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# Interdependent Privacy on Facebook

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## Summary



## **Acknowledgement**



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# Chapter 1

## Introduction

### 1.1 Motivation

### 1.2 Problem Description

### 1.3 Methodology

Our assignment is divided into parts, where one consists of collecting data from Facebook users regarding their view on Facebook privacy settings, and the other is a theoretical research of how Facebook privacy settings has evolved since the introduction of Facebook. This means that we have used different approaches to be able to retrieve the information desired.

**Approach** In this section we will describe our approach of collecting data from Facebook users regarding their view on Facebook privacy settings. Facebook is a global social network, so to be able to get more accurate information it is important to reach out to a wide and diverse audience. We decided to use Amazon Mechanical Turk for this purpose. To gather the data, we made a survey for the users to answer. Survey is a common used research method that involves the use of standardized questionnaires or interviews to collect data about people and their preferences, thoughts and behaviours in a systematic manner [6]. Survey, as a research method, has several advantages in comparison to other methods of doing research. Survey is a good method of retrieving unobservable data, like for example peoples attitudes, behaviours, characteristics, preferences, and demographics. Surveys are great when you want to cover a large group of people, like a country, that otherwise would be difficult to observe. With large groups and large amounts of data, surveys allows small effects to be detected, and makes it easy to compare the subgroups that may appear. Survey are in an economically sense cost effective. It is a lot cheaper for a researcher to make and send out a survey than to use other methods like experimental research. Survey as a research method also has some disadvantages. The method is often exposed to biases, like sampling bias, non-response bias, and social desirability bias. Surveys have a reputation for low responses, hence the non-response bias. This was one of the reasons for choosing AMT as a platform for publishing your survey.

We started by creating the survey in Amazon Mechanical Turk (AMT), but learned that the templates provided by AMT was missing some of the features we wished to include, like having several pages with questions. So mainly for design purposes we chose to create our survey in SurveyMonkey. This is easily integrated with AMT and a often used option. Using SurveyMonkey also made it a lot easier to keep track of answers and see summaries. SurveyMonkey has a great and easily understandable user interface, and made it easy to share the survey to other mediums like Facebook, to reach out to a even more diverse and larger audience.

In AMT we set the requirements that the users had to be master-users. This is users that through a good reputation has earned the title And by setting this requirement we rule out unserious users and answers. This will save us a lot of time in the screening process. When a user chooses to take our survey, they first get some information about the purpose and incentive of the survey, and a link to SurveyMonkey to take the survey. When the survey is finished the user receives a code that they have to provide before submitting their HIT in AMT. This is an assurance for us that all users on AMT has finished the survey before they get paid. Throughout the lifetime of our survey we have changed this code, just to make sure that nobody tries to get paid without actually doing the work. When the survey is completed in a serious manner the workers get paid \$1,5. On average, the users spent 13 minutes and 37 seconds to take the survey, this gives an effective hourly rate of \$6,61.

# Chapter 2

## Related Work

### 2.1 Social Network Services

A social network service (SNS), is a platform used to establish social networks of different people. These people often share a common interest or activity [7]. Online social networks (OSNs) is a large part of the social network services. From online social networks was first introduced until today, the popularity and complexity has grown drastically, with a hundreds of millions active users [8]. OSNs have a peer-to-peer architecture, and therefore makes it easy for members to initiate communication with whom they want, given that they are also connected to the network. OSNs also enables the possibility for people to easily publish and retrieve information about subjects of interest [9]. The internet has caused the creation of several information sharing systems [10]. Among these systems are the Web and OSNs. As mentioned before, the popularity of OSNs has grown drastically, and have become among the most popular sites on the Web. With this change, there has also been a change in what is centralized and in focus. The Web is to a large extent organized around content, while OSNs on the other hand are organized around users. This change has lead to the importance of understanding user behaviour. You can say that the expansion of OSNs has lead to a shift in how context is exchanged over the Web. End users are no longer just content consumers, but now also required to be content creators and managers [11].

A user is often represented with a profile on OSNs. To obtain a profile the user, in most cases, must register the site. When a user is given a profile, it is normal for the user to provide information about themselves. This information could for example be date of birth, home town, sex, name (or pseudonym) and maybe a profile picture. The social network is formed when users start connecting with each other. The reason for these connections are numerous; real-life friends, real-life acquaintances, colleagues, share an interest/activity or if you are interested in the information contributed by the other user.

Since Facebook was introduced to the public in 2006, it has grown to be the largest online social network (OSN) in the world. The growth of Facebook has made it necessary to

introduce new ways to manage privacy and ensure a secure online environment. The privacy embedded in the program/app etc. is not enough to ensure such an environment, due to the interdependent privacy issues. Your privacy is to a large extent affected by the privacy decision of others.

## 2.2 The History of Facebook

When Mark Zuckerberg enrolled at Harvard in 2002, he had decided to major in psychology. “I just think people are the most interesting thing—other people,” he said. “What it comes down to, for me, is that people want to do what will make them happy, but in order to understand that, they really have to understand their world and what is going on around them” [12]. He showed an interest and passion to connect people together and create Harvard more open.



**Figure 2.1: The Facebook icon** as we know it today.

It all started in October 2003 when the Harvard sophomore Mark Zuckerberg and three of his classmates created the web page Facemash. Zuckerberg hacked into the administrative database to extract the ID photos of all the students of the different houses. The web page presented two and two photos creating a “hot or not” game for his fellow students. The votes were counted and created a top-ten list of the cutest people in each house. Within the first hour Facemash had 450 visitors and 22 000 votes. After numerous complaints from professors and fellow students, Harvard administration shut down Zuckerberg’s Internet connection after a few days. Harvard charged Zuckerberg for violating individual privacy, violating privacy and breach of security for stealing the photos. Zuckerberg agreed to take the web page down and got away with just a warning.

After Facemash, Zuckerberg was known around campus as a programming prodigy. Harvard seniors, Tyler and Cameron Winklevoss and Divya Narendra had since 2002 been working on a social networking page, called HarvardConnection. This was a page where students could create a profile, and through that share some personal information and post pictures and share this with large and small communities that one could be part off. They wanted Zuckerberg’s help to finalize their project so that the page could be up and running before they graduated. Zuckerberg agreed to help at the same time as pursuing his own projects. Harvard offers a class directory to all freshmen, this directory is also known as

the "Facebook". This "Facebook" contains a picture of all the students, name, date of birth, home town and high school. The purpose of the "Facebook" was that the freshmen could get to know each other. Harvard's plan was to eventually get this online. Since Harvard had not gotten to it yet, Zuckerberg decided to do the job himself. He wanted to create a page where people signed up and created their own profiles, and in that way could post some personal information about themselves, and have control over what was posted. After ten days of intensive work, Zuckerberg almost finished the site. The site was kept simple and intuitive, and everybody with a Harvard e-mail address could create a profile. The profile consisted of a profile picture, name and some personal information such as taste in books, music, films and favourite quotes. Users could link to their friend's profiles and by using a "poke" button let others know that you have visited their profile. Thefacebook went public February 4, 2004, and to get the word spread they sent it out on the Kirkland house mailing list, that contained over 300 students. It did not take long until the other houses heard and within twenty-four hours, close to fifteen hundred people had registered. "I think it's kind of silly that it would take the university a couple of years to get around to it," he said. "I can do it better than they can, and I can do it in a week." [12]. Later the same year the three founders of HarvardConnection, now called ConnectU, filed a lawsuit against Zuckerberg. Stating that he broke their oral contract, stole their idea, and delayed working on their site to be able to finish his own site, Thefacebook, first. Zuckerberg denied doing anything wrong, and stated that he had proof that he did not steal the idea from the HarvardConnection. Just a few months later Facebook filed a countersuit. Facebook accused ConnectU with defamation. The case went on for years. In 2011 the Winklevoss brothers dropped the lawsuit and accepted a 65 million settlement [13].

There was already similar pages out there, like Friendster and myspace.com. Especially on myspace.com people played roles, giving themselves out to be someone else. Teenage girls pretending to be older and grown men giving themselves out to be young girls. There is nowhere to validate that the person really is who they give themselves out to be. This limits to what extent people post personal information. With Thefacebook.com you had to sign up with a valid Harvard e-mail address, in that way you know that they are actual people, and mostly students. This made it easier to post more personal information like cell-phone number, home address and even sexual orientation. The concern was not about security, but more about wasting time, it became an addictive pleasure.

It didn't take long before Mark Zuckerberg began to receive e-mails from other colleges, requesting to get Thefacebook at their schools. The site was easily scalable, the concern rather laid in how to maintain the intimacy and the clubby appeal. When Thefacebook expanded to the colleges Colombia, Yale and Stanford, students were only able to search and see people from their respective college. Only with permission from a student from another college could you add the person to your friend list. This is a key factor to Facebook's

success. Zuckerberg wanted people to post personal information and create a more open school community.

In June 2004, when the school year was over, Thefacebook had expanded to over forty schools, with 150 000 users. With the rapid expansion, the need for investors and more capacity increased. Zuckerberg moved his base to California and removed the "the" from the name. Thefacebook became just Facebook.

October 2005 Facebook expanded to universities in England, Mexico and Puerto Rico, and in September 2005 a high school version was available [14]. This was a big step for Facebook. All high school members needed an invitation to be able to join. Zuckerberg launched the possibility for all users to see the profiles and send friend request to everyone in the network, the older users had strong objections. College students did not like the idea of high school kids looking at their profiles and being able to befriend them. But with the rapid expansion Facebook was forced to make the site more open and knock down some of the walls dividing the users. Facebook made it possible for employees at different companies like Apple and Microsoft to join the network. At the end of 2005 Facebook was used at over 2000 colleges and at over 25 000 high schools in United states, Canada, Mexico, England, Australia, New Zealand and Ireland.

Up to this point you had to be a student at a college of high school, or employee at a certain company to be able to join the network. After September 2006 everyone over the age of thirteen, with a valid e-mail address, could join. The site was no longer restricted to schools and was now open to the whole world.

By 2009 Facebook had 200 million active users, and was finally getting more users than Myspace, becoming the world's biggest social network [15]. With the release of iPhone in 2007, and the launch of Facebook's mobile application in 2008 a new way of sharing became reality. The mobile application enabled Facebook users to send pictures, status updates and comments in real-time. Facebook introduced the "like" button in 2010, together with the growing application and gaming platform.

The movie "The Social Network" directed by David Fincher and Aaron Sorkin came out in October 2010. It is an american drama movie based on the early days of Facebook's history. The popular movie has received many awards, among them 3 oscars [16].

The Facebook timeline was introduced in December 2011 [17]. The new interface makes the entire history of the users visible, all photos, links, pages you have liked, comments and other things that you have shared on Facebook.

In April 2012 Facebook announces that they are buying the photo sharing application Instagram for \$1 billion . This was the biggest acquisition that Facebook has done [18].

Instagram just finished a great year with the launching of the android application and a huge growth, with more than 30 million users, and more than five million pictures being uploaded every day [19]. Just a month later Facebook goes public, another big step for Facebook. Each stock were sold for \$38 dollars, giving the company a market value of \$104,2 billion dollars, becoming the highest valued company in history. Facebook's market value was almost 4 times higher than Google in 2004 [17].

- Graph search
- Hashtags

## 2.3 Facebook Privacy

There exists numerous articles and papers written on the development of Facebook privacy, and many researchers have tried to map the human behaviour in regard to Facebook through for example the use of surveys. One of these articles is "Facebook privacy settings; Who cares?" by danah boyd and Eszter Hargittai [20]. The paper addresses a survey conducted on a cohort of 18- and 19-year-olds in 2009 and in 2010. The survey focused on their attitude and practice when it came to Facebook privacy settings. During this period, between 2009 and 2010, Facebook made many changes to their privacy settings. This was a turbulent period in Facebook history, with a lot of attention in media.

The demographics collected in the survey described in the paper by boyd and Hargittai was sex, age, race and ethnicity and parents' highest level of education. The ladder was used as a "measure" for socio-economic status. The demographics showed a diversity in the people taking the survey. The other data collected consisted of information within these topics: "Internet experience", "Use of Facebook", "Engagement in certain activities on social network sites among Facebook users" and "Experience with Facebook's privacy settings". Based on their discussion and conclusion, we have highlighted some of their findings:

1. Majority of young adults using Facebook have to some degree checked their privacy settings. Number of people who had checked increased from 2009 to 2010. One reason for this may have been the media attention Facebook received as mentioned above.
2. How familiar someone is with technology plays a role in how they handle their Facebook privacy settings. The reason for this assumption is withdrawn from the relationship between changing privacy settings and the frequency of Facebook use, as well as Internet skill. Considering the default settings, this is especially important since the least skilled people get more vulnerable when Facebook changes the default privacy settings.
3. Among the majority both genders are equally confident in changing their Facebook privacy settings.

danah boyd and Eszther Hargittai concludes, based on their findings, that experience and Internet skill is important to take into account in regard to how people handle their privacy settings on Facebook. It is incorrect to think that the Facebook users have the same approach to the site. This kind of thinking leaves a part of the users more exposed. It is therefore very important that the people who configure the default privacy settings take these users into consideration. They should be aware of the fact that every user is different and have a different basis of understanding.

Another relevant article on the topic of Facebook privacy settings is "Analyzing Facebook Privacy Settings: User Expectations vs. Reality" [11]. It addresses to what degree the Facebook privacy settings match the expectations of the users. To find information about the users view on the topic, they conducted a survey via Facebook with people recruited from Amazon Mechanical Turk (More information on Amazon Mechanical Turk can be found in section 2.5). They got 200 users who completed the survey. The average values for the users were: 248 friends, 363 uploaded photos, 185 status updates, 66 links, 3 notes, 2 vidoes. Their analysis is centred around two questions, and one of these questions are interesting for us to look at: *"What are the ideal privacy settings desired by users? How close are these to the actual settings that users have?"*

They had some very interesting results on their survey, and these are the ones we wanted to highlight:

1. Facebook privacy settings match the users expectations 37% of the time, and then the settings are not as expected they are almost always more open, and exposes the content to a wider audience than desired.
2. Modified privacy settings match the users expectations only 39% of the time. This implies that even though you are aware of you privacy settings, you can still have problems configuring them correctly and as desired.
3. Nearly half of the content shared by the users are shared with all Facebook users. This was desired 20% of the time.
4. When the privacy settings on photos have been changed by the user, the privacy settings on these photos match the users expectations less than 40% of the time.

As mentioned before there exists much material on the topic of Facebook privacy. We chose to shed light on these two articles, because of the similarities in topic to our paper. Later in our paper we will see if we can draw comparisons between the results in these two articles and our own survey result.



## 2.4 Interdependent Privacy

In today's society Internet is no longer a privilege, it is a human right. With the evolvement of the online social networks (OSN) the incentive to share personal information has grown drastically. People create profiles at different OSNs and share personal information, pictures and comments with each other. With the enormous data sharing privacy concerns arise. The privacy of an individual users is bound to be affected by the decisions of others, and therefore out of the individuals control. This phenomenon lays the basis for the term *interdependent privacy* [21].

**Privacy** Roger Clarke defines privacy as *the interest that individuals have in sustaining a 'personal space', free from interference by other people and organisations* [22]. Further Clarke divides privacy into multiple levels; bodily, personal behaviour, information privacy. Bodily privacy is concerned with the integrity of an individual's body, such as blood transfusion without consent, compulsory immunisation and compulsory sterilisation. Personal behaviour privacy relates to all aspects of behaviour, like sexual preferences, and political and religious actions. Information privacy is a collective term including personal communication and privacy of personal data. These include the ability to communicate, using the desired media without being monitored by others, and claim that data about themselves not automatically should be available to others, even when there is data that should be processed by others.

In this article our focus will be on online privacy, the level of privacy and security of personal data published on the internet. For a user the privacy and anonymity is the most important factor in consideration when using online services. It is a hot topic and now more important than ever, especially when the consequences are unforeseen, and the extent of them are often hard to predict. Biczók and China defines online privacy risks with the basis in Clark's privacy definition as described in the list below [21];

- Personal: Potential loss of information about a user and his/hers behavioural data. This can be done by phishing, hacking to steal secure and sensitive user data, like passwords and pin codes.
- Relational: Revelation of how a user relate to and communicate with others. Spyware is an offline application that can obtain a users data without the consent of the user.
- Spatial: Invasion of the virtual space of an online user. An example of this can be unwanted comments and posts on a user's blog or social networking page.

**Social networking privacy** [epic.org/privacy/socialnet](http://epic.org/privacy/socialnet)

**Interdependent privacy** In today's interconnected world, we share enormous amounts of data every single day. Protecting personal, relational and spatial privacy of individuals is no longer just dependant of only your individual actions, but increasingly depending on the actions of others [21]. With the continuous growing use of social networks, data sharing has become very easy. We share photos, comments, videos, and links. This increasing data sharing arises the concerns for interdependent privacy.

An example can be if Alice posts and tags a picture of her Facebook friend Bob. Alice finds the picture of Bob funny and sees no problem in posting it. Bob on the other hand, does not share Alice's opinion, he finds the picture embarrassing and inappropriate. Bob wants the picture removed, but by the time Alice comes around to remove it, people have already seen it, and maybe reposted it. Bob's privacy was dependent on what Alice did, and out of his own control.

Sharing information without consent from the users can lead to the emergence of externalities. In economics externalities is defined as the unintended costs or benefits that are imposed on unsuspecting people and that results from economic activity initiated by others [23]. When the effect is beneficial it is considered a positive externality. A negative externality is when the side-effect is negative. Let us relate this to our example with Alice and Bob. When Alice shares the photo without Bob's consent, it might be at benefit for Alice (in personolized experience), but for Bob it will be received as a negative externality, a loss of his online privacy. Another example of interdependent privacy is the Facebook platform for third-party applications (apps). How your privacy depend not only on your actions, but also on the actions of your friends. We will discuss this in more detail below.

(Her skal vi skrive kort om Facebook sin app-plattform)

The article "Third-Party Apps on Facebook: Privacy and the Illusion of Control" was written in the end of 2011 and looks at the privacy threats with the use of third-party apps on Facebook [24]. In this paper the authors look at what information the third-party applications request when you install them, and how easy it is for an application to retrieve more information from a user than what the user initially want to. There has not been done any other studies on this topic before the time this article was written. Their aim is to increase user control of the apps' data control and alert the users when the apps' violate your initial privacy setting. When a user wants to add an application, the application is required to ask for permission to access certain information, like your "basic information", which includes name, profile picture, gender, networks, list of friends and other information that a user has publicly available to everyone. Other permissions that apps frequently ask for is "post to my wall", "send me email" and "access my profile information". You can later go to your settings and change what information you share with the apps. But by this time you may already have shared information that you initially wanted to keep private. As an example say that a user, we call her Alice, would like to keep her birthday private and have stated this in her privacy

settings. Alice then install an app called "Happy Calendar", that let her keep track of friends' birthdays. When installing the app, they asked for permission to access hers and her friends' birthdays in addition to her basic information. Alice allows the app premission, to later find out that "Happy Calendar" has created an album with a calendar image showing the profile pictures to all her friends including herself. This album was posted on her wall and Alice's friends receives notifications about the album. The birthday that Alice initially wanted to keep private is no longer private. The article states that there should be more evident to the user when the app ask for information that is in conflict with the user's privacy settings. In the article two new designs of the approval page are presented and tested. From the tests it was clear that users was not always aware of what they share, and that a more extensive and informative permission-page would be necessary. It is important that the users understand what they are sharing and that apps often ask for information that you do not want others to see.

## 2.5 Amazon Mechanical Turk

The growth of the Internet have made it easier to conduct studies, surveys and so on. One commonly used technique for conducting these studies and surveys are called *crowdsourcing*. Crowdsourcing is a technique where you outsource a job to a undefined group of people. The beneficial aspects with crowdsourcing is that you are provided access to a large set of people who are willing to do the tasks you want done, for low pay [25].

Amazon Mechanical Turk is a good example of a crowdsourcing site. Amazon Mechanical Turk is a Internet marketplace where human intelligence is utilized to perform various tasks [26]. The people using Mechanical Turk are separated into two groups. You have the *requesters* that post jobs/tasks, and the *workers* who can choose from these jobs/tasks, and execute them for pay [25]. The jobs are posted as HITs (Human Intelligence Tasks). HITs are individual tasks that workers can complete to make money.

**The Turk** The name "Mechanical Turk" comes from a chess-playing automaton from the late 18th century. The Turk, as it was called, was a construction made to seem like a automatic chess-playing machine. In reality there was a chess-pro inside the machine, that steered the arms of the doll that was on the other side of the chess-board. The Turk was constructed in 1770 by the Austro-Hungarian Wolfgang von Kempelen. The reason for this construction was that von Kempelen wanted to impress the Empress Maria Theresia of Austria. The Turk toured around Europe and in America for decades, without anyone knowing the secret of the machine. The chess-pro that operated the construction played and defeated many, including Benjamin Franklin and Napoleon Bonaparte. Although many suspected that the Turk was steered by a hidden human, the trick was not exposed before 1820. The Turk was ruined in a fire in 1854 [27].



of pay a worker is willing to accept for a task on MTurk is \$1.38 per hour, and they refer to this amount as the *reservation wage*.

The article "Analyzing the Amazon Mechanical Turk Marketplace" [30] written by Panagiotis G. Ipeirotis in December 2010 shows that the effective hourly wage on MTurk is \$4.80. This is calculated based on some observations, and also on some assumptions. What they observed was that the median arrival rate was \$1.040 per day, and that the median completion rate was \$1.155 per day. They then assumed that MTurk acts like an M/M/1 queuing system. Based on these observations and assumptions they used basic queuing theory and calculated that a task worth \$1 is completed with an average of 12.5 minutes. Like mentioned earlier, this results in an effective hourly wage of \$4.80.

Winter and Mason [28] conclude that if you increase the pay, the quantity of participants increases, but the quality of the work done does not increase. They think the reason for this is the *anchoring effect*. The anchoring effect describes that it is common for humans to depend too much on the first information given to them when making decisions [31]. In the case Winter and Mason presents: the workers who get more pay, also assume that the work they are about to conduct is more extensive, and therefore do not get more motivated to perform the work.

## 2.6 SurveyMonkey

SurveyMonkey is the world's leading provider of web-based survey solutions [32]. SurveyMonkey was founded in 1999 by Ryan Finley, and had 15 million users in 2013 [33]. Using SurveyMonkey as a tool you are allowed to create your own survey based on templates. To get started with SurveyMonkey and to create surveys you have to register the site, and choose account type after need. The different account types have different prices. The more expensive, the more is included. There are several features available when using SurveyMonkey [34]. It is easy to create questions, with 15 question types available. You can also add logic to the questions. It is easy to customize the appearance of the survey, with the colors you prefer and so on. Getting responses on the survey is done by sharing an URL, for example on Facebook or in e-mails. When you have gotten answers on your survey, you get the data presented in graphs and charts. You can also export the results in various ways, for example all response data or just individual responses.

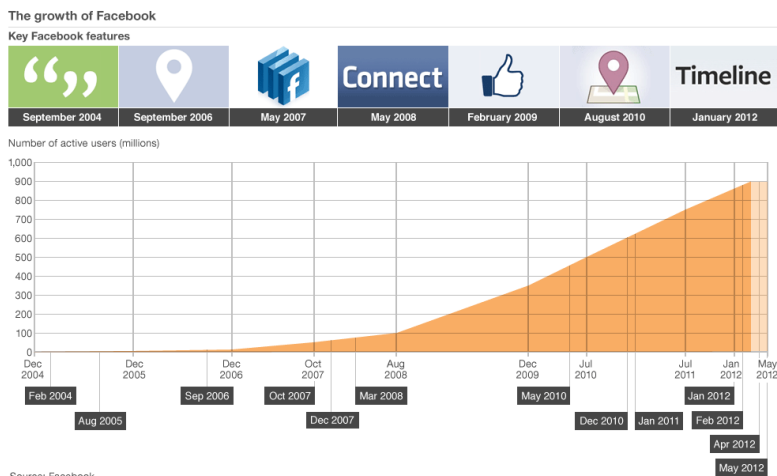


# Chapter 3

## Facebook Privacy

In this chapter we are going to look into what kind of privacy settings that exist on Facebook. We will also look at and map how the default privacy settings have evolved over time. In addition to this we will look at some of the features introduced by Facebook over the years, and how these features have effected the privacy on Facebook. Finally we will review some of Mark Zuckerberg's thoughts and comments in regard to Facebook privacy.

### 3.1 Privacy on Facebook



**Figure 3.1: The development of Facebook users and introduction of new features.** The orange field in the graph shows the increasing number of Facebook users over the years. Key Facebook features are shown over the graph according to when they were introduced [19].

There is no doubt that Facebook has had a remarkable development, both when it comes to number of active users and the development of new features, as shown in Figure 3.1.

Along with new users and new features, there has also been made major changes to what kind of privacy settings exists and what kind are needed.

### **3.1.1 Facebook Settings**

Whenever Facebook make an update to the settings, the users usually get a personal message informing them about the change. Because of the high number of users, this change happens gradually. This means that not everyone will get a notification about the changes made at once [35]. Despite the changes over time, the main control of ones privacy lies in the hands of the users. The users have the opportunity to make their profile more secure, than what is set to default.

#### **The settings that exists**

There exists numerous settings one can edit to make the profile more or less secure. The main problem here is probably that many people are not aware of these settings, or are not confident enough in changing them. Regardless of this the settings exists, and it is up to each one of the users how they could be configured. On the Facebook settings page you have different tabs regarding different kind of settings. These settings available are elaborated in Table 3.1.



**Table 3.1:** The settings that exist on Facebook [1].

Setting tab	Description
General	Under this tab you can edit your name, username, email, <i>password</i> , which network you are in and language.
Security	Under this tab you can do changes that makes it harder for someone else to hack into your Facebook account. Here you can enable/disable <b>Secure Browsing</b> (the use of https when possible). It is possible to turn on <b>Login Notification</b> . This means you will get notified either by email or text message (after you choice) when your account is accessed from a computer or mobile device that you haven't used before. You can also enable something called <b>Login Approvals</b> , where a security code is required to access your account from a unknown browser. This code can be given to you in a text message sent to your mobile. You also have the chose to use <b>Code Generator</b> on your Facebook mobile app to reset your password or generate login approvals security codes. Under the security tab you can also create <b>App Passwords</b> , add <b>Trusted Contacts</b> , view <b>Recognized Devices</b> and <b>Active Sessions</b> . Under active sessions you can see all sessions active via your accout. Here you can look for unfamiliar devices or locations, and if you find a session that is not you, someone else have been logged into your account. This session can easily be ended.
Privacy	Under this tab you can change the audience for your future posts. You can also chose who can send you friend requests, who can look you up using the email address you provided and who can look you up using the phone number you provided. The last setting concerns whether or not you want other search engines to link to your timeline. This can either be turned On or Off.
Timeline and Tagging	Under this tab you can chose who can post on your timeline, who can see posts you've been tagged in on your timeline and who can see what others post on your timeline. You can also choose whether or not you want to review tags people add to your own posts before the tags appear on Facebook, and you can choose the audience for a post you're tagged in if they aren't already in it.

Blocking	Under this tab you can block users, app invites from specific users, event invites and specific apps. Under this tab you can also make a <b>Restricted List</b> . Your friends on this list will only be able to see the information and posts that are public.
Notifications	Under this tab you can control how you get notifications, and what you get notified about.
Mobile	Under this tab you can add your phone number(s), and activate registered phone(s) for text messaging.
Followers	Under this tab you can turn on follow, this makes it possible for other people to follow you. Followers will only see your public posts and will not be added as friends.
Apps	Here you can choose whether or not you want to use apps, games and websites on Facebook and elsewhere. You also get a list of the apps you use, and you can edit the audience for things posted via these apps. The people on Facebook who can see your information can bring this information with them when they use apps. This is to improve the user experience. Under <b>Apps other use</b> you can control the categories of information that people can bring with them when they use apps, games and websites. You can also turn on something called <b>Instant personalization</b> , which let you see relevant information about your friends the moments you arrive on select partner websites. Finally, under this tab you can choose the audience for the things posted using old Facebook mobile apps that do not have the in-line audience selector.

### 3.2 Default Settings on Facebook

Facebook has evolved from being a networking site for students attending Harvard to becoming a global phenomenon. Facebook's user interface has gone through several changes over the years, which has brought both joy and frustration to the users. When these changes have been made, there has also been adjustments to the default privacy settings as well [36]. At the beginning, in 2005, when Facebook first was applied outside of Harvard University, the users personal information was only accessible to a users Facebook friends and to people connected to the same network on Facebook [2]. This is far from reality today. We will now look into how the default privacy settings on Facebook has developed over since it was first introduced.

### 3.2.1 Development of Default Settings

The main changes to the default privacy settings are emphasized in

**Table 3.2:** Changes in the default privacy settings on Facebook from 2005 until today. [2, 3]

Year	Default Privacy Settings
2005	Personal information (e.g., name and profile picture) is only visible to specific groups specified in your privacy settings.
2006	The only information displayed in your profile is your school and specified local area.
2007	Name, name of school (network) and profile picture (thumbnail) is available to all Facebook users.
November 2009	Name, profile picture and demographics is available and searchable to the entire Internet. In addition to this, list of friends are visible to all Facebook users.
December 2009	Your name, profile picture, list of friends, pages you are fan of, demographics and likes are available for the entire Internet.
April 2010	The entire Internet can see everything, except wall posts that are limited to friends and photos that are limited to your network.
2011	
2012	
November 2013	The entire Internet can see everything, except posts you've been tagged in on your timeline and others posts on your timeline, which are limited to friends of friends.

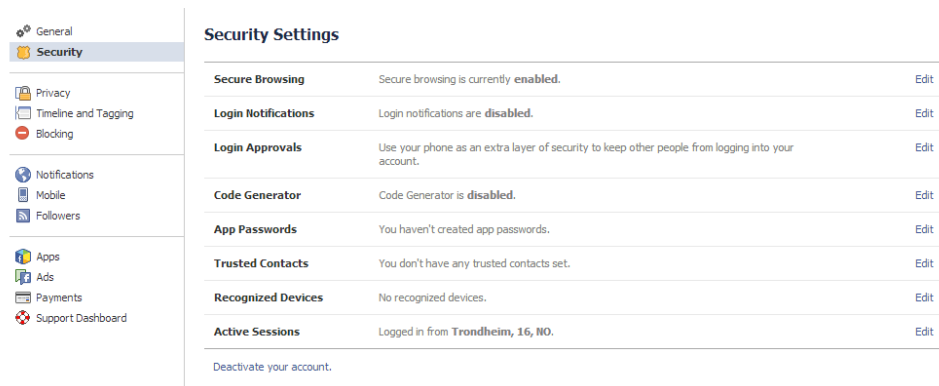
Table 3.2.

Secure browsing became default in July 2013. Since 2011 users have been able to turn on secure browsing. [37]

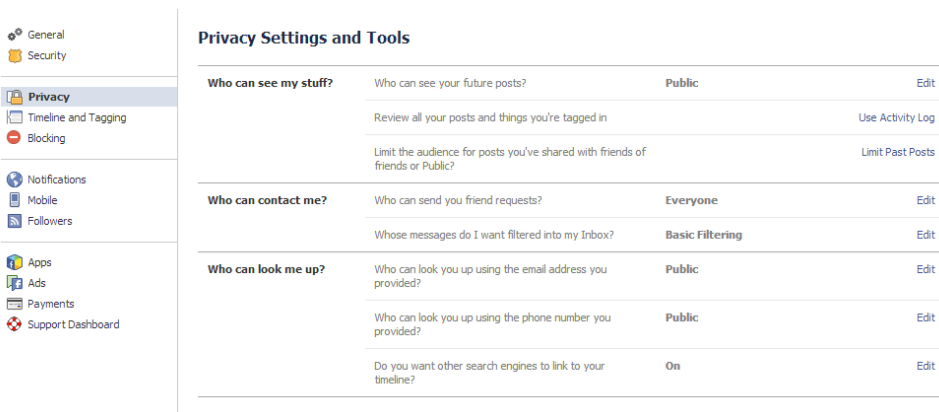
### 3.2.2 Default Settings 2013

To examine the default settings on Facebook anno 2013, we created a new Facebook profile, so we could see how the settings were as default. Figure 3.2, Figure 3.3, Figure 3.4 and Figure 3.5 shows the outline of the different settings without any alterations, in other words the default settings.

Figure 3.2 shows how the default security settings look like in November 2013. As we can see from the Figure, secure browsing is enabled by default.



**Figure 3.2: Default security settings on Facebook November 2013.** This Figure shows the default security settings on Facebook in November 2013.



**Figure 3.3: Default privacy settings on Facebook November 2013.** This Figure shows the default privacy settings on Facebook in November 2013.

Figure 3.3 shows the default privacy settings in November 2013. *"Who can see your future posts?"* is set to *Public*, which means everyone can view you posts. *"Who can send you friend requests?"* is set to *Everyone*. *"Who can look you up using the email address you provided?"* and *"Who can look you up using the phone number you provided?"* is set to *Public*, which means it is easier for people to find you on Facebook if they know you email or phone number. The setting *"Do you want other search engines to link to your timeline?"* is turned *on*. This means that for example if you google a person, the Facebook profile will appear in the search. To summarize, the privacy settings are *as public as they can get by default*.

<ul style="list-style-type: none"> <li>General</li> <li>Security</li> <li>Privacy</li> <li><b>Timeline and Tagging</b></li> <li>Blocking</li> <li>Notifications</li> <li>Mobile</li> <li>Followers</li> <li>Apps</li> <li>Ads</li> <li>Payments</li> <li>Support Dashboard</li> </ul>	<b>Timeline and Tagging Settings</b>			
	<b>Who can add things to my timeline?</b>	Who can post on your timeline?	Friends	<a href="#">Edit</a>
		Review posts friends tag you in before they appear on your timeline?	Off	<a href="#">Edit</a>
	<b>Who can see things on my timeline?</b>	Review what other people see on your timeline		<a href="#">View As</a>
		Who can see posts you've been tagged in on your timeline?	Friends of Friends	<a href="#">Edit</a>
		Who can see what others post on your timeline?	Friends of Friends	<a href="#">Edit</a>
	<b>How can I manage tags people add and tagging suggestions?</b>	Review tags people add to your own posts before the tags appear on Facebook?	Off	<a href="#">Edit</a>
		When you're tagged in a post, who do you want to add to the audience if they aren't already in it?	Friends	<a href="#">Edit</a>
		Who sees tag suggestions when photos that look like you are uploaded? (this is not yet available to you)	Unavailable	

**Figure 3.4: Default settings for timeline and tagging on Facebook November 2013.** This Figure shows the default settings for timeline and tagging on Facebook in November 2013.

<ul style="list-style-type: none"> <li>General</li> <li>Security</li> <li>Privacy</li> <li>Timeline and Tagging</li> <li>Blocking</li> <li>Notifications</li> <li>Mobile</li> <li>Followers</li> <li><b>Apps</b></li> <li>Ads</li> <li>Payments</li> <li>Support Dashboard</li> </ul>	<b>App Settings</b>			
	On Facebook, your name, profile picture, cover photo, gender, networks, username, and user id are always publicly available, including to apps (Learn Why). Apps also have access to your friends list and any information you choose to make public.			
	<b>Apps you use</b>	Use apps, plugins, games and websites on Facebook and elsewhere?	On	<a href="#">Edit</a>
	<b>Apps others use</b>	People who can see your info can bring it with them when they use apps. Use this setting to control the categories of information people can bring with them.		<a href="#">Edit</a>
	<b>Instant personalization</b>	Lets you see relevant information about your friends the moment you arrive on select partner websites.	On	<a href="#">Edit</a>
	<b>Old versions of Facebook for mobile</b>	This setting controls the privacy of things you post using old Facebook mobile apps that do not have the inline audience selector, such as outdated versions of Facebook for BlackBerry.	Public	<a href="#">Edit</a>

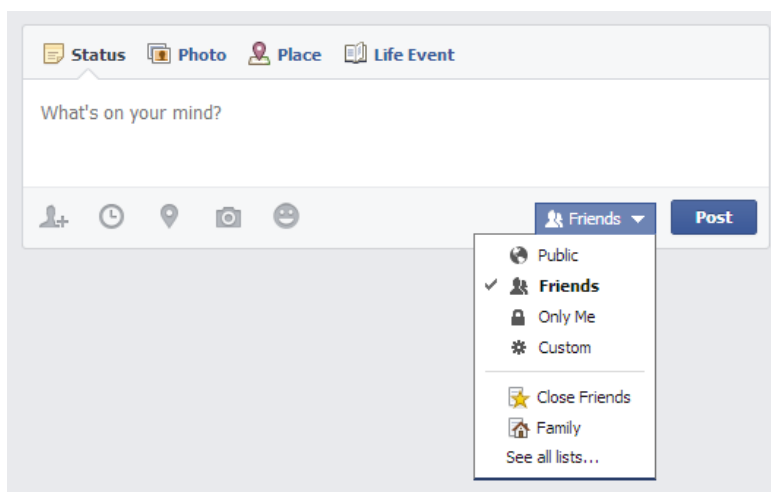
**Figure 3.5: Default settings for apps on Facebook November 2013.** This Figure shows the default settings for applications on Facebook in November 2013.

Figure 3.4 shows the default settings for timeline and tagging of Facebook in November 2013. *"Who can post on your timeline?"* is set to *Friends*, which means that only Facebook friends can add things to your timeline. *"Review posts friends tag you in before they appear on your timeline?"* is set to *off*. This means when friends tags you in something, it will appear on your timeline before you have had a chance to review it. In most cases this is probably fine, but it may occur that a Facebook friends tag you in something you would not prefer to have displayed on your timeline. In these cases it would be desirable to have the review-setting turned on. *"Who can see posts you've been tagged in on your timeline?"* and *"Who can see that others post on your timeline?"* is set to *Friends of Friends*. In contrary to

those who can post on your timeline, which are friends, friends of friends are able to view the content added to your timeline. If you have many friends on Facebook, and these friends have many friends each, the audience for posts are suddenly extremely large.

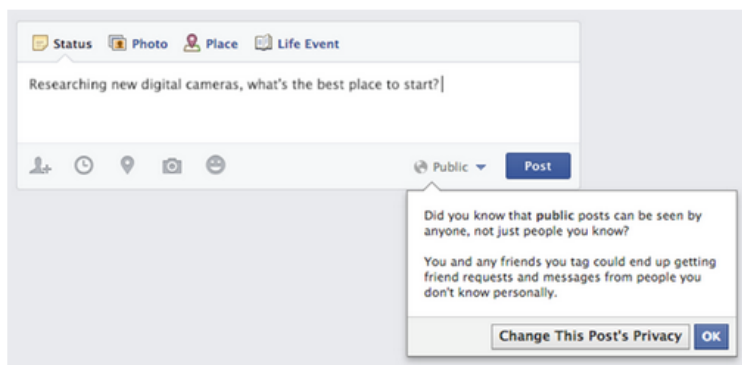
**Default settings does not preserve privacy** It is safe to conclude that the default privacy settings on Facebook anno 2013 is far too public. Unless there are conducted changes to the privacy settings, the timeline will be publicly available, with the exception of posts you've been tagged in and other's posts on your timeline which is "only" visible to friends, and friends of friends.

### 3.2.3 Default Settings for Teens

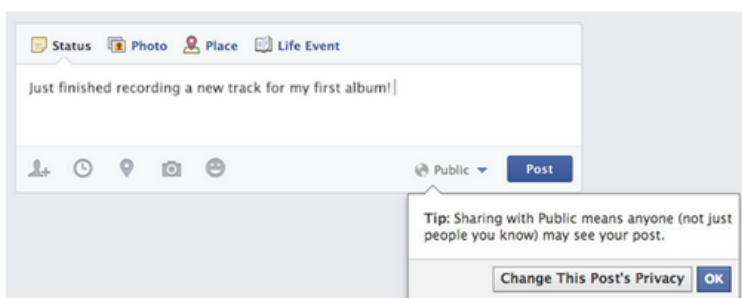


**Figure 3.6: Choosing who can see a status update.** When posting a new post the user can choose the audience the post will be visible to. This can either be "public", "friends", "only me" or "custom".

Each time a user on Facebook share a status update, the user chooses who the post is visible to, see Figure 3.6. The change you make will remain the same in future posts, unless you decide to change it. Up until today the default audience is set to "public", but for teens between 13-17 years, it has been "friends of friends". On October 16th Facebook announced to change the default setting for teens [38]. Now the initial audience for posts are "friends". Teens can later change this to "public", this was not a option before. Teens are active users of social media, and have want to be heard, either it is political engagement or an opinion on a movie. Further Facebook allows teens to turn on Follow, by doing this their public posts will show up in people's news feeds. Facebook designed these changes to improve the facebook experience for young people. In [38] Facebook also makes it clear that they take the safety of teens very seriously, and therefore have created a more extensive warning message, shown



**Figure 3.7: The message shown to teens when posting to the public for the first time.** After the first time they post to the public the message in Figure 3.8 is shown [38].



**Figure 3.8: The message shown to teens when posting to the public, except for the first time.** The first time they post to the public the message in Figure 3.7 is shown [38].

in Figure 3.7. This message appears when a teen changes the audience for their post. If they continue to post to the public, they will get an additional reminder message, as shown in Figure 3.8.

### 3.3 Facebook Features - Impact on your Privacy

#### 3.3.1 News Feed

"Somehow we missed this point with News Feed and Mini-Feed and we didn't build in the proper privacy controls right away. This was a big mistake on our part, and I'm sorry for it." [15]

### **3.3.2 Facebook Platform - Apps**

#### **3.3.3 Beacon**

At the end of 2007 Facebook launched the feature called Beacon. Beacon was created to help users easily share information from other websites with their Facebook friends [39]. Beacon was a key part of the Facebook Ads system. The aim was to connect businesses and users and create a more targeted advertising towards the users.

When Beacon was launched it had 44 partner site, among these are Live Nation, fandango.com, Trip Advisor, STA travel, eBay, the Knot and Zappos.com. According to the Facebook announcement [39] these websites could determine which actions was most relevant and appropriate for a user to share on Facebook. This could be anything from watching a video, a new high score on an online game, posting an item for sale or completing a online purchase. When a user, that is logged on to Facebook, enters a website that is part of Beacon, they will receive a message asking whether they would like to share their actions on Facebook. If a users agrees, the users actions on that page will be shown in their news feed or mini feed and shared with their friends.

Beacon received a lot of attention and privacy concerns. Some websites posted to Facebook without asking the users if they want to share the information first. Beacon is a very short piece of code provided by Facebook. The participating websites implement this code on the actions that they would like people to share. An example described in [40] is with the blog page TypePad. The user have the opportunity to chose whether Beacon should be turned on or not. When creating a post and publishing it the user receives a small pop-up window in the lower right corner stating that you are now sharing this information with Facebook. The pop-up allow you to answer no, but here you have to be quick, the window is not visible very long. When entering Facebook a message is shown at the top of the users wall. Telling the users that a website have shared information with Facebook. You then have the opportunity to go through and select weather that website is allowed to share at all, to just friends of to the public.

But not all websites have created an option for the users to themselves choose to opt-in. And pushes to Facebook without notifying the users or lets the users select themselves that they want to share it. An much used example of this is a man buying and engagement ring online and the website posts on Facebook. Before the guy have the time to remove it, both friends and family and also the coming fiancée have seen it. So much for the surprise engagement. This is unfortunate for the users, but also for the companies using Beacon, it puts them in a negative light.

Another problem is that Beacon only checked that a user was logged on Facebook. When several people use one computer it could create problems, since Beacon was machine specific. One family member, the mother, could be logged on while her 10 year old son plays an



online game, and manages to make a new high score. This high score will then be posted in the newsfeed on the mothers Facebook profile, and shown to the mothers friends. Beacon only checks that there is a valid Facebook cookie on the machine and then pushes the content to that Facebook user, without any validation.

In a blog post, Mark Zuckerberg apologized for the way the feature was created and for the handling of the complaints in hindsight. [41]

### 3.3.4 Facebook Connect - "Log in with Facebook"

From may 2008 users had the ability to connect and log in to other web pages via Facebook, "log in with Facebook". The users are allowed to connect their Facebook identity, friends, and privacy to any website supporting this feature. This was Facebook's first attempt to allow access to user data from Facebook outside of Facebook itself. The important features of Facebook Connect are stated in Table 3.3.

**Table 3.3:** Facebook Connect Features [4, 5].

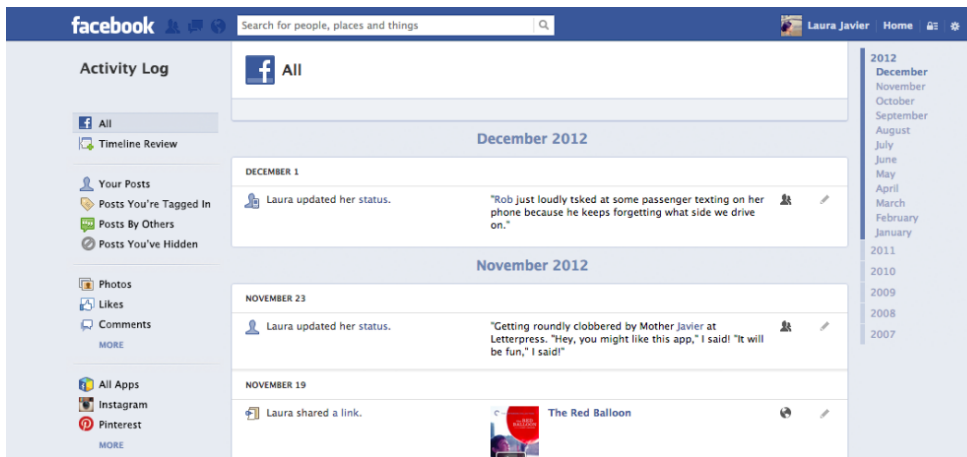
Feature	Description
Trusted Authentication	Authentication when users connect their account to a third party. During the user's experience the developer could at any time like to add additional social context. These activities need authentication from the user. In other words, the user have total control over the permissions that are granted.
Real Identity	The users can port information linked to their real identity with them on the web to a third party website. This information includes basic profile information, profile picture, name, friends, photos, events, groups etc.
Friends Access	As mentioned, the users take their friends with them to third party sites. This makes it possible for the developers to add social context to the sites. You will also get notified if some of your friends already have an account on the site.
Dynamic Privacy	When the users move around from one place on the web to another, they always bring their privacy settings with them. This is done so one can be sure that their information and privacy settings are updated at any time. In other words, when you update your privacy settings on Facebook, they will automatically be updated on third party sites.

### 3.3.5 Timeline

As mentioned in section 2.2 in Chapter 1, the Facebook timeline was introduced in December 2011 [17]. This feature made the entire history of the users visible: your posts, posts by others, likes, photos, links, pages liked, comments and other things that you have shared on Facebook. The timeline showed much more than the old profile did, and it was far more visual [42]. On the top of your timeline it is room for a big photo. This photo is called a *cover photo*. Cover photos are publicly available, and it is not possible to change the settings for them. You can of course choose which photo you want as your cover photo, or just choose not to have a photo there at all. When scrolling down your timeline, you'll see photos, posts etc. and different events in your life in order of when they happened in time [42]. You can look at it as the story of your life. You get the opportunity to "go back in time" and fill in the blanks. If you want to emphasize, for example an event or a photo, you can highlight it with a star, or on the other hand, if you want to hide something from the timeline you can also do so.

**Privacy concerns regarding Facebook timeline** When timeline was introduced many people became overwhelmed by the changes, and felt they lost control over their privacy. When you agreed to start using timeline, you got a certain period of time to review and edit your timeline before making it public. This gave the users the opportunity to clean up their timeline before everyone else could view the content of it. Cleaning up the timeline can be done using something called the "Activity Log" [43], which is shown in Figure 3.9. The activity log is basically a list over everything ever done in connection with you on Facebook, either done by you or by others. The activity log also makes it easy to view and change the audience for the different "activities". If you are an active user of Facebook, reviewing the whole activity log can be very time consuming.

The introduction of timeline was not in itself a privacy breach since you had, and still have, the opportunity to decide what you want to be visible on it, and what you want to hide. On the other hand, there are people who are extra exposed when Facebook introduced new major changes, like the timeline. Let's refer back to section 2.3 in Chapter 2, where we highlighted some of the findings from the survey addressed in the paper "Facebook privacy settings; Who cares?" by danah boyd and Eszter Hargittai [20]. boyd and Hargittai concluded their paper, based on their survey and findings, that experience and Internet skill is important to take into account in regard to how people handle their privacy settings on Facebook. Since familiarity with technology plays a role in how people handle their Facebook privacy settings, one can assume that the least skilled people get more exposed when Facebook changes the outline of the default privacy settings. This can be seen in the context with the introduction of the timeline. The least skilled users of Facebook that perhaps do not know how to change their privacy settings, probably was left extra exposed when the timeline was introduced and their timeline may have shown, and may still show, more than they actually would prefer.



**Figure 3.9: Example of an activity log on Facebook.** On the left side you see types of content. If you want to view for example "Posts by others" you can do so by clicking on it. To the right you see a list of the years and months. You can click on which year or month you want, and review the activity from that year/month [43]

There also exists privacy settings connected to your timeline under "Timeline and tagging" in your settings on Facebook. You can regulate who can add things to your timeline, and who can see things on your timeline. Under "Privacy" you can also regulate who can see your future posts.

### 3.3.6 Graph Search

Graph Search is a semantic search engine introduced in a beta version by Facebook in March 2013. During the summer 2013 the Graph Search became available for everyone using Facebook with US English language [44]. The old search bar at the top of the page is replaced with a larger search bar, Graph Search [45]. The Graph Search enables the users to search using natural language queries, and not just search using keywords. In addition to this the search results will be based on both relationships and content [44]. Two examples are "Photos of 'friend's name' are tagged in" and "Restaurants in Oslo, Norway visited by my friends". The basic idea is that the users are given the possibility to search Facebook for different stuff (photos, people, places etc.) in a specific subset, specifying the queries [46]. To emphasize how specific the search can be, we will provide you with an example. Let us say you met someone at a party and the only thing you know about the person is the name, where the person goes to school and you know that the person is a friend of one of your Facebook friends, you can write a query which reads as follows: *"People named 'name of the person' that are friends with 'name of the common acquaintance' and who go to 'name of school'"*. Of course this may not give the outcome you wanted, if the person for example

have not given any information about where he/she goes to school on Facebook. Just having the opportunity to perform such queries gives the user more power, and makes it easier to connect to new people.

Zuckerberg says that Graph Search is centered around "making new connections", because the feature makes it easier to make new connections [46]. Facebook emphasizes that the purpose of Graph Search is not to replace traditional web search. The Graph Search concerns, on the other hand, the filtering of all photos and all connections on Facebook. Since Facebook is the largest online social network in the world, it is *not just a few* photos and connections available, but over 240 billion photos and over 1 trillion connections. The choices you have made in your settings determine what friends and others can see when they conduct a Graph Search [47]. If a photo is set to "Only me" no one else can find it in the search, if it is set to "Friends" friends can find it in their search, and if it is set to "Public" anyone who searches for it can find it. Graph Search is in other words a good tool for viewing as many photos as you are allowed to view of people who are not your Facebook friends. The photos of you that are public will come up in a Graph Search regardless of how you have set your privacy settings. As long as someone has posted a photo of you as public, the entire Facebook can find and view this photo via Graph Search. So if you are interested in viewing pictures of a specific person who is not your friend on Facebook, it is not necessary to start digging through numerous albums and so on, but just do this with a quick search.

A limited group of people got access to Graph Search in January 2013. During an introductory press conference, Mark Zuckerberg stated that Graph Search was in its early stages, and that it will take years to complete it. He said: "Graph Search is a really big project, and it's going to take years and years to index the whole map of the graph". After the introduction of Graph Search, many questions were brought up about the privacy issues regarding it. One of the issues brought up was that the tool makes it easier for people to retrieve information and photos about other people who do not want this content to be available and seen. The fact is that people only get to view content they already could view, but it makes it much easier to find this content. Facebook assured that Graph Search does not affect the privacy of minors. They stated that identifying information about those between the ages of 13 and 17 would only be shared with friends of friends of that minor [48].

Graph search is for the time being still only available for users using US English language on their Facebook, but is a work in progress like mentioned before. Facebook has stated that further work on the feature deals with searching across posts, comments and mobile [48].

### **3.3.7 Facebook Removes Search Privacy Setting**

Facebook announced October 11 that they will remove the setting that has made it possible for Facebook users to hide from the ability to be looked up on the Internet [49]. It was only the users that have not used the setting "who can look up my timeline by name" in December by last year that was affected by the change. Facebook explains the removal of the feature by

it being outdated, and that there are several others ways to find a persons time line. They argue that it can be confusing for the user when they try to look up someone and do not find them. Mark Zuckerberg said that a users should do things they want to keep secret.

(sånn jeg ser det så er det jo fult mulig å søke opp hvem som helt på facebook sin egen søkefunksjon, det betyr jo ikke ta jeg ønsker å være søkbar på google.

### 3.4 Zuckerberg's Thoughts

Zuckerberg ones said this about Facebook in a one of his meetings: "I mean, one way to look at the goal of the site is to increase people's understanding of the world around them, to increase their information supply," he said. "The way you do that best is by having people share as much information as they are comfortable with. The way you make people comfortable is by giving them control over exactly who can see what" [12].

This comment from Zuckerberg brings out his thoughts around the privacy issues. He wants the users of Facebook to be comfortable with sharing information, and give them this confidence by giving them control. In general the privacy settings and restrictions that Facebook has have protected the users. They can easily change the setting and decide who can see what. Zuckerberg firmly means that you should not post comments or pictures of things you do not want anybody else to see. And if a user does so, the user has to take the blame for it, not Facebook. Zuckerberg was once asked about pictures put on Facebook of students drinking at an East Coast college, which led to some students being expelled. His answer to this question was: "First of all, it's pretty stupid if you put up pictures of you doing drugs on Facebook. I think that that's just sort of the deviant behavior on the very far end of the distribution. I bet that those kids do not post pictures of them doing drugs on Facebook anymore." He added that he meant this was a "pretty shitty way to learn that" [12].

Mark Zuckerberg wrote this in a letter to possible investors [50];

*Facebook was not originally created to be a company. It was built to accomplish a social mission - to make the world more open and connected.*

*People sharing more - even if just with their close friends or families - creates a more open culture and leads to a better understanding of the lives and perspectives of others. We believe that this creates a greater number of stronger relationships between people, and that it helps people get exposed to a greater number of diverse perspectives.*

*By helping people form these connections, we hope to rewire the way people spread and consume information. We think the world's information infrastructure should resemble the*

*social graph - a network built from the bottom up or peer-to-peer, rather than the monolithic, top-down structure that has existed to date. We also believe that giving people control over what they share is a fundamental principle of this rewiring.*

*We think a more open and connected world will help create a stronger economy with more authentic businesses that build better products and services.*

**Skal vi ha med det her?** User control became a hot topic already in 2006. There had been reported that sex-offenders was using social networks to pick out their victims. MySpace found out that several teenagers had been assaulted by people they meet at their web page. Facebook also received some negative mention in the press. Numerous times the campus police had to shut down big parties announced on Facebook. In 2005 a student at Fisher college was expelled after posting this comment about the schools police officer "needs to be eliminated" [12].

# Chapter 4

## Survey

To be able to map to what extent people care and are aware of their Facebook settings, regarding privacy, security and interdependent privacy, we designed and distributed a survey. The survey addressed the different settings available on Facebook, and awareness regarding Facebook applications and knowledge about interdependent privacy. For the design of the survey, we utilized SurveyMonkey which provides web-based survey solutions (See section 2.6). We distributed the survey on two platforms, namely Amazon Mechanical Turk (AMT) and Facebook. Amazon Mechanical Turk is a Internet marketplace where human intelligence is utilized to perform various tasks [26]. For more information about Amazon Mechanical Turk, see section 2.5. To reach out to a even larger audience, we posted the survey-link on our Facebook pages. In this chapter we will describe how we designed and distributed our survey. We will examine the results with focus on interdependent privacy.

### 4.1 Constructing the Survey

There is not much research on the area of interdependent privacy. To be able bring forward information and contribute to new research, we created a survey. When making the questions, we wanted to create an image of peoples use of Facebook, how they set their settings and how they know and care about their privacy and to what extent their privacy is dependent on other users. We quickly chose to use AMT as a platform for distributing the survey, because we wanted to create an image of the average Facebook user as well as getting a high diversity among the respondents (different countries, age, education etc.). Previous research shows positive results with the use of AMT [11, 28].

We started implementing the survey inside the survey template provided by AMT. After some consideration, we found that AMT did fulfil our requirements for the design, so we chose to implement the survey using SurveyMonkey instead. When creating the survey, we thought that it would be better to include some extra questions, than to leave some behind. When the survey first got distributed, we were not longer able to edit the questions. We therefore chose to include questions not only regarding privacy and interdependent privacy,

but also other aspects of Facebook usage. For example some questions about security settings, usage, personal experience in regard of photos and comments sharing.

#### **4.1.1 Design**

AMT offers a template for creating surveys. This template uses HTML. It is simple, but requires more work from the requester. We found the template to be little user friendly, and it did not give you many design options. Our survey consist of many questions, and some of them had follow-up questions requiring text answers. It was then desirable to have these on two different pages. We did not want the respondents to have their answers affected by the next question. It requires more of the respondent to write a text answer, so to avoid them answering based on the next question we separated the questions onto different pages. For example, we have one question asking whether or not the use of Facebook has lead to any uncomfortable situations. If the user answers "Yes", a follow-up question asking to describe the situation that occurred will appear. If the user answers "No" the follow-up question will be skipped. If the user had seen the follow-up question, he/she may not be bothered to answer yes even though this may be the truthful answer. We did not find an easy solution to implement this design feature in AMT, so we looked for other options. Even though AMT provide their own "Survey"-template, they also provide a "Survey Link"-template. This means that you can create the survey somewhere else, and just link to it in AMT. We chose the latter, and used SurveyMonkey to create the survey. SurveyMonkey provided us with the tools and features necessary to design our survey as desired.

**Features we used in SurveyMonkey.** SurveyMonkey offers several features, and has a intuitive user interface. It was easy to implement the questions, and separate them on different pages which was of high value to us. SurveyMonkey offers the ability to customize the appearance (color/theme, layout, etc.) of the survey to a higher extent than AMT. We put in a picture of the university logo, to emphasize the seriousness of the survey, as shown in Figure 4.1. SurveyMonkey also offers many different question types (multiple choice, text box, matrix and drop-down menus, etc.), and restrictions on the questions. It was important to have some restrictions especially on the text boxes. Some of the restrictions that we used was limit the amount of characters in the text boxes, to avoid too long answers. We also made almost all questions mandatory, meaning that the respondents had to answer them before being able to move to next question. As mentioned we divided the questions onto several different pages. This gives the respondents the impression that the survey is shorter. Each page has a title on top, grouping the different areas the questions consider. A progress bar was added to show in percent how far into the survey the respondent is at any time. This gives a good overview, and the user get a feeling of how much is left. We chose to use these features to avoid overwhelming the respondents with too many questions at a time.

SurveyMonkey offers a great user interface also when it comes to reviewing the answers. It is possible to see graphs showing the distribution of answers to all the questions, as well as



individual answers. SurveyMonkey also offers a filter and comparing feature, which made the analysis a lot easier, especially when having a large number of respondents.

#### 4.1.2 How the Survey is Structured

The first page seen when taking the survey, is a introduction page that shortly explains what the survey is about, and it's purpose. This page emphasizes the seriousness of the survey. When people see that it is a research survey carried out by master students at an University, we believe people will answer in a serious manner. The front page also includes the requirement for taking the survey, and a short explanation on where to find answers requested in some of the questions. This is shown in Figure 4.1. As mentioned before, we have divided the questions into different areas, and we will now go through each area and emphasize and elaborate the questions we consider as most relevant and important.



The screenshot shows the front page of a survey. At the top left is the NTNU logo and text: "NTNU Norwegian University of Science and Technology". Below this is a dark blue header with the title "Interdependent Privacy on Facebook" in white. Under the header is a light gray bar with the subtitle "Survey on Facebook privacy (research for the Norwegian University of Science and Technology)". The main content area has a white background and contains two paragraphs of text. The first paragraph explains the survey's purpose: "We are two master students conducting a survey to gauge user knowledge on certain aspects of Facebook privacy. The survey will be the foundation of a research project, which we are carrying out for Norwegian University of Science and Technology." The second paragraph provides instructions: "In order to answer some of the questions in this survey, you are required to be logged in to your main account on Facebook, and go to your 'Settings' page (accessible as a drop-down menu marked by either a 'wheel' or an 'arrow' in the top bar of your Facebook starting page). Before such questions you will be directed under which tab you find the requested information." Below the text is a progress bar showing a small blue segment on the left and the text "5%" on the right. At the bottom center is a "Next" button.

**Figure 4.1: Front page of the survey.** This figure shows the first page of our survey. It gives a short explanation about the purpose of the survey, and what it concerns. It also give some helping guidelines to where to find answers to some of the questions, and the requirement for taking the survey (that you need to be logged in to your main Facebook account).

#### Facebook usage

Following the first page is one page about Facebook usage. This page includes questions about sign-up year, how often they check their Facebook page and number of friends.

### **Facebook privacy: settings**

This is a part of the survey where the users need to be logged in to their main account on Facebook to check how their privacy settings look. The questions are taken directly from the "Privacy"-settings and "Timeline and tagging"-settings on Facebook. We divided these questions onto 4 different pages. Before we started asking about specific settings, ask the user how often they have checked their Facebook privacy settings during the last year. One of the following pages ask for the privacy settings, and the other for the timeline and tagging settings. These questions are straightforward for the user, since all they have to do is to render the settings they have set themselves. This will easily show us how many that actually have checked their settings, and to what extent they have made them more, or less, private than default. At the end ask the user whether or not they consider changing their settings after having reviewed them. This can make for some interesting observations, and can also give an impression of whether or not the users care or are aware of the settings.

### **Facebook privacy: personal experience**

This group of questions focus on the users personal experience with concern to both privacy and interdependent privacy. We ask whether or not the respondents have experienced that their use of Facebook has affected their professional life or led to any uncomfortable situations. Both of these questions have a follow-up question where to are asked to describe the situation that occurred. You will only be sent to the page with the follow-up question if you answered yes. If you answered no, you will skip the page with follow-up question.

A big part of Facebook consists of sharing photos and comments with others, we therefore asked the respondents to indicate on a scale from 1 to 5 how much they care about what is published about themselves, and what they publish about others, see Figure 4.2. It was mandatory for the users to give an answer on the scale. We added a text box for the users to elaborate if desired, but this was not mandatory. We received a total of 250 responses on our survey, and 190 of them chose to elaborate.

### **Facebook privacy: apps**

This is the part that concerns interdependent privacy (see section 2.4), and this is a very important part of our survey. As mentioned before this is a relatively unknown term, so we wanted to find out whether or not the respondents knew the meaning of interdependent privacy. Since the app platform on Facebook to a high extent relies on information about a user's friends, it is in this area interdependent privacy becomes more important to address. When you install an app on Facebook, it asks for your basic information, and often more information about you and your friends. For more detailed information about the app-platform see subsection 3.3.2. Question 26, 27, 28 and 29 (see Figure 4.3 and Figure 4.4) asks about the users awareness regarding what kind of information the apps can retrieve. There exists settings directed towards apps on Facebook (see Figure 3.5). In question 30



## Interdependent Privacy on Facebook

### Facebook privacy: personal experience

**\*21. To what degree do you care about what is published about yourself on a scale from 1 - 5, where 1 is "Don't care at all, everything can be public" and 5 is "I untag and hide everything that is published of me" (pictures, comments etc.)? Please elaborate in the text box below.**

☐ 1      ☐ 2      ☐ 3      ☐ 4      ☐ 5

Please elaborate:

**\*22. To what degree are you selective about what you post about others on a scale from 1 - 5, where 1 is "I am not selective at all, I post everything" and 5 is "I never post anything about anyone" (pictures, comments etc.)? Please elaborate in the text box below**

☐ 1      ☐ 2      ☐ 3      ☐ 4      ☐ 5

Please elaborate:

**\*23. Is it important to you that the content of your profile is only visible to your facebook friends? Please explain.**

 63%

Prev

Next

**Figure 4.2: Question 21 and question 22 in the survey.** This figure shows question 21 and 22 in the survey. The questions concerns to what degree (on a scale from 1 to 5) the respondents care about what is published about themselves, and what they publish about others. After each of the two questions it is a text box where the respondents can elaborate.

(Figure 4.4) we ask the user to look at one of the app settings, "Apps others use". In this setting the user decides which information they make available to apps others use, in other words control the categories of information that people can bring with them when they use apps. We want to know if the user are aware of the existence of this settings. We did not ask for more specifics about what information they share, because this is not relevant. What is

relevant is whether or not they know it exists, and are aware of what kind of information they share. We finish this part of the survey with the same question we started it with, if they know the meaning of interdependent privacy. We wanted to ask again to see if they got a higher understanding of the term after answering questions about apps, and saw how it is all interconnected.

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### Interdependent Privacy on Facebook

Facebook privacy: apps

For Q25: check under the tab "Apps > Apps you use".

**\*25. Under the tab "Apps > Apps you use" in your Facebook settings, you can see the list of apps you use. How many apps do you use?**

☐ None
 ☐ 1-5
 ☐ 6-10
 ☐ 11-20
 ☐ 21-30
 ☐ More than 30

**\*26. Are you aware of the fact that ALL apps you install on Facebook have access to your basic information, including the list of your friends?**

☐ Yes
 ☐ No

**\*27. Did you know that A SIGNIFICANT PORTION of Facebook apps you install can post information on your behalf to your and your friends' timeline? (E.g., Spotify posts songs you have listened to.)**

☐ Yes
 ☐ No

74%

Prev Next

**Figure 4.3: Question 25, 26 and 27 in the survey.** This figure show question 25, 26 and 27 in our survey. Question 25 concern the number of apps the respondents use. Question 26 and 27 concerns the user's awareness connected to apps on Facebook.

### Facebook security: settings

The main focus in this report is on privacy, not security. At the same time, we wanted to ask a few questions regarding Facebook security settings as well. The reason for this, is because we wanted to see if there was a connection between strict security settings and strict privacy settings among the respondents of our survey. The questions concern if the respondents use secure browsing and login notification.

## Interdependent Privacy on Facebook

### Facebook privacy: apps

**\*28. Did you know that SOME Facebook apps you install have access to your friends' private information, such as religious view, interests or relationships?**

☐ Yes

☐ No

**\*29. Did you know that SOME Facebook apps you install have access to relational information, such as private chat messages and joint events between you and your friends?**

☐ Yes

☐ No

**\*30. In order to avoid that apps used by your friends can access your personal information, you can edit the settings under the tab "Apps > Apps others use" in your Facebook settings. Have you been aware of these settings?**

☐ Yes, I am aware of them, but haven't changed the default settings.

☐ Yes, I am aware of them, and have changed the settings.

☐ No, I was not aware of them, and will not change the default settings.

☐ No, I was not aware of them, but I will look into if I want to change my settings now.

**31. After answering the last few questions about privacy issues regarding Facebook apps, do you have an idea about what interdependent privacy means with regard to Facebook? If so, please try to describe it below. Please do NOT use Google or any other search engine to find the answer. If you don't know the answer, just leave the field blank.**

 79%

Prev

Next

**Figure 4.4: Question 28, 29, 30 and 31 in the survey.** This figure show question 28, 29, 30 and 31 in our survey. Question 28, 29 and 30 concerns the user's awareness connected to apps on Facebook. Question 31 asks the respondents whether or not they know what the term interdependent privacy means.

## Demographics

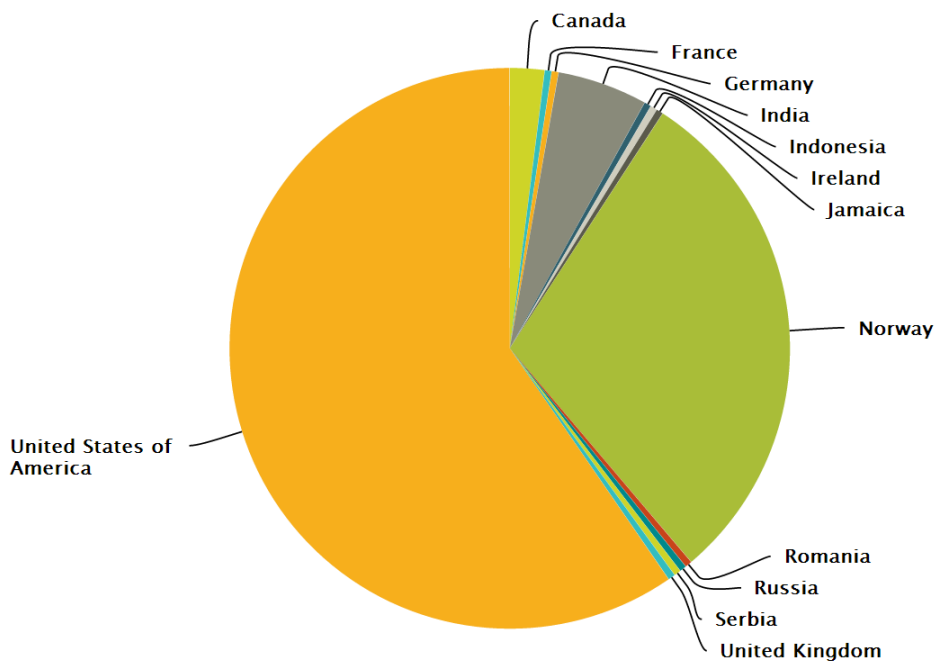
The last part of the survey, we have asked for demographic information about the respondents, to get a hunch of what kind of people have taken the survey. We chose to put the demographics part at the end, rather than in the beginning. We assume that a respondents attention span

gets lower during the survey, we therefore wanted to put the "easy" questions at the end since they require less focus. These questions consists of; gender, age, country, family situation, highest qualification/degree, employment status and income. Although these questions are easy to answer, they are very important to include. When analysing, they are necessary in order to be able to draw comparisons between for example age and/or gender. An interesting factor is to see where the respondents using AMT come from.

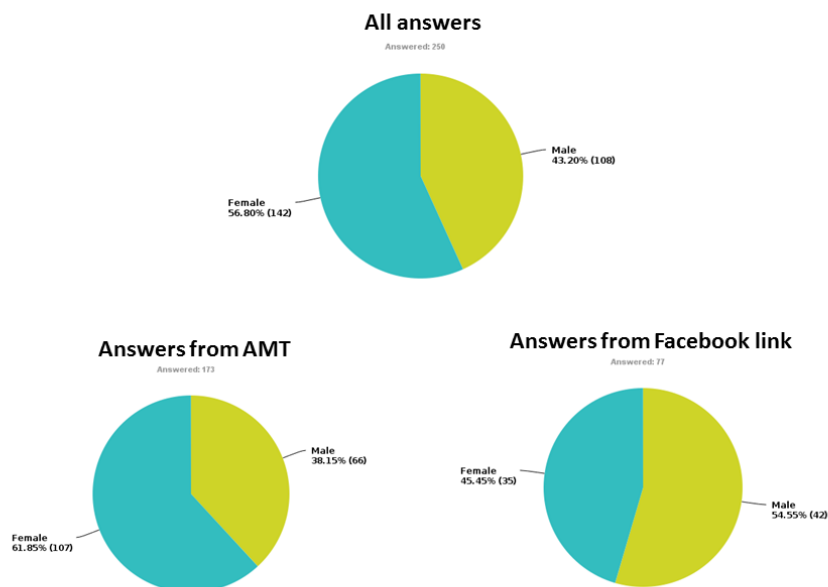
#### 4.1.3 Distributing the Survey

#### 4.1.4 Feedback on the Survey

### 4.2 Survey Results



**Figure 4.5: Distribution of the participant's country of origin.** This graph shows the distribution of the participant's country of origin. Most of the participants are from the United States of America and Norway.



**Figure 4.6: Gender distribution.** This graph shows the overall gender distribution (on the top), gender distribution from AMT (to the left) and the gender distribution from the Facebook link (to the right).

#### 4.2.1 Demographics

As mentioned before we distributed our survey on two platforms; Amazon Mechanical Turk (AMT) and Facebook. As you can see in Figure 4.5, the distribution was mainly divided between two countries, the United States of America and Norway. Other countries are also represented; Canada, France, Germany, India, Indonesia, Ireland, Jamaica, Romania, Russia, Serbia and United Kingdom. 77 of the 250 responses were collected through the Facebook link, and out of these 77 people 96% (74 people) are from Norway. 173 of the 250 respondents took the survey via Amazon Mechanical Turk, and out of these people 85,5% (148 people) are from the United States of America.

The majority of the total respondents were female. They accounted for 56,80% of the responses, which is 142 responses. This means that 43,20% of the total respondents were male, with a 108 responses. We saw a difference in the gender distribution from the Facebook link and from AMT. On AMT 38,15% were men, and 56,80% were female. On Facebook

54,55% were male, and 45,55% were female. In other word the majority of respondents on AMT were females, in contrary to Facebook, were the majority of respondents were men. The different gender distributions are shown in the Figure 4.6.

Among the participants the age ranged between 19 and 76. The average age is 31. The average age of the AMT participants (33 years old) are higher than the average age of the Facebook participants (27 years old). When we look at the total income of the household per year and employment status, we find a wide range of variety among the participants. We have several participants in each group of income. Although the majority of the participants are employed for wages or students, all of the other employment status' are represented. This is consistent with former studies of AMT users [28].

## 4.2.2 Frequency in Checking Facebook Privacy Settings

### Never Checked Facebook Privacy Settings During the Last Year

Never checked Facebook privacy settings during the last year (30 of 250 people)			
	Default	More secure	Less secure
Who can see your future posts?	36,67 %	63,33 %	
Who can look you up using the email address or phone number provided?	76,67 %	23,33 %	
Do you want other search engines to link to your timeline?	73,33 %	26,67 %	
Who can post to your timeline?	96,67 %	3,33 %	
Review posts friends tag you in before they appear on your timeline.	76,67 %	23,33 %	
Who can see posts you've been tagged in on your timeline?	33,33 %	60,00 %	6,67 %
Who can see what others post on your timeline?	40,00 %	56,66 %	3,33 %
Review tags people add to your own posts before the tags appear on Facebook	86,67 %	13,33 %	
When you are tagged in a post, who do you want to add to the audience if they aren't already in it?	96,67 %	3,33 %	
Are you using secure browsing when using Facebook?	86,67 %		13,33 %
Are you using login notification?	63,33 %	36,67 %	

**Figure 4.7: Never checked Facebook privacy settings during the last year.** Forklare hva figuren viser.

30 of the people who answered our survey stated that they have never checked their privacy settings during the last year. Even though they have not checked their privacy settings during the last year, most of them have done some changes to their settings before the previous year. The reason for this assumption is that their settings differ from the default settings. The average number of friends for the people who have never checked Facebook privacy settings during the last year is 162, and their average age is 39.



In Figure 4.7 you can see a percentage distribution over Facebook settings among the people who have never checked their Facebook privacy settings during the last year. We have divided them into three categories; "Default", "More secure", and "Less secure". You end up under the category "Default" if your settings is similar to the default settings anno 2013. See section 3.2.2 for more detailed description of the default settings on Facebook. You end up under the "More secure" category if you have changed the default setting to a more secure settings. The "Less secure" is for those who have made changes to their settings which is less secure than the default settings.

The majority of these users are active users, since 67% of them checks their Facebook page at least once a day.

60% of the people who had never checked their Facebook privacy settings during the last year *did not* consider changing their privacy settings after reviewing them. 40% of them wanted to make their privacy settings more private.

We have a quote from a 67 year old woman that took our survey (with Ph.D and only 5 Facebook friends) that emphasised many user's unawareness when it comes to different Facebook settings: "Now you have scared me. I am alone and afraid".

#### Checks Facebook Privacy Settings "Once a month" or "Once a week or more"

Check Facebook privacy settings "Once a month" or "Once a week or more" (48 of 250 people)			
	Default	More secure	Less secure
Who can see your future posts?	8,33 %	91,67 %	
Who can look you up using the email address or phone number provided?	31,25 %	68,75 %	
Do you want other search engines to link to your timeline?	18,75 %	81,25 %	
Who can post to your timeline?	81,25 %	18,75 %	
Review posts friends tag you in before they appear on your timeline.	33,33 %	66,67 %	
Who can see posts you've been tagged in on your timeline?	12,50 %	81,25 %	6,25 %
Who can see what others post on your timeline?	12,50 %	81,25 %	6,25 %
Review tags people add to your own posts before the tags appear on Facebook	43,75 %	56,25 %	
When you are tagged in a post, who do you want to add to the audience if they aren't already in it?	54,17 %	45,84 %	
Are you using secure browsing when using Facebook?	85,42 %		14,58 %
Are you using login notification?	33,33 %	66,67 %	

**Figure 4.8: Checks Facebook privacy settings "Once a month" or "Once a week or more".** Forklare figuren mer nøye her

48 of the people who answered our survey stated that they check their privacy settings "Once a month" or "Once a week or more". The average number of friends for these people is 416, and their average age is 28,5.

In Figure 4.8 you can see a percentage distribution of what kind of settings the people who check their privacy settings "Once a month" or "Once a week or more" have. We have divided them into the same categories as above; "Default", "More secure", and "Less secure".

85% of the people who checked their Facebook privacy settings "Once a month" or "Once a week or more" during the last year, has checked their Facebook page at least once a day during the last month. This indicates that the majority of those who check their settings frequently are also very active Facebook users.

70,83% of these people did not consider changing privacy settings after reviewing them. 27,08 % wanted to make their privacy settings more private, and 2,08% considered changing them to more public.

### **Comparing the ones Who Have Never Checked their Facebook Privacy Settings During the Last Year and the Ones Who Checks "Once a month" or "Once a week or more"**

**Activity level.** The majority of both groups checks their Facebook page at least once a day. The percentage is a little bit higher for the people who have checked their privacy settings "Once a month" or "Once a week or more" during the last year. 85% of them checks their Facebook page at least once a day, in contrast to the other group (who have never checked their settings during the last year) with 67% checking their Facebook page at least once a day. This indicates that the ones who have never checked their settings during the last year does not refrain from doing this because they are inactive users. One assumption for this may be that the users are unaware of the settings. 40% of them stated that they wanted to make their settings more private after taking the survey. This backs up the assumption about unawareness.

**More secure settings for those who check their settings more often?** If we compare Figure 4.7 and Figure 4.8, we see a clear difference in percentage that have changed from default to a more secure option. The percentage is much higher for all settings listed for those who checks frequently. Some of the settings shows a remarkable difference between the groups. We want to accentuate the settings that concern interdependent privacy. When we look at the setting "Review posts friends tag you in before they appear on your timeline" for the ones that never checked during the last year, only 23,33% have changed to a more secure option. For the ones that check frequently, 66,67% have changed to a more secure option. Another example is the setting "Review tags people add to you own posts before the tags appear on Facebook" where 13,33% of the ones who never have checked their settings

during the last year changed to a more secure option. On the contrary, as many as 56,25% of the frequent settings-checkers have changed to a more secure option.

**Considered changing settings.** The percentage of those wanting to make their settings more private is higher for those who have never checked settings during the last year with 40% of the group. Only 27% of the frequent setting-checkers wanted to make their settings more private. None of the people who have never checked their settings during the last year wanted to make their settings more public, unlike the other group (those who check "Once a month" or "Once a week or more") where 2% actually considered changing them to more public. Overall the frequent settings-checkers were more pleased with their settings than the once who had never checked them during the last year. 70% of the frequent settings-checkers did not consider changing their settings after reviewing them. Although the ones who have never checked their settings during the last year have far less secure settings than the other group, 60% of them did not consider changing their settings either.

#### **4.2.3 Interdependent Privacy**



## Discussion



## Conclusion





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