

Report
on
SECURITY AND PRIVACY IN SOCIAL NETWORKS ON THE INTERNET

submitted to
James McCallum
University of Technology Dresden
Dresden
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by
Thomas Gängler
University of Technology Dresden
Department of Computer Science

This report contains information on the background of the aspects security and privacy in social networks on the Internet. Furthermore, a categorisation of the representatives and a detail description in which way they will be used. At last, a introduction in field of semantic analysis close the report topic.

ABSTRACT

This paper describes the expansion of social networks to the Internet. The change is still on progress, so the report is about:

- an up-to-date overview about what these networks are
- how they will be used
- which consequences they have for their users

An explanation of used terminology will help to understand the scope of these social networks. Furthermore a critical view on several developments like:

- *cyberbullying*
- the habits of the providers of these portals in the aspect of *data aggregation*
- the role of secret services

will give detailed insight into this topic.

TABLE OF CONTENTS

ABSTRACT	ii
I. INTRODUCTION	1
II. SOCIAL NETWORK SITES	2
Definition	2
Basic Types	2
Friend Social Network Sites	2
Media Social Network Sites.....	4
Dating Sites.....	4
Related Types	4
Social Mapping.....	4
Social Bookmarking.....	5
Micro Blogging.....	5
Social Online Games.....	5
III. SECURITY AND PRIVACY	6
A new Openness	6
The Consequence of this Openness	7
Fake Characters and Infiltration.....	7
Cyberbullying and Cyberstalking.....	7
I Googled You.....	7
Alibi Clubs.....	8
Privacy Guidelines in Comparison	8
History.....	8
Will They learn from their mistakes?.....	9
IV. MISSION CREEP	10
Data Mining and Data Aggregation	10
OpenSocial and the other way around	11
Privacy Survival Guide	11
V. CONCLUSION	12
APPENDIX A: REFERENCES	A

LIST OF FIGURES

Figure 1: Registered users of some very popular SNSs in million.....	2
Figure 2: Visitors in million in one month of some very popular SNSs.....	3
Figure 3: Results of the field research in teenager's habits on SNSs.....	6
Figure 4: An illustration of Google is scanning all your activity in the Internet.....	8
Figure 5: Mission creep illustrated.....	10
Figure 6: Connecting the entries.....	10

I. INTRODUCTION

Social networks on the Internet play a big role in modern society's social interaction. The traditional way of communication will be substituted through the evolution of the Internet. Today, there are services available which copy the real world into cyberspace. This development pays its price in getting hard to control. The consequences are not fully researched. Maybe it is also too early to draw real conclusions for the behaviour of human beings in that field. The explosive increase of social networks on the Internet are the product of the personalisation of the Internet. According to this, the changes related to privacy are reaching a new level of transparency.

Therefore, it is necessary to think about the habits of the people, which participate in these online communities. The intent of this report is to clarify the difference of social interaction on these portals. In relation to that, a categorisation and explained terminology will be helpful to separate specific issues of each social network type available on the Internet.

The huge number of users using these form of social networking is involved in a certain danger. Some social risks and threats are currently discovered and improvements will follow. Others consequences are possibly hidden and have to be fully researched. This paper will give a good overview about what is going on on these portals and how to use them in a safe way.

This report will be broken into three main sections. Firstly, a definition of the term *social network site* (SNS) will help to understand the main intent of those websites. Therefore, a separation between basic and related types is necessary. Secondly, an analysis of users' habits will reveal a main difference in comparison to habits outside of the Internet. After defining this new behaviour, a detailed description of the consequences including social threats and risks will follow. The last chapter deals with an after-effect which can develop into a bigger danger of the privacy of human beings. Nevertheless a privacy survival guide will recommend steps for users to feel safe to a certain extent while using SNSs.

II. SOCIAL NETWORK SITES

This section introduces the topic *social network sites*. Firstly, a formal definition of the term *SNS* explains how this term is to understand and will be used. Secondly, the report focusses on the basic types of *SNS* by mentioning their features, giving examples and showing the particularities of some examples. At last, the third paragraph, related types to *SNS*, has a strong connection to the second.

Definition

Social network site is the meta term for defining these categories of websites which share a set of features providing social interaction and creating personal relations [[DB106]]. Types of virtual social interaction are e.g. chat, messaging, email, video, voice chat, file sharing, blogging and discussion groups [[WIKI108]]. *SNSs* are able to unite people who share common interests. There are three core elements to all *SNSs*. A personal profile defining more or less detailed information about the human being who created this profile. Relationship models which are able to create relations between ontologies and the opportunity to comment the content of these portals.

Basic Types

Generally, it is difficult to differentiate between some special types or to map a type to a specific social network site. However, an attempt of defining these main types and giving examples to them is made in the following. A good and up-to-date overview of the variety of *SNSs* is displayed on the website mashable.com [[MASNS07]], which is a news site for social networks and related topics.

Friend Social Network Sites

The most popular *SNSs* are the *friend SNSs*. They are also known as Friend-of-a-Friend (FOAF) social networks, depending on the relationship ontology "knows", which is used from the structural model in the background of the *SNS* [[IW3C206]]. There are many representatives of these type. Maybe every region in our world has its own popular ones. Strongly connected to this is the sub class *student SNS*. They have the small difference that (normally) only students can join these communities. In the same area one finds the representatives of the sub class *pupil SNS* where current and ex-pupils can join and search for schoolmates. It is not easy to get a whole overview about which site is the most popular one, but *Figure 1* and *Figure 2* dated from June 2006 reveal that MySpace [[MYSP07]] is the most popular *SNS* of the world.

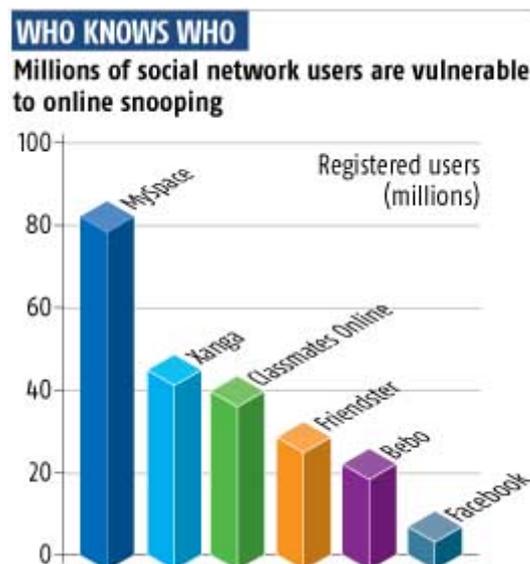


Figure 1: Registered users of some very popular SNSs in million

These figures are mostly cumulative ones, so in most cases nobody (except of the SNS provider) really knows about the exact numbers of registered users or visitors. There are newer estimates from November 2007 where more than 200 million users are registered with MySpace [[TECC107]]. The advantage of this example is to provide the user with every media feature one would like to use and providing the opportunity to share all these contents with friends and the rest of the world. So MySpace is one of the best examples of merged forms of SNS, because it also includes the basic type *media SNS*.

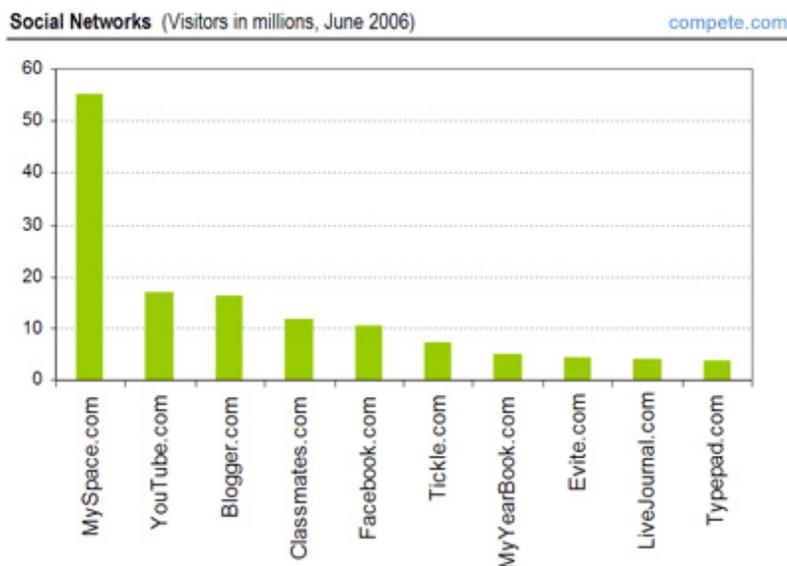


Figure 2: Visitors in million in one month of some very popular SNSs

Apart from the majority of young people, especially teenagers, exists a big group of musicians on the network. Nearly, every modern part time musician or band (who can also be youth) release their new tracks on MySpace and the professional ones too. As is described on the "about us"-page of MySpace: "MySpace is for every one" [[MYSPA07]].

Another FOAF social network is the student site Facebook [[FB07]], which grew enormously in the last couple of months. In November 2007 approximately 50 million user were registered with Facebook [[TECC107]]. The German derivative of Facebook is StudiVZ [[STVZ07]]. The founder of Facebook, Mark Zuckerberg, is regarded as the person who invented the type of SNS which is related to students by simply implementing a online version of a year book of his university [[FAZ107]]. As is the case with perhaps every friend SNS, the participants are able to use services like blogging, photo albums or groups. The big opportunity of these student and pupil SNSs is that approximately all users are registered with their real name, which has the advantage that they will be easily found by their friends and will find them as well.

Representatives of other regions in the world are Badoo [[BD007]], for the region of South Europe and Latin and South America, and Life365 [[L36507]] for China and South East Asia. Astonishingly, the SNS Badoo was founded in London but the majority of users came from other regions of the world because it has developed its own target group through the origin and language of the participants. Therefore, it happened that in other regions of the world like Middle and West Europe or North America nobody knows such a huge portal like Badoo [[ZN107]]. Life365 from China is, like many products made in this country, an approximately one-to-one copy of the derivative of the neighbour country Japan [[WWB106]]. It belongs to another basic SNS type, the *dating sites*, and is, like many media portals, under the control of the state of China.

The last group, is the sub class of *business SNS*. these SNSs must be reputable providing the participants a high level of security because the basic feature is to find business partner for commerce or projects. An example is the German based *business SNS* Xing [[XG07]], which is a commercial-free portal to keep the privacy issues of a business network [[TECC207]].

Media Social Network Sites

These SNSs are specialised in presenting specific media types and sharing these media documents with friends who are members of the community or to publish them to the public. Generally, the content of the media document plays the main role for these portals and the issue of connecting friends like in a true FOAF social network is the condition for fulfilling this feature. One of the most popular photo communities is Flickr [[FL07]] which is owned by Yahoo! [[YH07]]. This portal tries to combine all services a photo publisher would like to use; e.g. grouping, commenting, tagging and geotagging.

The common representative of a *media SNS for videos* is YouTube [[YT07]] which is owned by Yahoo's competitor, Google [[GG07]]. There, registered users are able to upload short videos and present them to everybody. The services for categorising the videos are almost the same as those provided by Flickr for photos.

As already mentioned in the section about *friend SNS*, MySpace is a well-known representative of *media SNS for music* (of course it is also possible to publish videos at MySpace) but there are many more of them in the area of free music published under the *Creative Commons License* [[CC07]]. Another example is Last.FM [[LFM07]], an online music community where members are able to create personalised radio stations or just publish their current play list or music charts to the others.

A good overview to representatives of each specific type of *media SNS* is published at mashable.com ([[MAOP07]] for photos, [[MAOV07]] for videos and [[MAOM07]] for music and audio).

Dating Sites

Maybe the oldest type of SNS is the *dating sites* type, which had existed even before the hype of *Web2.0* started. Representatives are the market leader in the USA [[PW105]] match.com [[MAT07]] or Friendsters [[FRIE07]] which is most widely used in Asia [[WIK1108]]. The main differences between these dating portals are mostly the region in which they are well-known and the issue of free or commercial membership. In many cases interested people are able to use restricted features of the *dating site* for free, but if they like to use all services they have to pay money. Relating to this issue it is easy to imagine that this kind of websites is the most lucrative one despite pornographic sites [[PW105]]. Curiously, the way of getting to know each other in these online communities is exactly the opposite of its traditional way (that means in reality not virtual, which is also known as *face-to-face* (F2F)). At the beginning, most participants a detailed description of the others. Through the information exchange (flirting) on the portal they get to know more features of the personality of the person they are interested in. The physical component often lost its importance. This is called getting known "from inside out" [[AW106]].

Related Types

Related types are the types which are distantly related to the basic types of SNS and focussing their context to other issues. Of course these types are of the origin of an online community or they may be integrated or connected to some representatives of the basic types.

Social Mapping.

Social mapping has been getting popular through the opportunity of using *GPS* technique to locate somebody or something. This type is inherited from the location service where the signal of a mobile phone is used to locate e.g. ones' own children to offer the parents the ability to let them know where their children are. FleetManager [[FM07]] is an example of a location service for companies to observe its employees. In *social mapping* networks the local information of the users forms the basis for the community context. Every participant is able to show the members of his group where his place actually is. Although, they have the opportunity to switch off their location service and make themselves invisible, the majority of them will not do this. Obviously, there exists social pres-

sure (peer pressure) and concerned persons have to justify themselves to their group if they are not online, thus, not available for them [[PW107]].

An representative of this type is 3FriendFinder [[3FF07]] which is based in Austria. *Social mapping* is to be considered to a new hype by youth and is also described as a "step back to real life" [[WP06]].

Social Bookmarking

Also a form of collaboration on the Internet is *social bookmarking*. It has similar features like the *media SNS* in the context of links of websites (bookmarks). Registered users are able to collect bookmarks and use services for grouping, tagging and commenting to categorise them. At least the participants can publish their collections to the community. *Social bookmarking* sites are like a search engine where the users are recommending websites [[PW207]]. The well-known representative Del.icio.us [[DIU07]] is one example for this type. Other representatives are listed at mashable.com [[MASB07]].

Micro Blogging

A relatively new form of informing the world about ones' activities and feelings is *micro blogging*. As a part of this type's term, micro blogging is inherited from *blogging* - the very common form of an online diary. Although the category of *Blogs* can also be a related type to SNS, like the representative LiveJournal [[LJ07]]. The advantage of *micro blogging* is the technique using a mobile phone to send short messages or pictures to the community and everybody will know what somebody is currently doing. This service can also be included into bigger SNS as an advanced feature and the technique itself includes possibly *social mapping* services as a feature. Google took over the *micro blogging* portal Jaiko [[JAI07]] with the aim of getting a "holistic view of a person's life" [[PW307]] and aggregating data from the participants.

Social Online Games

The concept of social networks is also mapped to the context of online games (*social online games*). these games have no real game behaviour that means reaching a static or dynamically created goal. Registered users are able to create contents of a virtual world and playing the game which is called life. Therefore, the title of the best-known *social online game* representative is Second Life [[SL07]]. It has got about 6 million registered users and 15.000 to 38.000 active participants. With Second Life almost everything is possible that is possible in real life, from virtual marriages over virtual sex to virtual representatives of true companies [[PW407]].

Another example of these games is Spore [[SPO07]], a relatively new game where the users are able to simulate a kind of evolution and fight to survive in this virtual world. This starts with feeding a small mono cellular creature and ends with entering new planets with new created civilisations.

III. SECURITY AND PRIVACY

After having introduced the term social network site in the last section, this section deals with the issues of privacy and security on social networks and their relationship to each other. The first paragraph explains the habits in these communities in focussing on the consequences of this openness in the next paragraph. According to the risks and threats of SNSs, a comparison of the privacy guidelines of some popular SNS representatives will follow.

A new Openness

Through the development of social networks on the Internet a kind of paradox habit of the main target group (youth) has been developed. Of course there are users with a different background and privacy awareness in every community, but all these habit types share one core element - the more or less open manner of publishing intimate information about oneself [[PW507]]. At the moment, there are several studies and papers about this topics available. Some examples are here:

- [[GWULS07]] analyses this problem more general
- [[DB107]] researches the role of SNSs in teenagers life
- [[PIALP106]] focusses on social networks in America and related ties
- [[PIALP107]] evaluates a field research with teenagers and their habits on SNS

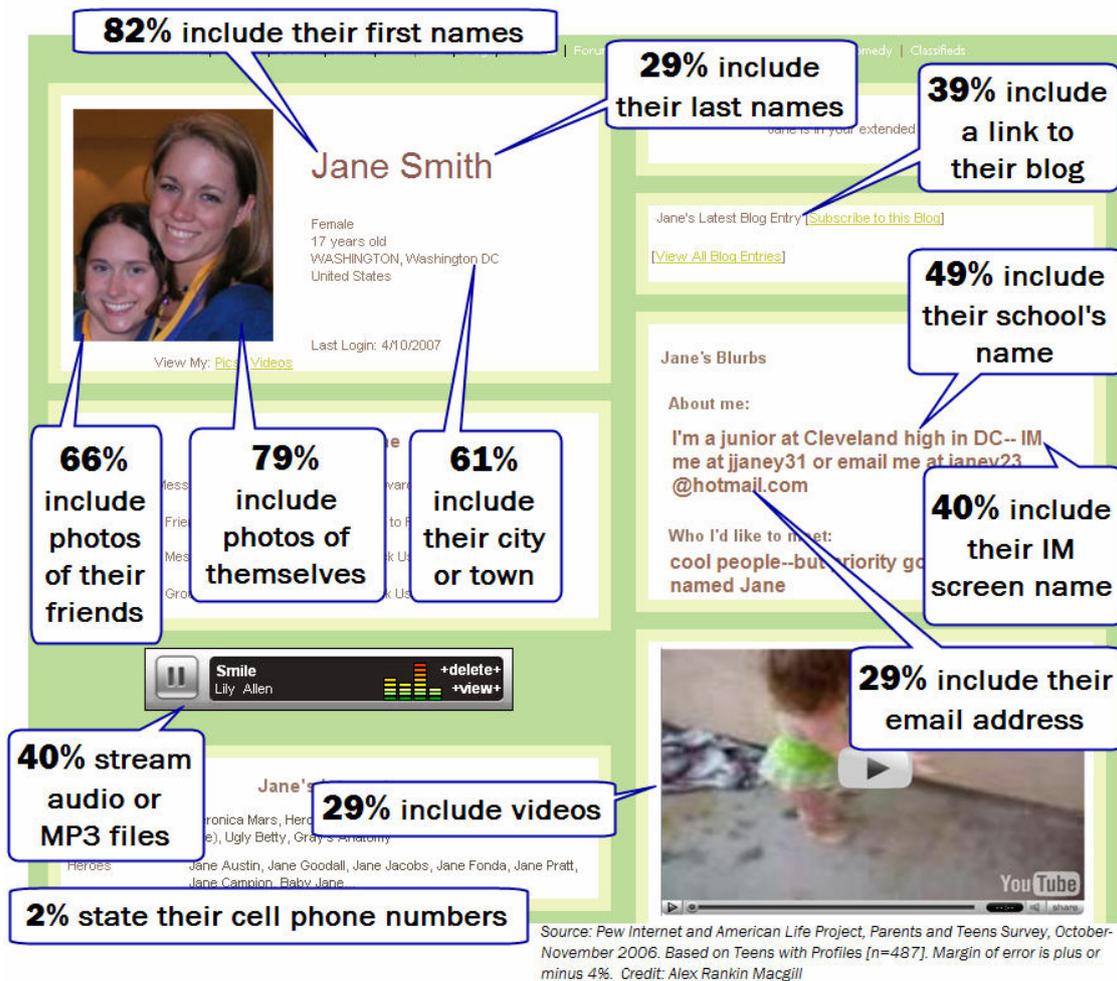


Figure 3: Results of the field research in teenager's habits on SNSs

As illustrated in *Figure 3*, the level of publishing detailed information about one's personality is generally high. Although, all this information is not only published to a couple of friends, it is offered to everyone on the Internet. Furthermore, the talkativeness of the users of SNS is at a high level in the context of private messages and comments, which are visible to members of their group, and nevertheless also to public. On the one hand, some participants follow this habit to fulfil their urge of attention and publicity. On the other hand, other community members are not aware that more than just their fellows (even everybody) can access the information of oneself. At last, the inhibition threshold of publishing intimate details of oneself using a pseudonym is even slighter than doing this under a real identification. This often happens, as already described, on *dating SNS*.

The Consequence of this Openness

The development of the new openness has caused some consequences, which are also quite well analysed and the risks and threats of SNS are extensively revealed [[ENISA07]]. Despite of the developments in the ethical behaviour of the SNS providers and the related field of *data aggregation* (this is the topic of the next section), this sub chapter describes the main social threats of SNS and some morally dubious after-effects, which are now distinguished. Of course, the same well-known threats like spamming, phishing, cross site scripting, viruses and worms are applied to SNSs, but these after-effects were predictable and represent a general problem of the Internet.

Fake Characters and Infiltration

Although the majority of SNS users are more honest about themselves on the Internet as in real life. There is also a minority which creates fake characters [[DB207]]. These fake characters can fulfil different purposes. Sometimes they represent completely new identities and sometimes human beings behind the profiles like to present their personality in the way they would like to be seen by others.

Furthermore, fake characters will be used to infiltrate private ties in SNSs because people trust in profiles that seem to inspire confidence like "Freddi the frog" [[SP07]] and confirm his invitation or add him to their group.

Cyberbullying and Cyberstalking

Cyberbullying is the general description of a new and growing practice of using technologies like the Internet to harass or bully someone else [[USC106]]. SNSs provide a common playground for that threat. The reason is the easy opportunity of fulfilling the goal of many bullies to bare the victim in front of a big audience, which exists on SNSs. This form is also known as *cybermobbing* [[PW607]].

Morally dubious is the contra product of *dating SNS*, the *dating warning sites* where women [[DDHG07]] and men [[TD07]] can report about their ex-partners to fulfil the urge of revenge and to beware of the concerned person. These sites represent an ideal platform for *cybermobbing* because the anonymous bullies present their victim with personal data and photos. Furthermore, the victim's problem is often a lack of information in being informed about their exposure on these portals and possibilities to fight against this serious harm.

Another form of *cyberbullying* is *cyberstalking* which is more dangerous. With SNSs the bullies are often able to invisibly spy their victims as well.

I Googled You

To collect and combine all the public information people left on SNSs and on other websites where they signed with (parts of) their identity, one simply has to enter one's name (additionally more information about the identity like date of birth or city) on a web search service like Google. Shortly after, one will be provided with personal data the concerned person gave away on the Internet [[MJ06]].



Figure 4: An illustration of Google is scanning all your activity in the Internet

There is no secret about the data collection on the Internet through web crawlers like search engines (as illustrated on Figure 4; more background information about *data mining* in the next section). Therefore, it is just a normal consequence if the CEOs of a company where someone is applying for a job has googled the candidate on the Internet to get a deeper insight into ones life [[WIWO06]]. Of course, they have to keep in mind that the result of the search request is never ever trustworthy because some CEOs may decide against a candidate whose search results reveal negative aspects of his past.

Alibi Clubs

The last paradox after-effect is related to the social mapping services which are sometimes included as a feature in SNSs. Through the opportunity of full time surveillance with the help of these services, friends are able to check the availability and stay of someone every time. Therefore, the concerned person runs into the threat of justifying himself to other closer members of the community. The counter movement of this development are the so called *alibi clubs* [[PW707]] like the professional German representative Alibi-Profi [[AP07]]. Obviously, the members of these unions are willing to tell the closer friends or partner of someone a lie to excuse this person for a certain moment of time.

Privacy Guidelines in Comparison

This sub chapter deals with the privacy policies of SNS. Therefore, the restrictions and recommendations of some important representatives are analysed and compared. Furthermore, some developments in the history of this guidelines are reported.

History

At the beginning of the development of SNSs the SNS provider, on the one hand, paid less attention to the aspect of privacy. On the other hand, the majority of users were fascinated by the benefits they discovered on these portals. Therefore, they blindly trusted in the privacy policies of the SNSs.

Through the explosive increase of registered users on portals like MySpace and Facebook, the SNSs developed a kind of self dynamics and got out of control. Examples of encroachments on undamaged children from adults make the headlines, like [[TM106]]. Of course everyone is responsible for managing one's own profile, the participants often do not know who observes their private page. However, many users are also confirming the acknowledgement of a friend invitation for several easy reasons as listed at [[DB206]].

Another development, based on the (beginning) carelessness of the majority of the community members, was realized by some SNS providers, like the well-known example which happened on Facebook [[BS106]]. The developer of that portal released a feature that automatically notified all of one's friends on Facebook of every update that one makes. This services caused much protest and consequences were demanded by users.

After the negative press of the SNSs, the SNS providers tried to change their behaviour in several issues as described in the next paragraph in order to get a better reputation and keep their number of registered users.

Will They learn from their mistakes?

Of course, there was a change in the thinking of the SNS provider. Therefore, they developed guidelines with restrictions and recommendations to eliminate the described problems. These recommendations range from little hints in the privacy policy like minor aged children should avoid the specific SNS (like at Badoo [[BD207]]) up to whole safety guidelines for children and parents (like at MySpace [[MYSPS07]]).

Furthermore, a network of safety expert sites raised up and every SNS, which likes to present a childproof community, collaborates with them (like MySpace [[MYSPSE07]]). Nevertheless, the most direct consequence in representing the change of mind was to clean up the SNSs from youth threatening contents [[HEI206]].

The next step was the revision of the community guidelines to make the users aware of the conscious release of personal information and their presentation on private pages (e.g. [[YTS07]]). This was realized by almost every SNS. Different flag and ranking systems followed. On the hand, many SNSs offer services to mark contents as inappropriate (like at YouTube [[YTTCG07]]). On the other, some SNS providers have developed surveillance techniques to rank user profiles automatically at the time of registration (like at Xing [[FTD07]]).

Obviously, only a minority of new users read the conditions of use, privacy policies, general security doubts and community guidelines they agreed to when they joined the community. That is (and was) the biggest mistake one can make, because in most cases the term of data protection includes the forwarding of personal information to third parties by the SNS provider. In most cases, it is used (and will be used) for advertising, especially user related advertisements, or *data aggregation*. Although, there are differences in the intensiveness of the logging of personal data. Generally, the SNS providers describe these parts relatively inaccurate in their privacy guidelines (by using a lot of hedging words) to keep the possibility of re-using data (e.g. MySpace [[MYSPDS07]], YouTube [[YTPP07]], Facebook [[FBPP07]]).

After giving the users the opportunity to "opt out" features like the automatic notification of friends who updated their profiles on Facebook [[FBWN07]], the participants get more control over the flow of information. The disadvantage of this improvement is the method of some providers to pre-enable all these services automatically (e.g. Facebook, StudiVZ). Unfortunately, many community members use their SNS with features they would rather disable if they were aware of that fact. Nevertheless, there are several alarming personal data requests like the possibility of scanning one's email address book at the registration with Facebook.

Finally, the image improvement of the SNS providers happened in the way of providing more security recommendations and restrictions to keep the majority of young users safe. However, the issue of clarifying the methods of personal data processing has not reached the people in charge. Obviously, the SNS providers change their privacy policies continuously and the majority of participants confirm these changes blindly. However, the opportunity of reading a shortened version (easy to understand) of the SNS's terms of use does exist (e.g. at StudiVZ). The latest news are, firstly, the newest feature on Facebook, where users are able to notify their friends with social advertisements [[FB107]]. Secondly, the hidden logging of user activities (also if the user is logged out) at Facebook and the websites of partner companies to this information for marketing analysis [[TT07]].

IV. MISSION CREEP

Mission creep in the context of Internet, especially SNSs, means the method of collecting (personal) data from websites, which are generated by their user, and re-use this information under another aim, like forwarding to secret services like the NSA [[SO106]]. This is the secret behind such a capital expenditure as of \$ 240 for a share of 1.6 % of Facebook [[FAZ207]]



Figure 5: Mission creep illustrated

This chapter focusses on the new possibilities the industry and the government try to use and the techniques how it will be realized. At last, this section ends with some recommendations to keep safe to a certain level.

Data Mining and Data Aggregation

At the beginning of *mission creep*, is the process of *data aggregation*. In this step companies like Yahoo or Google crawl all the data that they can get out of *world wide web* with a specific focus on personal data from Internet users [[GW06]]. Furthermore, the SNS providers do this in the same way (as mentioned in their privacy policies).

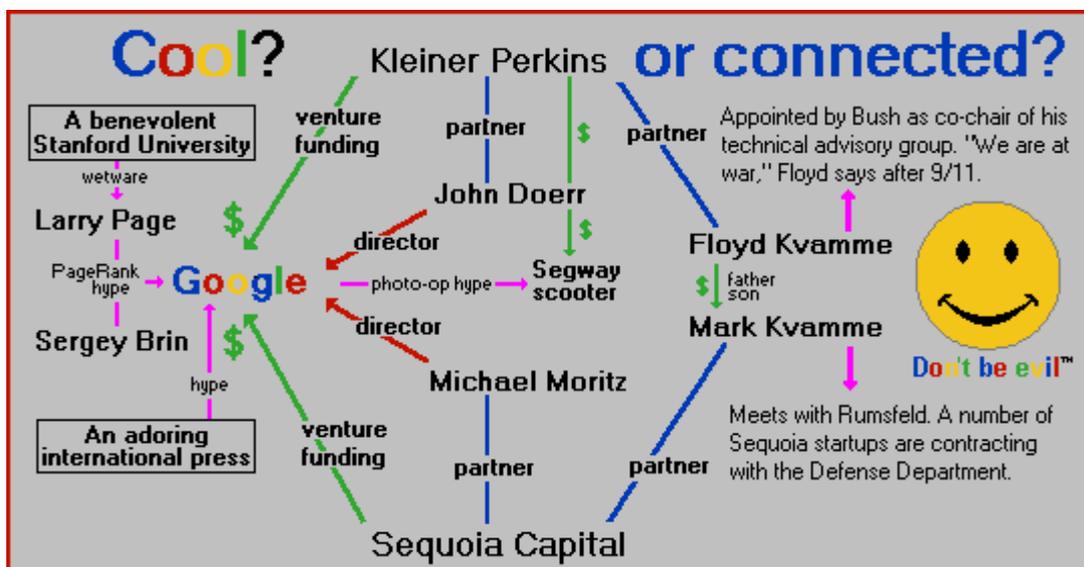


Figure 6: Connecting the entries

The next step is, to connect all the entries in their database in a meaningful way (as seen in a kind of funny illustration *Figure 6*). The applied technique is *data mining*, where static models and methods of the artificial intelligence are used to extract useful information from the databases. Applied to SNSs, the problem of outstanding standards in this field arises. Scientists have already detected this problem and provided an attempt to a solution [[IW3C206]] based on the *Resource Description Language* (RDF).

On the one side, new laws in the field of *data aggregation* [[SK107]] and the cooperation between private *data aggregation* companies [[SK207]] will help the secret services to get the information they need. On the other side, the SNS provider start to create their own collaborations (as described in the next paragraph).

OpenSocial and the other way around

There are two ways to connect one's user profiles of all joined SNSs. The first method is to unite all information for managing the access to the portals and merging the data of the profiles. This method is called *social network aggregation* [[WIKI308]]. The benefits for the user are a summary of information like, which friend is registered with a certain SNS, easy access to SNS and easy control of the profiles. There are several services providing *social network aggregation* listed at mashable.com [[MASNA07]].

The other way around, in November 2007, Google published a set of APIs called *OpenSocial* to provide the SNS providers a standard for their applications [[WIKI408]]. Several portals like MySpace, Xing, Friendster, Mixi and Orkut support the new technique. Nevertheless, Google provides a key/value API without using its own server for ones *social network application* [[GG108]]. This collaboration is able to unite all the information users generated on the participating SNSs and to force inter operability between the services of the communities [[MR07]]. The benefits for the advertising market are obvious.

Privacy Survival Guide

Regarding the background of *missing creep* and the aspect of the new openness at SNSs, it is necessary and useful to define some general recommendations in publishing information online and staying safe on SNSs. Good and short collections of advice is published on the website of US-CERT ([[USC206]] for SNS, [[USC307]] for publishing information online). Furthermore, the very good research report of ENISA in the field of SNS [[ENISA07]] deals with a whole section about recommendations and countermeasures including parts for government, providers, technology and standardisation. However, ten of the best recommendations are extracted here:

- View the Internet as a novel, not a diary
- Be careful what you advertise
- Realize that you can not take it back
- Limit the amount of personal information you post
- Remember that the Internet is a public resource
- Be wary of strangers
- Be sceptical
- Check privacy policies
- Restrict the visibility of personal information
- Think about mission creep is still running

V. CONCLUSION

As the reader can see, this report is just a compressed aggregation of information of the latest developments related to *social network sites*. I tried to give a compact view of this topic through involving all important relations to this form of social interaction.

On the one hand, several scientists have dealt with this problem and presented recommendations and countermeasures. On the other hand, the Internet community reflects its development in social interaction in their own way. My intend with this report was, to merge these two forms of observation.

The analysis and categorisation of the basic and related types was necessary to describe the differences between the representatives of what a social network on the Internet can be. Furthermore, it is important to know that the younger generation easily learns to understand the changes and getting used to them. That is maybe the introduction of the safety guidelines and the collaborations with safety experts. Nevertheless, it always depends on the behaviour of the *SNS* providers, how safe their portals are.

However, what they did well on one side - they did badly on the other. The basic intends of many *SNS* providers have not changed. Of course, they all like to earn money, but their way of doing this and the forms of collaborations with advertisement partners (third parties) are an ethically condemnable development. They try to influence their community members in the form that they tell their users how they should interact and use new features. Sometimes the alleged benefits for users will either cover the disadvantages of a new feature, or the cons are totally unconscious to them.

Therefore, I can just repeat myself in pointing to the threats and risks users are mostly too blind to accept if they join a *SNS* without reading the terms of use, the privacy policy and the community guidelines. Furthermore, the participants have a right to know what the *SNS* provider will do with their aggregated personal information. According on this, more detailed and clearly defined terms of use and privacy policy of these portals are necessary to cover grey area of uncertainty.

Finally, after knowing that mission creep is still running, people using such services should be more careful about publishing information. Everybody should bear in mind that the data one only wants to show to a restricted number of friends can be forwarded to third parties over a hidden data-channel. To sum up, data that has once been released and possibly spied out and forwarded, will never be removed.

APPENDIX A: REFERENCES

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