000, so it is statistically improbable that the difference we see between both genders occurred by chance. In other words, in the actual population, it is far more likely that the actual behaviour of the males (75.7%) is that of hiding their posts more often than the females (42.9%) when using the Relationships category.

Due to the results we have obtained, we have to accept Hypothesis 2.

Hypothesis 3 - "*Users not living in their native countries will use the "Home Country" and "Relationships" (family) categories more frequently than others."*

For Hypothesis 3 we also gathered information from both the qualitative and the quantitative datasets in order to also check the difference between the perceived behaviour of the participants and their actual behaviour. For the qualitative data we cross tabulated the answers to the questions:

- "7." Do you currently live in your native country? and
- "8." Indicate how useful you found each category provided by the application on a 1 to 5 scale (1: least useful, 5: most useful).

For question 8 obviously only the values regarding the Relationships category and the Home Country category were taken into account. Next we have the tables with these 2 cross tabulations (native country vs. relationships category and native country vs. home

country category) and also, like the hypothesis before, the calculation of each of the Chi-squares obtained, the degrees of freedom and the asymptotic significance of both values.

Table 13 – Cross tabulation between if the participant lives in its native country and how useful they found the Relationships category

			8. Indicate how useful you found each category provided by the application on a 1 to 5 scale (1: least useful, 5: most useful) - Relationships			
			2	**3**	**4**	**5**
7. Do you currently live in your native country?	**Yes**	Count	3	4	18	18
		Expected Count	2,4	3,2	17,5	19,9
	No	Count	0	0	4	7
		Expected Count	,6	,8	4,5	5,1
Total		Count	3	4	22	25
		Expected Count	3,0	4,0	22,0	25,0

Table 14 – Chi-square tests for hypothesis 3 (native vs. relationships – perceived behaviour)

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	2,753	3	**,431**

So we obtained a Chi-Square of 2.753 with p=0.431, so the analysis shows that people who live abroad do not report the Relationships category to be more or less useful than people living in their native country.

Table 15 – Cross tabulation between if the participant lives in its native country and how useful they found the Home Country category

			8. Indicate how useful you found each category provided by the application on a 1 to 5 scale (1: least useful, 5: most useful) – Home Country			
			2	**3**	**4**	**5**
7. Do you currently live in your native country?	**Yes**	Count	12	21	8	2
		Expected Count	9,6	16,7	8,8	8,0
	No	Count	0	0	3	8
		Expected Count	2,4	4,3	2,2	2,0
Total		Count	12	21	11	10
		Expected Count	12,0	21,0	11,0	10,0

Table 16 – Chi-square tests for hypothesis 3 (native vs. home country – perceived behaviour)

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	30,685	3	**,000**

So we obtained a Chi-Square of 30.685 with p<0.000, so it is statistically improbable that the difference we see between both native and not native participants occurred by chance. In other words, in the actual population, it is far more likely that the perceived behaviour of the non-native participants (avg. 4.73 in the Likert scale) is that of the Home Country category being more useful than the native participants (avg. 3 in the Likert scale).

In terms of the quantitative dataset, out of the 54 participants we had 11 that do not live in their native country. We had a total of 187 posts narrowcasted using the Relationships category, 41 done by people not living in their native country (avg. 3.73 posts) and 146 by people living in their native country (avg. 3.40 posts). The Home Country category had a total of 64 posts, 48 done by people not living in their native country (avg. 4.36 posts) and 16 done by people living in their native country (avg. 0.37 posts). Below we have the graphical representation for better viewing and comparison.

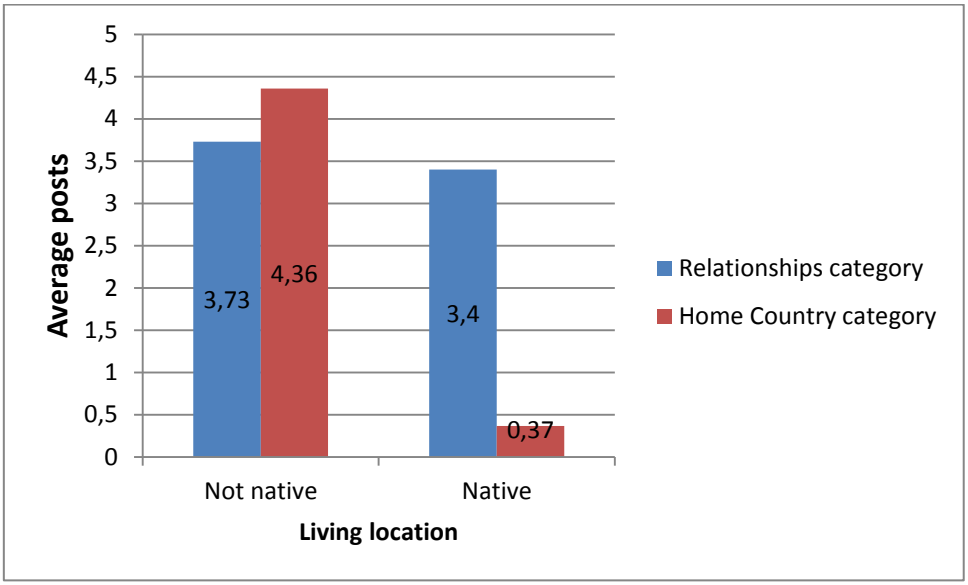

Chart 16 – Average posts for native and not native participants in the relationships and home country categories

We also performed two independent-samples T Tests (Confidence level = 95%, alpha = 0.05) using the percentage of the total posts done in both these 2 categories for both native and not native participants in order to answer the questions: "Is there a difference in the percentage of posts done in the Relationships category between the native and not native participants?" and "Is there a difference in the percentage of posts done in the Home Country category between the native and not native participants?".

We start with the one referring to the Relationships category in which our first null hypothesis states that the variance of percentages of posts done in the Relationships category by the native participants is equal to the variance of percentages of posts done in the Relationships category by the not native participants.

Table 17 – Group statistics for native and not native subgroups for % of total posts using the Relationships category

	Living Location	N	Mean	Std. Deviation	Std. Error Mean
% of total posts using Relationships Category	Native	43	32,2823	14,23375	2,17063
	Not Native	11	33,9564	10,93156	3,29599

So the participants living in their native country had 32.28% of their total posts done in the Relationships category while the participants not living in their native country had 33.96% of their total posts done in the Relationships category.

Table 18 – Independent-Samples T Test for native and not native subgroups for % of total posts using the Relationships category

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
% of total posts using Relationships Category	Equal variances assumed	1,37	**,247**	-,363	52	**,718**	-1,67404	4,61577	-10,93	7,58
	Not assum.			-,424	19,6	,676	-1,67404	3,94654	-9,91	6,56

With the Levene's Test for Equality of Variances we see that equal variances are assumed (second row is blank). The p-value is 0.247 which is greater than our alpha, so we failed to reject the first null hypothesis which states that the variance of percentages of posts done in the Relationships category by the native participants is equal to the variance of percentages of posts done in the Relationships category by the not native participants. Since equal variances are assumed, we can now proceed to our second null hypothesis which states that there is no difference between the percentages of posts done in the Relationships category by the native participants and not native participants. We can now compare means checking the top row of the rest of the table since equal variances are assumed. The mean difference between the amount of posts made by both

subgroups is 1.67404 and t (52) = -0.363 with p = 0.718. The p-value is greater than our alpha so we have also failed to reject our second null hypothesis. Therefore our results are not statistically significant in order to say there is a difference between the percentage of posts done in the Relationships category between the native and not native participants

Next we have the one referring to the Home Country category in which our first null hypothesis states that the variance of percentages of posts done in the Home Country category by the native participants is equal to the variance of percentages of posts done in the Home Country category by the not native participants.

Table 19 – Group statistics for native and not native subgroups for % of total posts using the Home Country category

	Living Location	N	Mean	Std. Deviation	Std. Error Mean
% of total posts using Home Country Category	Native	43	2,3295	3,94722	,60195
	Not Native	11	36,0309	7,74066	2,33390

So the participants living in their native country had 2,33% of their total posts done in the Home Country category while the participants not living in their native country had 36,03% of their total posts done in the Home Country category.

Table 20 – Independent-Samples T Test for native and not native subgroups for % of total posts using the Home Country category

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
% of total posts using Home Country Category	Equal variances assumed	4,79	**,033**	-20,315	52	,000	-33,70137	1,65897	-37,03	-30,37
	Not assum.			-13,982	11,363	**,000**	-33,70137	2,41027	-38,98	-28,41

With the Levene's Test for Equality of Variances we see that equal variances are assumed (second row is blank). The p-value is 0.033 which is less than our alpha, so we

can reject the first null hypothesis which states that the variance of percentages of posts done in the Home Country category by the native participants is equal to the variance of percentages of posts done in the Home Country category by the non-native participants. We can now proceed to our second null hypothesis which states that there is no difference between the percentages of posts done in the Home Country category by the native participants and not native participants. We can now compare means checking the bottom row of the rest of the table since equal variances are not assumed. The mean difference between the amount of posts made by both subgroups is 33.70137 and t (11.363) = -13.982 with $p<0.000$. So we can conclude that the answer to our initial question, "Is there a difference in the percentage of posts done in the Home Country category between the native and not native participants?", is yes.

Our results lead us to partly reject H3, in that users not living in their native countries do not use and do not perceive to use the relationship (family) category more frequently, but they do use and perceive to use the Home Country category more frequently.

Hypothesis 4 - *"When narrowcasting, users will hide posts from colleagues more often than from other friends."*

For this hypothesis we gathered information from the qualitative dataset and the results from third-person scenarios gathered in a lab study. The question analysed in the survey was "9a. Please indicate how you would prefer using each of the following categories on a 1 to 5 scale (1: only hide, 2: mostly hide, 3: neutral, 4: mostly show, 5: only show)." in which we focused only on the answers given to the possible future category "Work Colleagues". Below we have the Likert scale point distribution for this category in terms of hiding or not information from these friends.

Table 21 – Likert scale point distribution of usage for the possible future category "Work Colleagues"

	1	2	3	4	5	Mean
Work Colleagues	17	23	11	3	0	2

In terms on mean number of usage, the value obtained for the "Work Colleagues" category (avg. 2 on the Likert Scale) was the lowest considering both current categories and future categories which means that from all 9 categories present on this survey, this specific category was the one chosen by the participants of our study as the one they would hide more information from.

Next we have the average results of the 12 third-person scenarios we performed (refer to **Appendix 2** for individual scenario results) in which we asked participants to decide, for each scenario, to who they would like to show and hide that piece of information regarding different types of relationships they could potentially have in their friend list. We also had an "Other" option in which participants could specify another type of relationship not present to show or hide.

Table 22 – Average of all scenarios

Show (73.5%)		Hide (26.5%)	
Boss	50.8%	Boss	49.2%
Work Colleagues	56.9%	Work Colleagues	43.1%
Best Friends	98.6%	Best Friends	1.4%
Casual Friends	75%	Casual Friends	25%
Family	82.2%	Family	17.8%
Partner	92.5%	Partner	7.5%
Strangers	42.9%	Strangers	57.1%
Other	0%	Other	3.3%

Below we have a chart with the "hide" selection percentage distribution for each scenario.

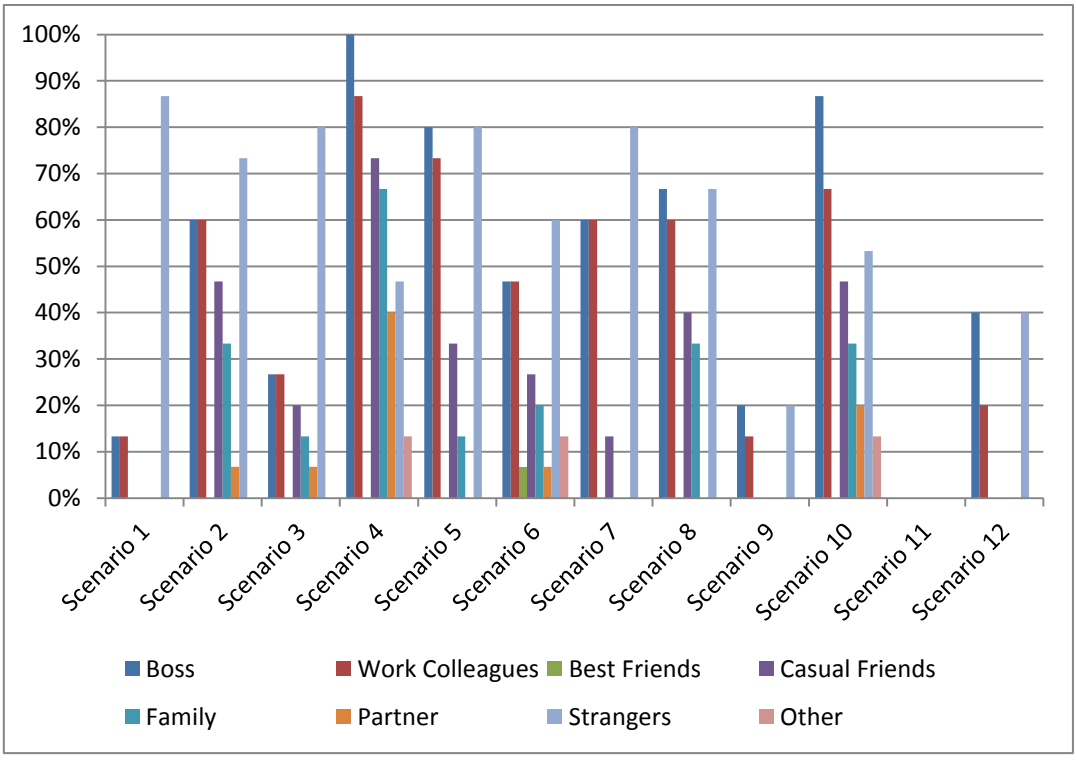

Chart 17 – "Hide" option selection distribution for each type of relationship by scenario

As we can see on our table and chart, there was a greater tendency to hide information by our participants from their Boss and Work Colleagues which lead us to accept H4.

Hypothesis 5 - *"Posting content using category-driven filters will reduce errors and completion times compared to when posting content using friend lists."*

Here we asked our participants to perform 5 tasks using the Facebook interface and our application while we registered the amount of errors made and the time taken.

Table 23 – Task 1: *Post something to all your adult friends (>=21)*

	Avg. number of errors	**Avg. time taken**
Facebook interface	6.3	408sec
Groupster	0.2	64sec

The majority of errors here in the Facebook interface were due to some people not knowing what to do to narrowcast, others errors came from incorrectly selecting users.

Table 24 – Task 2: *Post something to all your male friends*

	Avg. number of errors	**Avg. time taken**
Facebook interface	9.5	519sec
Groupster	0.1	35sec

Participants when asked to perform this task on Facebook interface went straight to it, but became increasingly frustrated as they set the friends to narrowcast too especially those with the larger amount of friends making many mistakes along the way.

Table 25 – Task 3: Post something hiding it from all your foreign friends

	Avg. number of errors	**Avg. time taken**
Facebook interface	7.7	243sec
Groupster	3.4	64sec

Some difficulty from the people using the application as some were confusing the Current Location category with the Home Country one forcing them from going from one to another. Most participants spent some time looking at their friend list before attempting the task with Facebook going back and forth to recheck.

Table 26 – Task 4: *Post something to all your friends living in your current location*

	Avg. number of errors	**Avg. time taken**
Facebook interface	5.6	202sec
Groupster	1.2	28sec

People using the application, seem to have learned from their mistakes in the previous task as they were faster and did less mistakes on this one.

Table 27 – Task 5: *Post something hiding it from your family and/or partner*

	Avg. number of errors	**Avg. time taken**
Facebook interface	1.8	41s
Groupster	0.1	27s

Both interfaces were quick and with a low number of mistakes. Most errors on the Facebook interface were due to forgetting a family member.

The results lead us to accept H5.

Hypothesis 6 – *"Users who narrowcast make fewer posts per day than users who do not narrowcast."*

For hypothesis 6 we gathered information from both the qualitative and the quantitative datasets in order to also check the difference between the perceived behaviour of the participants and their actual behaviour. For the qualitative data we checked the results for this question: "5. Did you post more or less frequently than before since you started using the application?". Out of the 54 people that answered the survey, 6 participants claimed they posted more often (11%), 16 participants claimed they posted less often (30%) and 32 participants answered that they posted about the same amount (59%). This can be seen on **Chart 5** in the survey questions results section.

Next we checked our quantitative dataset. In order to do this we checked the amount of posts done by the participants before they started using the application during the same timeframe (14 days) and compared it to the amount of posts made during the study while using the application. During their normal Facebook usage, the participants made a total of 488 posts in which there was no use of friends' lists to hide or show posts (avg. 9.04 posts per person). However during the study, our participants made a total of 595 posts (avg. 11.02 posts per person). Since this is a before-after type scenario, we need to perform a Paired-Samples T Test (Confidence Level = 95%, alpha = 0.05) in order to answer the question: "Did using the application have an effect in the amount of posts made by the participants".

Our null hypothesis is that using the application made no difference in the amount of posts made by our participants.
Our alternate hypothesis is that using the application made a difference in the amount of posts made by our participants.

Table 28 – Group statistics for amount of posts before and during the study

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Before study	9,04	54	2,754	,375
	During study	11,02	54	2,244	,305

Table 29 – Paired samples correlation

		N	Correlation	Sig.
Pair 1	Before study & During study	54	,497	**,000**

Here we can see that we have a 0.497 correlation between the amount of posts before and during the study which is statistically significant since $p<0.000$ which is less than our alpha (0.05)

Table 30 – Paired-Samples T Test for posts made before and during study

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Before study - During study	-1,981	2,544	,346	-2,676	-1,287	-5,724	53	**,000**

Here we can see that the mean difference between posts made before the study and during the study is 1.981. We can also see that t (53) = -5.724 with p<0.000 which is less than our alpha. This shows that the mean difference between posts made before the study and during the study is statistically different and we can reject our null hypothesis in favour of our alternate hypothesis. So the answer to our initial question, "Did using the application have an effect in the amount of posts made by the participants", is yes with users posting more often while using the narrowcasting application.

Our results lead us to reject H6

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6. DISCUSSION

Our first research question asked: "Do Facebook Friend lists provide appropriate narrowcasting capabilities?" A few years ago Facebook implemented a new rule development system in which its users could control who was able to read their posts where they had the option to select "everyone", "only friends", "friends of friends" as targets or if they wanted to be more precise they could also select specific friends or a list of friends previously done to show or hide any of their posts. However there are many problems to this method like the dependence on friend lists for which its definition is affected significantly by group co-presence present on social networking sites (Lampinen et al., 2009). On average, a Facebook user has 130 friends (Facebook Statistics, 2011) leading to a huge burden in terms of manually grouping them. In a study performed by Lipford et al. (2008) it was concluded that most users found the privacy settings confusing and difficult to use, explaining the failure to adjust them. An automatic, quick and useful way to sort the friends on users list would be needed to guarantee they would be interested in using a narrowcasting tool, so we can see where this system faults, it simply does not accommodate to the users' needs. These are some of the issues that have led to such low adoption rates as admitted by Mark Zuckerberg (Shiels, 2010) in which he stated that only 5% of the over 500 million Facebook users use this system. The lack of usability of lists is indicated as the main reason to this low number of users actually using it, hence we can safely say that in terms of our first research question, Facebook lists currently do not provide appropriate narrowcasting capabilities and still needs many changes for its use to be widespread throughout the Facebook community.

Our second research question asked: "Will users prefer a category-driven filter over the existing friend lists on Facebook?" The need for a narrowcasting tool that relied on categories was shown on studies performed by Jones, et al. (2004) and by Olson et al. (2005) in which they concluded that people want to be able to specify groups and basic categories centred on relationships that they could then assign specific privacy settings for each one while at the same time guaranteeing the least amount of work needed since managing groups can be a significant burden that worsens with the expansion of their network (more friends) and the popularity of the social networking website (Lederer et al., 2004). Also, although privacy is highly valued, it is not nor should it be the users' primary task and making it an explicit, tenuous task to the user could lead to problems such as the disregard of the solution by them (Ackerman & Mainwaring, 2005). Information gathered during our study through our qualitative dataset also showed that the vast majority of the participants preferred a category-driven filter over the existing friend lists with many of them claiming they would continue using the application and recommend it to their friends (**Table 6**), so our results showed that people have great interest in such a solution considering it to be a significant step forward when compared to the existing friends lists on Facebook.

Our third research question asked: "Does narrowcasting reduce the amount of information being shared through Facebook?" The importance of narrowcasting in a social networking site derives from the need to hide sensitive information you do not wish to disclose to certain people which, previous research have shown, is something that happens very often (Nosko et al., 2010; Acoca, 2008). During our study we realized that while using a narrowcasting tool people actually posted a higher amount of information, although to a much lesser audience overall while the majority of

participants perceived posting the same amount of content and very few actually claiming they had posted more frequently. The information we gathered shows us that narrowcasting has the potential to increase overall activity on Facebook which is of interest to the company while at the same time reducing unwanted spam and providing people with a much higher level of relevance on their content.

Hypothesis 1 predicted that users would share content more frequently when using an optimistic interaction pattern than when using a pessimistic pattern, which was verified. In our usage data we concluded there was a statistically significant difference between the amount of posts made by our optimistic and pessimistic subgroups in which we saw that the optimistic subgroup posted in greater quantity (**Table 7 & 8**). This conclusion contradicts findings from Boyd (2008) in which she claims that within a hyper-public, each person are not simply able to choose what they wish to expose, they have to choose what they wish to hide, meaning that people would actually be more confortable posting with a pessimistic interaction pattern hence posting more often which was not the case in our study. The optimistic approach is useful in cases where openness and availability are more important than complete protection (Hong & Landay, 2004). In the specific case of Facebook, a study done by Debatin et al. (2009) found that the benefits of online social networking outweigh risks of disclosing personal information.

Hypothesis 2 predicted that males using our category-driven filter would hide more posts from family and/or significant other than females, which was verified. With our qualitative dataset we concluded there was a statistically significant difference between the number of hidden posts in this category between both genders in which the perceived behaviour of the males (avg. 1.87 on the Likert scale) is that of hiding their posts more often than the females (avg. 3.42 on the Likert scale) when using the Relationships category (family and/or significant other) (**Tables 9 & 10**). This was then confirmed by our quantitative dataset where in the actual population, it is far more likely that the actual behaviour of the males (75.7%) is that of hiding their posts more often than the females (42.9%) when using the Relationships category in which we again proved there was a statistically significant difference between the values (**Tables 11 & 12**). The perceived behaviour and the actual behaviour from our participants were in concordance. This confirms previous studies that claim that males have a greater need to control their privacy (Petronio et al., 1984; Rosenfeld, 1979).

Men also report expecting greater negative ramifications when disclosing about life expectations (Petronio & Martin, 1986). Framed within the theory of privacy management, there has been plenty of research that has shown that men and women use different criteria for deciding to open or close their boundaries. Consequently, they tend to depend on different rules to reveal or conceal. The outcome of these rules is that women more than men tend to disclose overall (though there are situations where the reverse is also true) (Joinson, 2008; Stuntzman & Kramer-Duffield, 2010). Women, more than men, also tend to talk about intimate or personal topics with each other, with their families and with their partner (Dindia & Allen, 1992; Derlega & Chaikin, 1976; Chelune, 1976; Kleinke & Kahn, 1980), although this could be seen as personal one-to-one disclosure and not public disclosure like we are approaching in our work, we can conclude that this behavior transitions to public interactions.

Hypothesis 3 predicted that users not living in their native countries using our category-driven filter would use the “Home Country” and the “Relationships” (family) categories

more frequently than others, which was partially verified. In regard to the Home Country category, our qualitative dataset showed that perceived behaviour of the non-native participants (avg. 4.73 in the Likert scale) is that of the Home Country category being more useful than the native participants (avg. 3 in the Likert scale) (**Tables 13 & 14**) which was then confirmed by our quantitative dataset in which the participants living in their native country had 2,33% of their total posts done in the Home Country category while the participants not living in their native country had 36,03% of their total posts done in the Home Country category (**Tables 15 & 16**). This is explained by the greater need from people living abroad to contact people living back at their home countries, while people currently living in their home country would rely more upon the "Current Location" category.

In contrast, with the relationships our analysis of the qualitative dataset showed that people who live abroad do not perceive the Relationships category to be more or less useful than people living in their native country which was also confirmed by the quantitative dataset (**Tables 17 & 18**). This was then confirmed by our quantitative dataset in which the participants living in their native country had 32.28% of their total posts done in the Relationships category while the participants not living in their native country had 33.96% of their total posts done in the Relationships category (**Tables 19 & 20).** This is explained by the perennial usefulness of this category, regardless of if the user is currently living in their native country or not. People have a tendency to make decisions on how to share information based on the identity of the recipient rather than on the situation within which the information was sought (Lederer et al., 2002) in which those recipients are decided based on the type of relationship (Davis et al., 2005) providing substantial tie strength for all users. In both cases, the perceived behaviour and the actual behaviour from our participants were in concordance.

Hypothesis 4 predicted that users, when narrowcasting, hide posts from colleagues more often than other friends, and was verified. In terms of the qualitative dataset we saw that our participants had a high need to hide information they posted on Facebook from their work colleagues (avg. 2 on the Likert Scale) (**Table 21**), which was then confirmed with our third-person scenarios where we saw that three relationship types were almost always the top 3 chosen more frequently to hide each post (Boss, Work Colleagues and Strangers) (**Table 22 & Chart 17**) with the exception of Scenario 4 (I'm soooooo hangover) in which "Boss" and "Work Colleagues" are the top 2 but then we have "Casual Friends" and "Family" above "Strangers" which can be explained as the users being more preoccupied with their family members and acquaintances knowing about them being hangover than random strangers. Furthermore, in scenario 11 (Bin Laden is dead!!!) none of our participants chose to hide this post with this probably happening because it is a solely informational post with no personal information of any kind attached to it.

Previous research confirms that by norm people are usually more concerned about disclosing information to colleagues than other friends. With increased availability of places to seek information, as well as capabilities for archival on the Internet, employees need to be even more conscious of how their colleagues may learn more about them. Information and photographs posted on social networking sites, blogs, listservs, as well as personal information (i.e., address, email address, and birth date) are more accessible than ever before (Frampton, 2010). Companies utilize nearly any means possible to gain private information in determining an individual's ability to succeed in

the job (Cuesta, 2006). Organizations have increasingly attempt to seek private information on Facebook to assess an employee or potential employee's capabilities and degree of fit within the organization (Cuesta, 2006). Employers frequently employ social networking sites searches to make decisions about candidates (Cuesta, 2006; Larson, 2009). This extends also to colleagues; a study by Madden et al. (2007) showed that 19% of Internet users search for information about their professional colleagues with 33% of users specifically turning to social networking sites to search for information. This confirms our findings and shows that in most cases, users should be very concerned to whom and what they post on social networking websites or it can come back to haunt them and lead them to lose future job opportunities or in other cases future relationships.

Increased use of social networking sites has made managing personal and professional boundaries more complex, as the user composition on Facebook becomes increasingly diverse and an integral part of workplace communication (DiMicco & Millen, 2009). Social networking sites create a blurring of professional and personal lines (DiMicco & Millen, 2009; DiMicco et al., 2008; Jackson et al., 2007). One specific study discovered through the interviews with Microsoft employees that there are some tensions when using social networking sites to communicate with colleagues (Skeels & Grudin, 2009). Something that happens often is that voluntarily and actively shared information in one setting (i.e., personal life) has the potential to be involuntarily shared in another setting (i.e., workplace) (Madden et al., 2007). This shows the importance of the mechanisms present in our application or similar tools to help its users keep both these two aspects of their life separate.

In contrast, there are studies that claim that while some individuals strive to maintain a distinct difference between their personal and professional lives, others seek friendships and romance with coworkers. For those seeking relationships, the distinction between personal and professional life becomes even more blurred, making the management of privacy more complex. Workplace friendships are defined as informal and person-related interaction in a workplace setting that enhance job satisfaction and provide support and information sharing (Berman et al., 2002; Mao et al., 2009; Riordan & Griffeth, 1995). Though workplace relationships share many of the same characteristics as other friendships, they are distinctive (Sias et al., 2004). They also usually transcend unequal age, status, or gender (Berman et al., 2002). Though many workplace friendships are often based on proximity, common work interests, or projects, the friendships grow to include personal disclosure, mutual respect, need, and trust (Berman et al., 2002; Krouse & Affifi, 2007) resulting in some having in their colleagues very close friends they would not have any problem disclosing information to. However, we can safely say that the majority of our participants do not have this way of thinking and prefer to separate their personal life from their workplace in order to make sure to not do anything that could compromise their job. Narrowcasting tools on social networking websites should provide the possibility to separate content sharing to friends and work colleagues regardless of the existence of people that do not need this separation; they can just opt to not use these mechanisms.

Hypothesis 5 predicted that posting content using category-driven filters would reduce the amount of errors and completion times compared to when posting content using friend lists, which was verified. Although our tasks were not totally representative of tasks that users usually want to perform on Facebook, they had the goal to show the

problems with the current system in place. While the Facebook platform is more flexible than our application, it is tenuous, error prone when trying to perform some of the more classic and important tasks that rely on tie strength and relationships. Social media does not incorporate tie strength or its lessons. Instead, all users are the same: friend or stranger, with little or nothing in between (Gilbert & Karahalios, 2009). We predict that with the implementation of a few more categories keeping in mind the users relationships (ie. "Work Colleagues", "School Colleagues", etc) and the ability to swap people between subcategories, this type of application would grossly overcome the current Facebook interface in terms of usability leading to a much greater percentage of Facebook users adopting a narrowcasting ideology when posting in this platform. The Facebook interface could then be used for narrowcasting purposes which do not rely at all in tie strength.

Hypothesis 6 predicted that users who narrowcast make fewer posts per day than users who do not narrowcast, which was not verified. In terms of the qualitative dataset, out of the 54 people that answered the survey, 6 participants claimed they posted more often (11%), 16 participants claimed they posted less often (30%) and 32 participants answered that they posted about the same amount (59%) (**Chart 5**). The quantitative dataset had very interesting results in which we saw that while using a narrowcasting tool participants shared with less people overall but they actually posted more frequently (**Table 28**). In other words, neither the qualitative dataset nor the quantitative dataset supported our hypothesis while also contradicting each other showing us a paradox between perceived and actual behaviour as predicted also in previous studies (Reynolds, 2011; Norberg et al., 2007).

While analysing our data we were also able to derive some findings that were not covered on our initial research questions and hypotheses. Younger users of our application also disclosed more information than the older users which contradicts research done by Hoofnagle et al. (2010) which claims that young adult Americans have increased privacy concerns in comparison to older adults. Why young people are so willing to share personal information with often complete strangers they met online is an interesting phenomenon. A common misconception is that young people use social network sites to form new friendships or relationships, when in fact most use it to maintain connections that already exist (Ellison et al, 2006).

Overall young people are more willing to place personal information on their profiles and post on their wall as they believe or assume that most people who will view their page will be 'friends' (Lanhart & Madden, 2007) while also doing so in bigger amounts compared to older adults (Karahasanovic et al., 2009). Personal information on social network sites is also being volunteered because of changing cultural trends, increased familiarity and confidence in technology and lack of exposure or memory of misuse of personal data (Acquisti & Gross, 2006). Some evidence suggests the traditional distinction between public and private life becomes blurred for younger people using social networking sites like Facebook (West et al., 2009). Current young people have grown up with the internet where it has become normal to provide personal information to use certain online services while their rhetoric about online safety with regard to social media are mirrored narratives presented by the news media (Boyd, 2008b).

The underlying issue is that young people are simply not concerned with giving personal data to social networking sites or placing detailed information on their profile

pages. Because a change in teen culture is unlikely, the corporations behind social networking sites must act with more responsibility (Wallbridge, 2009). Furthermore, we saw a significant relationship between age and usefulness of the possible future category "Work Colleagues" which makes sense since young users reported low usefulness of this category since they probably do not have work colleagues while older users reported a great usefulness of this category. There was also a significant relationship between age and usefulness of the possible future category "School Colleagues" which also makes sense since usually older users are not that much interested in their school colleagues with most of them probably not even having them all or at all on Facebook.

6.1 Limitations of the study

Some limitations hindered to some degree this study during its elaboration. Firstly, although this study was conducted on the largest social networking website, Facebook, the conclusions extracted may not apply to the other social networking sites, especially Twitter which relies 100% on status updates. Furthermore, we have the fact that the great majority of the participants are college students or people with college degrees which could have introduced response bias; also this is not a correct representation of the current Facebook population which now comprises of many different demographics hence the potential problems that can influence the study. Another thing to take into account is that the application, instructions, lab study and online survey were all conducted in English while a majority of the participants have Portuguese as their native language. This can lead to comprehension problems with the participants not fully understanding what is required from them or not properly being able to contribute to the fullest. Finally, in order to encourage people to participate, gift certificates were raffled which could have influenced to some extent the participants' behaviour.

7. CONCLUSION

The contributions of this thesis are the development of a new method of grouping contacts on Facebook supported by a thorough analysis on peoples' reaction to it and also posting practices on this social networking site. The work here described presents a methodology that provides valuable data originating from many sources such as online survey, actual usage data, third-person scenarios and task performance in a lab study. The methods explained in this thesis can also be replicated and used to explore other aspects of Facebook or make an analysis on other social networking websites.

The purpose of this thesis was to implement and evaluate a narrowcasting tool that was easy to use and provided its users with appropriate friend list categorization in order to help them perform their tasks while also testing it on a diverse group of people so we could analyse their acceptance to it, the way they use it, the strong/weak spots of the implementation, differences in behaviour by the different demographics of people using it. By doing so, we also obtained a lot of data which enabled us to have some interesting findings in regard to peoples posting practices on Facebook. With the datasets gathered and analysis done this thesis added significant value to the field of study of social networking sites as a whole, providing ideas and solutions to solve the oversharing problem currently present on most social networking sites.

The findings described in this study will hopefully lead to a unified narrowcasting solution that people will use frequently unlike the current mechanisms. Facebook as the biggest social networking site has a responsibility in providing appropriate tools of narrowcasting to their millions of users. Most social networking sites haven seen a steadily drop in activity and numbers while Facebook is getting more and more popular (Boyd & Elisson, 2008). Facebook is now part of the mainstream culture appearing in numerous media outlets like TIME magazine, New York Times, and The Washington Post (Fletcher, 2010; Johnson, 2010; Stone, 2009; Zuckerberg, 2010), culminating with Mark Zuckerberg being name TIME's person of the year in 2010. One out of every dozen people on the planet has a Facebook account. They speak 75 languages and collectively lavish more than 700 billion minutes on Facebook every month. Last month the site accounted for 1 out of 4 American page views. Its membership is currently growing at a rate of about 700,000 people a day (Grossman, 2010). Facebook, whether people like it or not, has really changed each of us and made people more accustomed to openness. In an interview to TIME magazine, Mark Zuckerberg says he believes that "most people want to share more about themselves online" and specifically it isn't that they want privacy or secrecy, but that they just want to have control over what they share (Fletcher, 2010). This leads to its users to have a greater demand of privacy settings, wanting them more quickly (Johnson, 2010). However, Facebook has made itself indispensible to its members who keep coming back, no matter the potential privacy issues (Fletcher, 2010; Stone, 2009). Communication through social networking sites have become the norm with many people preferring it over other means of communication.

All of this makes the topic of this thesis even more important and shows that research on this area in essential considering the influence that Facebook has on our everyday lives. Below we have also outlined the possibilities of complementing the work reported here as future work. We hope to have provided some important and useful insights that

could lead to a safer and more enjoyable environment on social networking sites as that is something we should all strive for.

7.1 Future Work

Future work on this matter would rely on further extending this narrowcasting tool or building another category-driven filter following the notions and principles present in this thesis. As seen on the feedback provided during the online survey by the participants of our study, the most asked future features of the application are the ability to swap/add/delete friends from each of the subcategories which is especially useful since some people do not fully complete their profile information with the data needed to sort them in some categories, the addition of more categories especially ones regarding relationship types but not limited to that (Work Colleagues, School Colleagues, Interests, etc.), the ability to cross reference two or more categories so tasks like posting only to adult male friends would be a possibility, augmenting the granularity the Home Country and Current Location categories such that it people from the same country would also be divided into their cities allowing users to post to the whole country or a specific city. All these ideas provide a great start to the development of future work and extension of our application. Due to the aforementioned limitations present on this study, the conclusions drawn may not apply to the whole spectrum of online social network, so in order to provide further insights on the matter it is required to perform additional research for other social networking sites, especially Twitter because of its uniqueness of relying solely on status updates.

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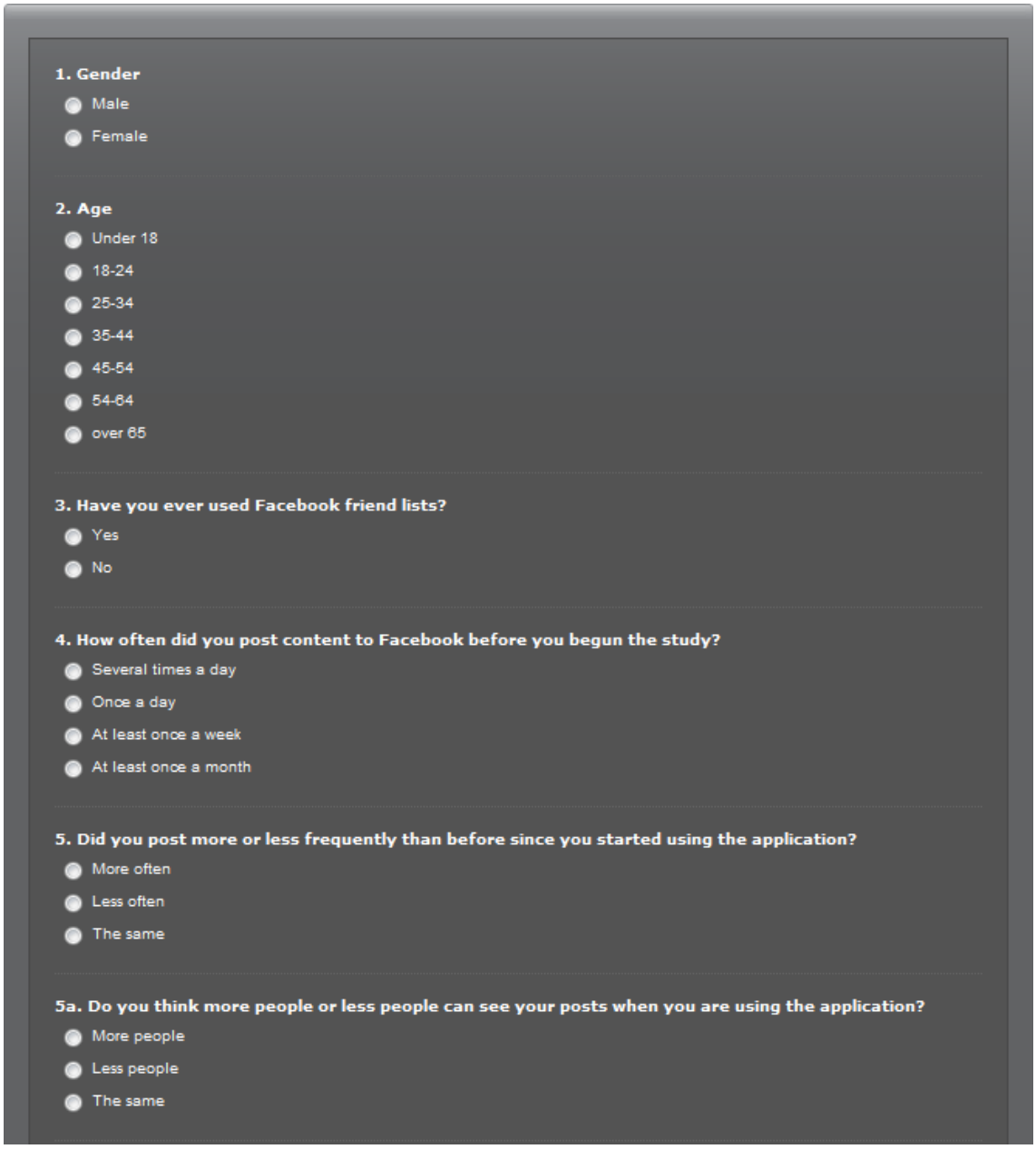
APPENDIX 1. Questionnaire



1. Gender

- Male
- Female

2. Age

- Under 18
- 18-24
- 25-34
- 35-44
- 45-54
- 54-64
- over 65

3. Have you ever used Facebook friend lists?

- Yes
- No

4. How often did you post content to Facebook before you begun the study?

- Several times a day
- Once a day
- At least once a week
- At least once a month

5. Did you post more or less frequently than before since you started using the application?

- More often
- Less often
- The same

5a. Do you think more people or less people can see your posts when you are using the application?

- More people
- Less people
- The same

6. Do you believe the application has changed your posting behaviour?

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

6a. Please justify your answer above.

7. Do you currently live in your native country?

- Yes
- No

8. Indicate how useful you found each category provided by the application on a 1 to 5 scale (1: least useful, 5: most useful).

	1	2	3	4	5
Age					
Relationships					
Home Country					
Current Location					
Gender					
Relationship Status					

8a. Please indicate how you preferred using each category -- to hide information or to show information -- on a 1 to 5 scale (1: only hide, 2: mostly hide, 3: neutral, 4: mostly show, 5: only show).

	1	2	3	4	5
Age					
Relationships					
Home Country					
Current Location					
Gender					
Relationship Status					

9. Indicate the level of usefulness of potential future categories, 1 being the lowest and 5 the highest.

	1	2	3	4	5
Work Colleagues	○	○	○	○	○
School Colleagues	○	○	○	○	○
Interests	○	○	○	○	○

9a. Please indicate how you would prefer using each of the following categories on a 1 to 5 scale (1: only hide, 2: mostly hide, 3: neutral, 4: mostly show, 5: only show).

	1	2	3	4	5
Work Colleagues	○	○	○	○	○
School Colleagues	○	○	○	○	○
Interests	○	○	○	○	○

10. Will you continue using the application?

- ○ Yes
- ○ No
- ○ I'm not sure

10a. Please explain your answer above

11. Did you or would you recommend this application to other people?

- ○ Yes
- ○ No

11a. Please explain why/why not.

12. What would you like see changed in future versions? (Optional)

APPENDIX 2. Lab study scenarios

Scenario 1: *Proud owner of a new iPhone!*

Show (85.8%)		**Hide (14.2%)**	
Boss	86.7%	Boss	86.7%
Work Colleagues	86.7%	Work Colleagues	86.7%
Best Friends	100%	Best Friends	100%
Casual Friends	100%	Casual Friends	100%
Family	100%	Family	100%
Partner	100%	Partner	100%
Strangers	13.3%	Strangers	13.3%
Other	0%	Other	0%

Scenario 2: *I could really use some good news about now*

Show (65%)		**Hide (35%)**	
Boss	40%	Boss	60%
Work Colleagues	40%	Work Colleagues	60%
Best Friends	100%	Best Friends	0%
Casual Friends	53.3%	Casual Friends	46.7%
Family	66.7%	Family	33.3%
Partner	93.3%	Partner	6.7%
Strangers	27.7%	Strangers	73.3%
Other	0%	Other	0%

Scenario 3: *Going to the mall*

Show (79.2%)		**Hide (20.8%)**	
Boss	83.3%	Boss	26.7%
Work Colleagues	83.3%	Work Colleagues	26.7%
Best Friends	100%	Best Friends	0%
Casual Friends	80%	Casual Friends	20%
Family	86.7%	Family	13.3%
Partner	83.3%	Partner	6.7%
Strangers	20%	Strangers	80%
Other	0%	Other	0%

Scenario 4: *I'm soooooo hangover*

Show (47.5%)		**Hide (52.5%)**	
Boss	0%	Boss	100%
Work Colleagues	13.3%	Work Colleagues	86.7%
Best Friends	100%	Best Friends	0%
Casual Friends	26.7%	Casual Friends	73.3%
Family	33.3%	Family	66.7%
Partner	60%	Partner	40%
Strangers	53.3%	Strangers	46.7%
Other	0%	Other	13.3%

1Scenario 5: *I desperately need a vacation*

Show (65%)		**Hide (35%)**	
Boss	20%	Boss	80%
Work Colleagues	26.7%	Work Colleagues	73.3%
Best Friends	100%	Best Friends	0%
Casual Friends	66.7%	Casual Friends	33.3%
Family	86.7%	Family	13.3%
Partner	100%	Partner	0%
Strangers	20%	Strangers	80%
Other	0%	Other	0%

Scenario 6: *Dear calculus, stop being so difficult so I can get some sleep.*

Show (62.5%)		**Hide (37.5%)**	
Boss	53.3%	Boss	46.7%
Work Colleagues	53.3%	Work Colleagues	46.7%
Best Friends	83.3%	Best Friends	6.7%
Casual Friends	73.3%	Casual Friends	26.7%
Family	80%	Family	20%
Partner	93.3%	Partner	6.7%
Strangers	40%	Strangers	60%
Other	0%	Other	13.3%

Scenario 7: *Sick in bed ☹*

Show (73.3%)		**Hide (26.7%)**	
Boss	40%	Boss	60%
Work Colleagues	40%	Work Colleagues	60%
Best Friends	100%	Best Friends	0%
Casual Friends	86.7%	Casual Friends	13.3%
Family	100%	Family	0%
Partner	100%	Partner	0%
Strangers	20%	Strangers	80%
Other	0%	Other	0%

Scenario 8: *I'm so in love!!!!*

Show (66.7%)		**Hide (33.3%)**	
Boss	33.3%	Boss	66.7%
Work Colleagues	40%	Work Colleagues	60%
Best Friends	100%	Best Friends	0%
Casual Friends	60%	Casual Friends	40%
Family	66.7%	Family	33.3%
Partner	100%	Partner	0%
Strangers	33.3%	Strangers	66.7%
Other	0%	Other	0%

Scenario 9: *Check out this awesome song*

Show (94.2%)		**Hide (5.8%)**	
Boss	80%	Boss	20%
Work Colleagues	86.7%	Work Colleagues	13.3%
Best Friends	100%	Best Friends	0%
Casual Friends	100%	Casual Friends	0%
Family	100%	Family	0%
Partner	100%	Partner	0%
Strangers	80%	Strangers	20%
Other	0%	Other	0%

Scenario 10: *To stay or not to stay in bed the whole day, that is the question*

Show (60.8%)		**Hide (39.2%)**	
Boss	13.3%	Boss	86.7%
Work Colleagues	33.3%	Work Colleagues	66.7%
Best Friends	100%	Best Friends	0%
Casual Friends	53.3%	Casual Friends	46.7%
Family	66.6%	Family	33.3%
Partner	80%	Partner	20%
Strangers	46.7%	Strangers	53.3%
Other	0%	Other	13.3%

Scenario 11: *Bin Laden is dead!!!*

Show (100%)		**Hide (0%)**	
Boss	100%	Boss	0%
Work Colleagues	100%	Work Colleagues	0%
Best Friends	100%	Best Friends	0%
Casual Friends	100%	Casual Friends	0%
Family	100%	Family	0%
Partner	100%	Partner	0%
Strangers	100%	Strangers	0%
Other	0%	Other	0%

Scenario 12: *Hey all, come see our band tonight in the Uni. Campus@8pm*

Show (87.5%)		**Hide (12.5%)**	
Boss	60%	Boss	40%
Work Colleagues	80%	Work Colleagues	20%
Best Friends	100%	Best Friends	0%
Casual Friends	100%	Casual Friends	0%
Family	100%	Family	0%
Partner	100%	Partner	0%
Strangers	60%	Strangers	40%
Other	0%	Other	0%