A Qualitative Study of Stakeholders' Perspectives on the Social

Network Service Environment

Running Head: Stakeholders' Perspectives on the SNS Environment

Hojung Kim[*]
School of Engineering and Design, Brunel University
Kingston Lane, Uxbridge, Middlesex, UB8 3PH, UK
hojung.kim@brunel.ac.uk

Joseph Giacomin
School of Engineering and Design, Brunel University
Kingston Lane, Uxbridge, Middlesex, UB8 3PH, UK
joseph.giacomin@brunel.ac.uk

Robert Macredie
School of Information Systems, Computing and Mathematics, Brunel University
Kingston Lane, Uxbridge, Middlesex, UB8 3PH, UK
robert.macredie@brunel.ac.uk

[*] Corresponding Author

Abstract

Over two billion people are using the Internet at present, assisted by the mediating activities of software agents which deal with the diversity and complexity of information. There are, however, ethical issues due to the monitoring-and-surveillance, data mining and autonomous nature of software agents. Considering the context, this study aims to comprehend stakeholders' perspectives on the social network service environment in order to identify the main considerations for the design of software agents in social network services in the near future. Twenty-one stakeholders, belonging to three key stakeholder groups, were recruited using a purposive sampling strategy for unstandardised semi-structured e-mail interviews. The interview data were analysed using a qualitative content analysis method. It was possible to identify three main considerations for the design of software agents in social network services, which were classified into the following categories: comprehensive understanding of users' perception of privacy, user type recognition algorithms for software agent development and existing software agents enhancement.

Keywords: Ethical issue, qualitative interview, social network service, software agent, stakeholder views

1. Introduction

The International Telecommunication Union (ITU, 2013) has announced that over two billion people are using the Internet at present. One difficulty of this situation is that cyberspace, a term which is used to refer to the virtual space where the Internet communication takes place (Sterling, 1992; Graham, 2013), is getting more and more complex. Maes (1994) has argued that cyberspace is overwhelming for people to deal with, no matter how well the interfaces are designed. Users retrieve an abundance of information, yet the consequential diversity and complexity of the information results in difficulties for people to productively identify what is most useful and relevant for them (Bignell, 2005; Ramparany, Ortholand and Louis, 2008).

The situation has become even more difficult within the context of the Web 2.0 (Ramparany, Ortholand and Louis, 2008). Particularly in social network services such as Facebook, which are defined as "web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection and (3) view and traverse their list of connections and those made by others within the system" (Boyd and Ellison, 2007), the profile of a person continuously and rapidly changes whereas the information or description from a traditional website remains fixed (Ramparany, Ortholand and Louis, 2008). The complexity issue is also associated with multiple identifications as users must manage their friends, connections, contacts or networks separately for each service (Norman, 2011). The problematic phenomenon is commonly referred to as the "walled garden" issue (Yeung *et al.*, 2009).

In order to address the complexity issue, software agents such as buyer agents, user agents, monitoring-and-surveillance agents and data mining agents have been utilised for serving and supporting people (Haag, Cummings and McCubbrey, 2004) and for preventing people from being confused or overwhelmed (Suchman, 2007). Software agents are defined as "software entities that carry out some set of operations on behalf of a user or another programme with some degree of

independence or autonomy and in so doing, employ some knowledge or representation of the user's goals or desires" (Gilbert *et al.*, 1995). For example, a recommender system, which is "an intermediary programme or an agent that intelligently compiles a list of requisite information which suits a user's tastes and needs" (Mittal *et al.*, 2010), has been a key approach to help users efficiently find friends, family members or professional connections in social network services (Wan *et al.*, 2013).

However, due to the monitoring-and-surveillance, data mining and autonomous nature of software agents, there have always been inevitable and potential hazards that are particularly related to the ethical issues (Haag, Cummings and McCubbrey, 2004; Bignell, 2005). Bignell (2005) also claimed that information technology developers often forget to examine the impact of the new and emergent technology of software agents and that software agent developers need to pay attention not only to technological details but also to the ethical concerns relating to their resulting impact. Considering the context, this paper aims to explore stakeholders' perspectives on the social network service environment through qualitative interview research, in order to identify possible prospective needs to consider for software agent design based on the understandings of the current situation from the macro-level. The research question addressed by the study was:

In the social network service sector, what will prospective users need from software agents in the near future?

2. Research Design

The study described in this paper employed a qualitative interview research method, because it is particularly suitable for a study which aims to explore a group of people's opinions about a specific matter/situation or to understand the respondents' world which is unknown to the researcher (Easterby-Smith, Thorpe and Lowe, 2002). Although the interview research method has a few

limits such as arduousness, time consuming process and difficulties in assessing reliability and validity (Stanton *et al.*, 2005), there are some significant merits as follows:

- Providing an effective way to collect a wide range of data (Stanton *et al.*, 2005)

- Uncovering new clues, opening up new dimensions of a problem and securing vivid, accurate and inclusive information that is based on personal experience (Burgess, 1991)

- No difficulty in missing returns which results in more effective control of samples (Kothari, 2004).

2.1 Stakeholder Model

A stakeholder is defined as "any group or individual who can affect or is affected by the achievement of the organisation's objectives" (Freeman, 1984). Despite the criticisms of stakeholder theory for lacking sufficient theoretical content (Key, 1999), the theory has its strengths in multiple distinct aspects such as descriptive, instrumental and normative (Donaldson and Preston, 1995). Prior to conducting the interviews, a stakeholder model was developed in order to structure the relationships among related stakeholder groups in a social network service sector and to logically recruit the stakeholders to interview (see Figure 1). The general approach was adapted from the study of Staniford *et al.* (2011) due to the similarity of the research method and stakeholder recruitment strategy.

Insert Figure 1 about here

As shown in Figure 1, the Organisation for Economic Co-operation and Development (OECD, 2007) has suggested in the report on the Web and user-created content that the key stakeholder groups within the context of the social network service can be classified into the following categories: business, government and consumer. Further, each stakeholder group can be subdivided

again into more detailed subcategories, which are adapted from existing studies and reports as follows:

- Business: Market research and/or Brand, Marketing, Product, Sales, Customer care, PR/Corporate communication, and Editors/Bloggers (Lippay, 2009)
- Government: Intergovernmental and international organisations, Governments, Private sector, Civil society, and Academic and technical community (WGIG, 2005)
- Consumer: Sporadics, Lurkers, Socialisers, Debaters, and Actives (Brandtzæg and Heim, 2011).

Through developing the stakeholder model it was possible to form the basis of a purposive sampling strategy (see Section 2.2) to recruit stakeholders who represent each subcategory. The stakeholder model therefore played an important role in covering all the possible areas in each stakeholder group so as to assist in reducing the sampling bias which often occurs when selecting interviewees.

2.2 Sample Size and Sampling Strategy

Based on the stakeholder model, a total of 21 stakeholders were recruited – 14 in the business and government stakeholder groups through LinkedIn, and seven in the consumer stakeholder group through Facebook. As an alternative to the sampling approach of quantitative studies in terms of the size, this study embraced a "theoretical saturation" concept which is the idea that researchers carry on sampling until no new or relevant data seem to be emerging (Strauss and Corbin, 1998). During the data collection process, the theoretical saturation was achieved before the sample size met the predetermined number of 21. According to Strauss and Corbin (1998), the data collection process should be stopped with saturated data. However, as shown in Figure 1, there are seven subcategories of the business stakeholder group, thus at least seven stakeholders in each group were required in order to cover all subcategories. In addition, to statistically analyse the perspectives of the three groups, the number of stakeholders in each group had to be constant. Therefore, the

sampling process carried on until the sample size reached 21 with seven stakeholders for each group. This number was considered adequate considering theoretical saturation and exploratory nature of analysis.

With regard to the sampling method, a purposive sampling strategy, which is one of the non-probability sampling methods often adopted by qualitative studies to select respondents who are relevant to the research topic area (David and Sutton, 2011), was employed in accordance with the responsibilities of the subcategories in the stakeholder model. Additional criteria including the business sector, market capitalisation and experience were considered to narrow down the target further and therefore to enhance the representativeness of the chosen stakeholders (see Table 1).

Insert Table 1 about here

2.3 Interview Type and Format

According to David and Sutton (2011), the interview type can be distinguished by two criterion, standardisation and structure. Standardisation refers to "the level of closure placed around the answers interviewees can give" and structure refers to "the degree to which the form and order of questions asked are kept identical from interview to interview" (David and Sutton, 2011). As this study focused on the exploratory analysis, open-ended questions, which allow interviewees to answer the questions with their accounts so that the researcher can identify insightful replies that are not covered by closed (or fixed-choice) questions (Bryman, 2004), were asked to the stakeholders, thus unstandardised.

In terms of the structure, the interviews were structured with a rigid sequence of questions for all stakeholders in order to compare the three stakeholder groups' opinions on social network service environments. The interview structure comprised the following five categories based on previous

reviews of social network services in order to explore from the current situation to the expected future of the social network service sector from the macro-level:

- Main stakeholders in social network service sector (OECD, 2007)

- Examples of software agents in social network services (Mavridis, 2011)

- Business/government strategy and customer experience (Boyd and Ellison, 2007; Morozov, 2013)

- Key issues in social network services (Preibusch *et al.*, 2007)

- Expected future of the Internet and social network service (Breslin and Decker, 2007).

Despite the same structure, different and flexible language or wordings were used for the same questions due to the different standpoints of the three stakeholder groups (Saunders, Lewis and Thornhill, 2012) and some prompts and probes were also used in order to elicit additional and detailed information depending on the initial replies (David and Sutton, 2011), thus semi-structured – in between structured and unstructured.

For coherence and consistency of the answers, only one interview format was used. An e-mail format was chosen in consideration of the stakeholders' availability, preferred choice and available time. Despite the lack of rapport between interviewer and interviewee (Bryman, 2004) and therefore an inability to collect tacit and non-verbal information (Selwyn and Robson, 1998), the e-mail interview format has some benefits due to the following reasons:

- It is not constrained by participants' geographical location or time-zone (Foster, 1994; Bryman, 2004).

- Interviewees' answers are often more detailed and considered than face-to-face interviews due to their greater commitment and motivation (Curasi, 2001).

- It does not require additional transcription so that the collected data can be analysed exactly as the participants had written. It not only saves the researcher's time and money but also

eliminates any errors which originate from incorrect transcription (Selwyn and Robson, 1998; Curasi, 2001; Bryman, 2004).

- The lack of rapport, mentioned above as a disadvantage of the e-mail interview, can be considered as a benefit as well, because it reduces the problem of interviewer effect (Boshier, 1990).

2.4 Recruiting and Data Collection Procedure

Using the purposive sampling strategy, initial contacts were made with professionals and users through LinkedIn and Facebook. Invitations were sent out one after another to 45 people in the business stakeholder group, 33 in the government stakeholder group and 16 in the consumer stakeholder group until the predetermined sample size of seven for each group was reached.

Once the stakeholders agreed to participate in the interviews, they were asked to provide the author with their e-mail addresses so that they could receive the questionnaires. The first questionnaires were sent out to the stakeholders from March to May 2013. Despite the e-mail format of the data collection method, the stakeholders were requested to answer the questions in a conversational style as the questionnaire consisted of open-ended questions. The stakeholders responded within one to two weeks, and the second questionnaires were sent out promptly to the stakeholders for additional and detailed information depending on the initial replies to the first questionnaires – prompting and probing. The interview data yielded approximately 120 pages of narrative texts, and the qualitative data were managed using the NVivo 10 software (Bazeley and Jackson, 2013) for computer aided coding. In order to ensure the impartiality of the analysis, three design researchers with experience in qualitative analysis, ethnographic interviewing and content analysis worked as a team to code the data.

2.5 Data Analysis

Qualitative content analysis, which is a method to analyse written, verbal or visual communication messages (Cole, 1988), was employed for this study. According to Elo and Kyngäs (2008), qualitative content analysis can be a suitable strategy to analyse large volumes of textual data and to define fewer content-related categories from the data. Categories are the outcomes of the analysis which condensedly describe the phenomenon in a broad context (Elo and Kyngäs, 2008). Despite criticism of the qualitative content analysis method such as lack of detailed statistical analysis (Morgan, 1993), this study used the method due to several major benefits as follows:

- Content-sensitive method (Krippendorff, 1980)

- Flexibility of research design (Harwood and Garry, 2003)

- Resulting in simplistic description of data (Cavanagh, 1997)

- Understanding the meaning of communication (Cavanagh, 1997)

- Concerning meanings, intentions, consequences and context (Downe-Wamboldt, 1992).

As shown in Figure 2, the study described in this paper employed both deductive and inductive approaches to analyse the interview data. The deductive approach is often used when existing data need to be retested in a new context (Marci, 1988), thus it allows researchers to confirm an earlier theory or model (Burns and Grove, 2005). The first step of the deductive analysis was to develop an analysis matrix which includes the five categories mentioned in Section 2.3. After that, the interview data were reviewed for content and coded into the corresponding categories (Polit and Beck, 2004). The coded data were then included in the grouping step of the inductive approach in order to support the inductive content analysis process.

Insert Figure 2 about here

The inductive approach is to observe particular instances from the data and combine them into a general statement (Chinn and Kramer, 1999), which means the categories emerge from the data (Elo and Kyngäs, 2008). The first step of the inductive approach was open coding which refers to

the activity where the researcher makes notes and headings as necessary while reading a text (Elo and Kyngäs, 2008). After the open coding process, the headings were collected in coding sheets (Cole, 1988; Downe-Wamboldt, 1992) – this study used NVivo 10 software instead of coding sheets – and categories were generated at this stage (Burnard, 1991). As shown in Table 2, The generated categories with similar contents (subcategories) were grouped together as higher order categories (generic categories), and those categories were grouped again into even higher order categories (main categories). This process of generating and grouping categories is referred to as an abstraction (Dey, 1993; Robson, 2011).

3. Findings and Discussion

Table 2 presents the main categories, generic categories and subcategories which were defined by the analysis. In what follows a description is provided of the main findings, organised into individual sections and subsections based on the 'main category', 'generic category' and 'subcategory'.

Insert Table 2 about here

3.1 Comprehensive Understanding of Users' Perception of Privacy

Privacy Infringement

The stakeholders concurred that the privacy infringement is one of the most critical issues (N_B=7, N_G=7, N_C=7 – Each number indicates statistical results from business, government and consumer stakeholder groups).

"I think ethical issues around security and privacy are primary concerns of users and, therefore, regulators and policy makers. They are concerns that software agents should take very seriously". (Business)

"For users, the ethical issues like privacy are absolutely a big problem". (Government)

"I think the privacy issue of social network services is the most imminent problem of today". (Consumer)

As Morozov (2013) claimed that "our contemporary privacy problem is not contemporary", the discussions on privacy have historical origins in Aristotle's distinction between political activities and private life (DeCew, 2013). The privacy issues have also been in existence since personal computers were popularised. According to Spinello (2011), computerised and digitised personal information has been efficiently and economically collected, stored and retrieved due to database technology. Moreover, easy transmission of digital information, which was caused by the advent of the Internet, accelerated the threat to privacy. Such sort of phenomenon has led philosophers to re-examine the concept of privacy and to define the word 'privacy' from three different aspects (Bynum, 2011): control over personal information (Westin, 1967; Miller, 1971; Fried, 1984; Elgesem, 1996), restricting access to information (Moor, 1997; Tavani and Moor, 2001; Tavani, 2007) and privacy in public (Nissenbaum, 1998; Nissenbaum, 2004). Moreover, recent Web 2.0 technologies have evolved specifically to facilitate user-generated, collaborative and shared Internet content, which resulted in the privacy issues being broader and more complex even to ordinary users (Vallor, 2012; Morozov, 2013). Interestingly, those privacy problems were already forecasted by several scholars before their actualisation. For example, Baran (1967) in his essay not only foresaw the current phenomenon of cloud computing ("utility computing" in his words at that time) more than four decades ago, but also insisted the necessity of information privacy protection. Simitis (1987) also explored the same issue from Baran's view concerning the automation of data processing.

Interdisciplinary empirical studies on the privacy issues in social network services have also been conducted by a coalition of sociologists, social psychologists, anthropologists, media scholars and political scientists (Vallor, 2012). For example, in one of early studies on privacy in social network

services, Gross and Acquisti (2005) analysed 4,000 Carnegie Mellon University students' Facebook profiles, and identified that the potential threats to privacy were contained in the personal information on the site. Acquisti and Gross (2006) also argued that the high level of privacy exposure was caused by the fact that many users leave their address and class schedule, thus making it easy for potential stalkers to track them down. Although social network service providers have offered privacy options, they have failed to provide users with the flexibility users need to handle conflicts with friends who have different conceptions of privacy (Preibusch *et al.*, 2007). Moreover, Fogel and Nehmad (2009) claimed that social network service users are found to expose higher risk-taking attitudes than individuals who are not members of social network services. A few years after the inception of the social network service, Boyd and Ellison (2007) specified privacy issues of social network services: inadvertent disclosure of personal information, damaged reputation due to rumours and gossip, unwanted contact and harassment or stalking, surveillance-like structures due to backtracking functions, use of personal data by third-parties, hacking and identity theft.

Dilemma Between Networking and Privacy Concerns

The majority of the stakeholders also concurred that the issue of the dilemma between networking and privacy concerns appears to be inevitable (N_B=5, N_G=6, N_C=6).

> *"I think it's impossible to be completely safe with one's information online when the purpose of social network services is 'networking' with others". (Consumer)*

This issue is fundamentally caused by *quid pro quo*. For example, users disclose their personal information to other users within a service in exchange for the ability to see others' information and communicate with them. Moreover, social network services are usually based on the business model that users can use such services free of charge by agreeing that services can collect and analyse their personal information. The businesses make profits through providing third-parties, namely advertisers, with the collected/analysed user information so that the third-parties can deliver targeted advertisements to the users (Baym, 2011; Spinello, 2011). Government agencies, which are

generally supposed to be interested in policy, also use personal information to pursue their own programme (Morozov, 2013). For example, the Italian government is using a tool 'redditometro' to examine a taxpayer's expenditure in categories such as household costs, car ownership, vacations, gym subscriptions, mobile phone usage and clothing (Povoledo, 2013). The UK government's 'Behavioural Insights Team', which was inspired by Thaler and Sunstein's (2009) idea that "nudging" people's behaviour based on collected/analysed personal information could help solve various problems such as obesity, climate change and drunk driving, was also featured by Jones, Pykett and Whitehead (2013).

The issue of the dilemma between networking and privacy concerns is also consistent with studies on the dilemma between employing software agents and privacy concerns. On the one hand, a software agent is obviously one of the useful and effective tools for computing or Internet experiences considering the degree to which our day to day activities now take place within computing environments characterised by rapid change, large quantities of extraordinarily complex information and a lack of common organisational structures through which information may be accessed and managed (Dowling, 2000). On the other hand, as mentioned in the introduction, there have always been inevitable and potential hazards that are particularly related to privacy issues due to the monitoring-and-surveillance, data mining techniques and the autonomous nature of software agents (Haag, Cummings and McCubbrey, 2004; Bignell, 2005). The dilemma is thus whether the software agents will act in a correct and responsible manner in accordance with the users' objectives where new methods of information dissemination and filtering are required to assist with coping with the highly complex digital environment.

Need of Rigorous Privacy Policy

Given the above issues, the stakeholders concurred that stronger privacy policy or regulation would be necessary (N_B=7, N_G=7, N_C=7).

"In order to protect privacy, a strong and applicable privacy protection policy is essential".
(Business)

"Accompanying the change of the Internet and social network service, endless concern and even more rigorous security and privacy policies will be required". (Government)

"While there are more platforms for people to express themselves through technology, people will need more protection from unforeseen predators". (Consumer)

As mentioned, the privacy infringement in the social network service environment has been one of the serious issues since the inception of the services. Moreover, the issue has remained unattended due to the nature of social network services which is socialising with others online, thus users have to expose their highly personal information to their friends, or even to strangers (Acquisti and Gross, 2006). In this sense, it is no wonder that the privacy infringement issue was identified through the interviews. However, it would be impossible to stop people using social network services only because of privacy concerns. The fact that people use such services confronting the threat to privacy, can possibly mean that users acquire something that is irresistible through them. Therefore, rigorous implementations of privacy policy would still be beneficial for the social network service users.

The main point is that, as there have been successive and numerous philosophical debates on privacy since Aristotle, there is still confusion with the meaning, value and scope of the concept of privacy (DeCew, 2013). It means that each social network service user may have a different perception and value of privacy. It is also still ambiguous to what extent it is privacy infringement and to what extent it is not. Moreover, a single user would apply different privacy standards to his/her social network service usage depending on his/her motivations for different services. To implement rigorous privacy policy, therefore, it would be essential to understand not only fundamental knowledge of privacy but also how users perceive privacy, how they value privacy and

how their privacy standards differ depending on the motivations for service usage. Therefore, the first proposition is suggested as follows:

- Proposition 1: Detailed and comprehensive understanding of users' perception of privacy would be beneficial to implement rigorous privacy policy.

3.2 User Type Recognition Algorithms for Software Agent Development

Difficulties in Providing Customised Services

On the assumption that the first proposition is fulfilled, it would be possible for businesses to provide consumers with customised services based on not only each user's different perceptions of privacy but also a single user's various standards of privacy policy for different service usage motivations. However, the majority of the stakeholders concurred that there has not been such an approach (N_B=5, N_G=5, N_C=6).

"We don't do anything to fulfil the diverse needs of each user type at the moment. I think it is impossible ... to consider each user's needs". (Business)

"We don't apply separate policies. We apply all the same policies with the identical basis". (Government)

"I don't think social network service providers recognise different types of users and provide customised service for different types of users at the moment". (Consumer)

According to Brandtzæg and Heim (2011), one of useful means for researchers, designers and managers to understand users is to classify them into meaningful categories through a segmentation. For example, Office of Communication (Ofcom, 2008), the communications regulator based in London, UK, suggested five distinct groups of social network service users based on their behaviours and attitudes through qualitative research:

- Alpha socialisers (a minority): use social network services in intense short bursts to flirt, meet new people, and be entertained.

- Attention Seekers (some): crave attention and comments from others, often by posting photos and customising their profiles.

- Followers (many): join social network services to keep up with what their peers are doing.

- Faithfuls (many): typically use social networking services to rekindle old friendships, often from school or university.

- Functionals (a minority): tend to be single-minded in using social network services for a particular purpose.

Recently, Brandtzæg and Heim (2011) highlighted that existing user typologies related to social network service were mostly based on qualitative research, and that Ofcom's study was the only one that addresses social network service specifically. Through an empirical study, they suggested five types of social network service users in order to divide the various users' behaviours into meaningful categories: sporadics, lurkers, socialisers, debaters and actives. Figure 3 presents how the five user types link to participation level and modes of participation.

Insert Figure 3 about here

- Sporadics (19%) visit social network services only from time to time. They have a low level of participation and tend more towards an informational mode since they use it most of all to check their status and to see if somebody has contacted them.

- Lurkers (27%) are the biggest group of the five user categories. They are quite low in participation, and participate in activities that are more related to recreation. These users are involved in several activities passively.

- Socialisers (25%) are the second biggest user type. Their behaviour is characterised as recreational in terms of small talk with others, but the users' participation level is high.

- Debaters (11%) have a similar participation level to socialisers, characterised by being highly involved in discussions, reading, and writing contributions in general. In addition, this participation mode is related to a more informational practice.

- Actives (18%) are engaged in almost all kinds of participation activities within the service. They socialise, debate, and engage in several other activities, and even in killing time (as do lurkers).

However, studies on the user types of social network services, including Brandtzæg and Heim's research, are often confined to the classification itself, and it was not possible to find further research that suggests enhanced service strategies which are supported by the results. This indicates that it could be novel and beneficial if customised services are offered on the basis of the classified user types, which is generally referred to as "personas" (Cooper, 1999) in design field.

Software Agents for User Type Recognition

Given that classifying users into categories is a useful way to understand them, what method would be within the bounds of possibility for businesses to understand the user type within social network services and to offer users customised services? The majority of the stakeholders concurred that it would be beneficial to design software agents in social network services to recognise the user types (N_B=5, N_G=5, N_C=6).

"If there were reasonable and acceptable categorisations of user types in particular circumstances, it would be very beneficial to design the recommender systems from their point of view". (Government)

"I think an automatic recognition system for different type of users with their social network service usage and followed by customised services for different types of users will fulfil the needs of users better than the more generalised services that social network service providers are offering at the moment". (Consumer)

The thing to consider in this argument is that it would be inevitable to develop an automated user type recognition system accompanied by some features such as monitoring-and-surveillance, data mining and autonomous nature. Ironically, these features are fundamental characteristics of software agents (Gilbert *et al.*, 1995; Franklin and Graesser, 1996; Haag, Cummings and McCubbrey, 2004) as well as the factors that menace privacy as Zarsky (2013) claimed, in his recent paper suggesting transparency of automated prediction system, that non-interpretable process of data mining might elevate privacy risks, which is referred to as the "deficit of democracy" (Morozov, 2013). Spinello (2011) also emphasised that services based on collected personal behavioural data have obvious risks of manipulation due to the possibility of "subtle exploitation of a user's needs and desires". Therefore, the 'rigorous privacy policy' argued in section 3.1 should be a prerequisite for the following second proposition:

- Proposition 2: Implementation of user type recognition algorithms for software agent development would be beneficial to understand social network service users' perception of privacy and to provide them with customised services.

3.3 Existing Software Agents Enhancement

Market Saturation in Social Network Service Sector

The majority of the stakeholders emphasised the meaninglessness of another new service similar to existing and dominant ones such as Facebook (N_B=5, N_G=4, N_C=6), and mentioned a need for innovative and differentiated service to compete with existing services (N_B=3, N_G=3, N_C=4).

"From the users' point of view, there is no reason for them to choose the new services with the same features as Facebook because most people use Facebook". (Business)

"New services will have to offer users innovative and differentiated features in order to compete with existing services". (Government)

It could mean that it is unlikely to expect completely new and innovative services namely market saturation, as one participant from the consumer stakeholder group answered that:

"It may not be economical, timely or reliable to research, hire and start new products/services to those offered by the social network company. Instead, hiring/partnering with/acquiring a software agent to grow/maintain a happy customer base".

In this sense, the research described in this paper suggests that it would be reasonable to investigate how to enhance existing software agents in social network services in terms of privacy protection and user type recognition rather than to suggest a completely new service model. Therefore, the following section will deal with two software agents in social network services which were noted by the majority of the stakeholders in the interviews – recommender system and personalised web feed.

Notable Software Agents in Social Network Services

One of software agents commonly perceived by the majority of the stakeholders was a recommender system (N_B=4, N_G=5, N_C=6).

"The social network service providers, through a software agent, recommend new groups which I might be interested in". (Consumer)

A recommender system provides users with information which might interest them through using its artificial intelligence (Mittal *et al.*, 2010). The term 'recommender system' was coined by Resnick and Varian (1997) for a system that gives personalised recommendations to stakeholders. A recommender system uses the input data to predict users' potential likes and interests, thus users' past evaluations are typically an important part of the input data (Lu $\square$ *et al.*, 2012). In detail, latent user preferences are assumed to be indicated by a wide range of observable data: features of the user, features of the items purchased by the user, behaviour of users with similar preferences, etc. (Huang, Chung and Chen, 2004). According to Arazy, Kumar and Shapira (2010), therefore,

recommender systems play a significant role in reducing information overload in cyberspace, which has resulted in them becoming one of the important topics of academic research (Adomavicius and Tuzhilin, 2005). Many recommender systems have been implemented for various types of items such as newspapers, research papers, e-mails, books, movies, music, restaurants, Web pages and other e-commerce products (Mittal *et al.*, 2010). Suggestions for books on Amazon, or movies on Netflix, are examples of the recommender system in reality (Melville and Sindhwani, 2011). As mentioned in the introduction, the recommender system is also widely used in the social network service environment to allow users to find their potential friends. Given that the number of social network service users is still increasing and they make more connections with others through such services, it is obvious that the recommender system is one of the most indispensable software agents in social network services.

A personalised web feed (or news feed), one of common functionalities in social network services through which users can read aggregated updates of their friends or their favourite news sources (Bao, Mokbel and Chow, 2012), was also perceived as one of software agents in social network services by the majority of the stakeholders (N_B=4, N_G=2, N_C=3):

> *"Making a personalised news feed for a billion people can be tricky, but it's a super fun experiment because the software agents know what people need, and are constantly enhancing their functionality through machine learning". (Business)*

The software agents for web feeds learn from users' behaviour, which confirms the autonomous, continuous, proactive and reactive characteristics of software agents (Franklin and Graesser, 1996). Technologically, what enables the web feeds is an 'application programming interface (API)'. The API, not a user interface but a software–software interface, allows communications between different applications or websites without any human intervention (Hsu, 2013). The personalised web feeds employ these APIs provided by various sources, and list specific contents that the users might be interested in based on their previous behaviour. In addition, the application that creates a

new single webpage by combining contents from various sources is called a "mashup" (Murugesan, 2007). As an extension of this idea, Bao, Mokbel and Chow (2012) proposed a new platform called "GeoFeed" which allows users to retrieve more dynamic updates from the web feed based on the users' geographical location rather than a static point.

Given the current situation of the mass of information on the Internet these days, particularly for those who manage hundreds of connections in social network services, the personalised web feed can be considered as one of the essential software agents. Therefore, the third proposition is suggested as follows:

- Proposition 3: Enhancement of recommender systems and personalised web feeds in terms of privacy protection and user type recognition would be beneficial in the saturated social network service market.

4. Conclusion

The aim of the study was to comprehend stakeholders' perspectives on the social network service environment through qualitative interview research, in order to identify possible prospective needs to consider for software agent design based on the understandings of the current situation from the macro-level. Twenty-one stakeholders, belonging to three key stakeholder groups, were involved for the interviews in this study. Three main categories emerged from the collected data: comprehensive understanding of users' perception of privacy, user type recognition algorithms for software agent development and existing software agents enhancement. As a result, three theoretical propositions were identified based on the qualitative content analysis approach as follows:

1. Detailed and comprehensive understanding of users' perception of privacy would be beneficial to implement rigorous privacy policy.

2. Implementation of user type recognition algorithms for software agent development would be beneficial to understand social network service users' perception of privacy and to provide them with customised services.

3. Enhancement of recommender systems and personalised web feeds in terms of privacy protection and user type recognition would be beneficial in the saturated social network service market.

Synthesising the above propositions, the answer to the research question is suggested with a single statement as follows:

Prospective users of social network services would need a software agent which recognises the user type and integrates key features of both recommender system and personalised web feed so as to fulfil users' various needs as a consequence of different perceptions of privacy.

Therefore, it would be beneficial to empirically observe social network service users' behaviour while interacting with the services or software agents, in order to identify the detailed attributes and factors which affect user perception of privacy, user type recognition and software agent ability in social network services.

References

Acquisti, A. and Gross, R. (2006). Imagined communities: Awareness, information sharing, and privacy on the Facebook. *Proceedings of the International Workshop on Privacy Enhancing Technologies.* Cambridge, UK, 36-58.

Adomavicius, G. and Tuzhilin, A. (2005). Toward the next generation of recommender systems: A survey of the state-of-the-art and possible extensions. *IEEE Transactions on Knowledge and Data Engineering, 17 (6)*, 734-749.

Arazy, O., Kumar, N. and Shapira, B. (2010). A theory-driven design framework for social recommender systems. *Journal of the Association for Information Systems, 11 (9)*, 455-490.

Bao, J., Mokbel, M. and Chow, C. (2012). GeoFeed: A location-aware news feed system. *Proceedings of the IEEE International Conference on Data Engineering.* Arlington, VA, USA, 54-65.

Baran, P. (1967). The future computer utility. *The Public Interest, Summer*, 75-87.

Baym, N. (2011). Social networks 2.0. In M. Consalvo and C. Ess (Eds.), *The handbook of internet studies* (pp. 384-405). Malden, MA, USA: Wiley-Blackwell.

Bazeley, P. and Jackson, K. (2013). *Qualitative data analysis with NVivo.* 2nd ed. London, UK: SAGE.

Bignell, K. (2005). Software agents: Ethical issues concerning agent autonomy. In M. Khosrow-Pour (Ed.) *Managing modern organizations through information technology* (pp. 549-552). Hershey, PA, USA: Idea Group Inc.

Bloomberg (2012). *Stock market & financial markets overview – Bloomberg.* Retrieved from http://www.bloomberg.com/markets/

Boshier, R. (1990). Socio-psychological factors in electronic networking. *International Journal of Lifelong Education, 9 (1)*, 49-64.

Boyd, D. (2008). *Taken out of context: American teen sociality in networked publics.* Doctoral Thesis, University of California, Berkeley.

Boyd, D. and Ellison, N. (2007). Social network sites: Definition, history, and scholarship. *Journal of Computer-Mediated Communication, 13 (1)*, 210-230.

Brandtzæg, P. and Heim, J. (2011). A typology of social networking sites users. *International Journal of Web Based Communities, 7 (1)*, 28-51.

Breslin, J. and Decker, S. (2007). The future of social networks on the Internet: The need for semantics. *IEEE Internet Computing, 11 (6)*, 86-90.

Bryman, A. (2004). *Social research methods.* 2nd ed. Oxford, UK: Oxford University Press.

Burgess, R. (1991). *Field research: A source book and field manual.* London, UK: Routledge.

Burnard, P. (1991). A method of analysing interview transcripts in qualitative research. *Nurse Education Today, 11 (6)*, 461-466.

Burns, N. and Grove, S. (2005). *The practice of nursing research: Conduct, critique and utilization.* 5th ed. St. Louis, MO, USA: Elsevier/Saunders.

Bynum, T. (2011). Computer and information ethics. In: E. Zalta (Ed.) *Stanford encyclopedia of philosophy*. Spring 2011 ed. Retrieved from http://plato.stanford.edu/archives/spr2011/entries/ethics-computer/

Cavanagh, S. (1997). Content analysis: Concepts, methods and applications. *Nurse Researcher, 4 (3)*, 5-13.

Chinn, P. and Kramer, M. (1999). *Theory and nursing: Integrated knowledge development.* 5th ed. St. Louis, MO, USA: Mosby.

Cole, F. (1988). Content analysis: Process and application. *Clinical Nurse Specialist, 2 (1)*, 53-57.

Cooper, A. (1999). *The inmates are running the asylum: Why high-tech products drive us crazy and how to restore the sanity.* Indianapolis, IN, USA: Sams.

Curasi, C. (2001). A critical exploration of face-to-face interviewing vs. computer-mediated interviewing. *International Journal of Market Research, 43 (4)*, 361-375.

David, M. and Sutton, C. (2011). *Social research: An introduction.* 2nd ed. London, UK: SAGE.

DeCew, J. (2013). Privacy. In: E. Zalta (Ed.) *Stanford Encyclopedia of Philosophy*. Fall 2013 ed. Retrieved from http://plato.stanford.edu/archives/fall2013/entries/privacy/

Dey, I. (1993). *Qualitative data analysis: A user-friendly guide for social scientists.* London, UK; New York, NY, USA: Routledge.

Donaldson, T. and Preston, L. (1995). The stakeholder theory of the corporation: Concepts, evidence, and implications. *The Academy of Management Review, 20 (1)*, 65-91.

Dowling, C. (2000). Intelligent agents: Some ethical issues and dilemmas. *Proceedings of the Australian Institute of Computer Ethics Conference.* Canberra, Australia.

Downe-Wamboldt, B. (1992). Content analysis: Method, applications, and issues. *Health Care for Women International, 13 (3)*, 313-321.

Easterby-Smith, M., Thorpe, R. and Lowe, A. (2002). *Management research: An introduction.* 2nd ed. London, UK: SAGE.

Elgesem, D. (1996). Privacy, respect for persons, and risk. In C. Ess (Ed.) *Philosophical perspectives on computer-mediated communication* (pp. 45-66). Albany, NY, USA: State University of New York Press.

Elo, S. and Kyngäs, H. (2008). The qualitative content analysis process. *Journal of Advanced Nursing, 62 (1)*, 107-115.

Fogel, J. and Nehmad, E. (2009). Internet social network communities: Risk taking, trust, and privacy concerns. *Computers in Human Behavior, 25 (1)*, 153-160.

Foster, G. (1994). Fishing with the net for research data. *British Journal of Educational Technology, 25 (2)*, 91-97.

Franklin, S. and Graesser, A. (1996). Is it an agent, or just a program? A taxonomy for autonomous agents. In J. Müller, M. Wooldridge and N. Jennings (Eds.), *Intelligent agents III: Agent theories, architectures, and languages* (pp. 21-35). New York, NY, USA: Springer.

Freeman, A. (1984). *Strategic management: A stakeholder approach.* Boston, MA, USA: Pitman.

Fried, C. (1984). Privacy: A moral analysis. In F. Schoeman (Ed.) *Philosophical dimensions of privacy: An anthology* (pp. 203-222). Cambridge, UK: Cambridge University Press.

Gilbert, D*., et al.* (1995). *Intelligent agent strategy.* Armonk, NY, USA: IBM Corporation.

Graham, M. (2013). Geography/internet: Ethereal alternate dimensions of cyberspace or grounded augmented realities? *The Geographical Journal, 179 (2)*, 177-182.

Gross, R. and Acquisti, A. (2005). Information revelation and privacy in online social networks. *Proceedings of the ACM Workshop on Privacy in the Electronic Society.* Alexandria, VA, USA, 71-80.

Haag, S., Cummings, M. and McCubbrey, D. (2004). *Management information systems for the information age.* 4th ed. Boston, MA, USA: McGraw-Hill.

Harwood, T. and Garry, T. (2003). An overview of content analysis. *The Marketing Review, 3 (4)*, 479-498.

Hsu, I. (2013). Personalized web feeds based on ontology technologies. *Information Systems Frontiers, 15 (3)*, 465-479.

Huang, Z., Chung, W. and Chen, H. (2004). A graph model for e-commerce recommender systems. *Journal of the American Society for Information Science and Technology, 55 (3)*, 259-274.

ITU (2013). *The world in 2013: ICT facts and figures.* Geneva, Switzerland: International Telecommunication Union.

Jones, R., Pykett, J. and Whitehead, M. (2013). *Changing behaviours: On the rise of the psychological state.* Cheltenham, UK: Edward Elgar.

Key, S. (1999). Toward a new theory of the firm: A critique of stakeholder "theory". *Management Decision, 37 (4)*, 317-328.

Kothari, C. (2004). *Research methodology: Methods and techniques.* 2nd ed. New Delhi: New Age.

Krippendorff, K. (1980). *Content analysis: An introduction to its methodology.* Beverly Hills, CA, USA; London, UK: SAGE.

Lippay, L. (2009). *Social media stakeholders in a medium-large company: Traditional vs. social media processes and data + social media involvement.* Yahoo Inc.

Lu□, L*., et al.* (2012). Recommender systems. *Physics Reports, 519 (2)*, 1-49.

Maes, P. (1994). Interacting with virtual pets, digital alter-egos and other software agents. *Proceedings of the Doors of Perception Conference.* Amsterdam, Netherlands. Retrieved from http://museum.doorsofperception.com/doors2/transcripts/maes.html

Marci, C. (1988). Using qualitative analytical techniques. In N. Woods and C. Marci (Eds.), *Nursing research: Theory and practice* (pp. 437-456). St. Louis, MO, USA: The C.V. Mosby Company.

Mavridis, N. (2011). Artificial agents entering social networks. In Z. Papacharissi (Ed.) *A networked self: Identity, community and culture on social network sites* (pp. 291-303). New York, NY, USA: Routledge.

Melville, P. and Sindhwani, V. (2011). Recommender systems. In C. Sammut and G. Webb (Eds.), *Encyclopedia of machine learning* (pp. 829-838). New York, NY, USA: Springer.

Miller, A. (1971). *The assault on privacy: Computers, data banks, and dossiers.* Ann Arbor, MI, USA: University of Michigan Press.

Mittal, N*., et al.* (2010). Recommender system framework using clustering and collaborative filtering. *Proceedings of the International Conference on Emerging Trends in Engineering and Technology.* Goa, India, 555-558.

Moor, J. (1997). Towards a theory of privacy in the information. *Computers and Society, 27 (3)*, 1-6.

Morgan, D. (1993). Qualitative content analysis: A guide to paths not taken. *Qualitative Health Research, 3 (1)*, 112-121.

Morozov, E. (2013). The real privacy problem. *MIT Technology Review.* Retrieved from http://www.technologyreview.com/featuredstory/520426/the-real-privacy-problem/

Murugesan, S. (2007). Understanding Web 2.0. *IT Professional, 9 (4)*, 34-41.

Nissenbaum, H. (1998). Protecting privacy in an information age: The problem of privacy in public. *Law and Philosophy, 17 (5/6)*, 559-596.

Nissenbaum, H. (2004). Privacy as contextual integrity. *Washington Law Review, 79 (1)*, 119-157.

Norman, D. (2011). *Living with complexity.* Cambridge, MA, USA: MIT Press.

OECD (2007). *Participative Web and user-created content: Web 2.0, wikis and social networking.* Paris, France: Organisation for Economic Co-operation and Development.

Ofcom (2008). *Social networking: A quantitative and qualitative research report into attitudes, behaviours and use.* London, UK: Office of Communication.

Polit, D. and Beck, C. (2004). *Nursing research: Principles and methods.* Philadelphia, PA, USA: Lippincott Williams & Wilkins.

Povoledo, E. (2013). Italians have a new tool to unearth tax cheats. *The New York Times.* 27 January. Retrieved from http://www.nytimes.com/2013/01/28/world/europe/italys-new-tool-for-tax-cheats-the-redditometro.html?pagewanted=all&_r=0

Preibusch, S*., et al.* (2007). Ubiquitous social networks: Opportunities and challenges for privacy-aware user modelling. *Proceedings of the Workshop on Data Mining for User Modeling.* Corfu, Greece.

Ramparany, F., Ortholand, J. and Louis, V. (2008). Mediating social networking using software agents: The carpooling use case. *Proceedings of the International Conference on Artificial Intelligence.* Las Vegas, NV, USA, 456-462.

Resnick, P. and Varian, H. (1997). Recommender systems. *Communications of the ACM, 40 (3)*, 56-58.

Robson, C. (2011). *Real world research: A resource for users of social research methods in applied settings.* 3rd ed. Chichester, UK: Wiley.

Saunders, M., Lewis, P. and Thornhill, A. (2012). *Research methods for business students.* 6th ed. Harlow, UK: Financial Times/Prentice Hall.

Selwyn, N. and Robson, K. (1998). Using e-mail as a research tool. *Social Research Update. (21)*. Retrieved from http://sru.soc.surrey.ac.uk/SRU21.html

Simitis, S. (1987). Reviewing privacy in an information society. *University of Pennsylvania Law Review, 135 (3)*, 707-746.

Spinello, R. (2011). Privacy and social networking technology. *International Review of Information Ethics, 16*, 41-46.

Staniford, L*., et al.* (2011). Key stakeholders' perspectives towards childhood obesity treatment: A qualitative study. *Journal of Child Health Care, 15 (3)*, 230-244.

Stanton, N*., et al.* (2005). *Human factors methods: A practical guide for engineering and design.* Aldershot, UK: Ashgate.

Sterling, B. (1992). *The hacker crackdown: Law and disorder on the electronic frontier.* New York, NY, USA: Bantam.

Strauss, A. and Corbin, J. (1998). *Basics of qualitative research: Techniques and procedures for developing grounded theory.* 2nd ed. Thousand Oaks, CA, USA: SAGE.

Suchman, L. (2007). *Human-machine reconfigurations: Plans and situated actions.* 2nd ed. Cambridge, UK: Cambridge University Press.

Tavani, H. (2007). Philosophical theories of privacy: Implications for an adequate online privacy policy. *Metaphilosophy, 38 (1)*, 1-22.

Tavani, H. and Moor, J. (2001). Privacy protection, control of information, and privacy-enhancing technologies. *Computers and Society, 31 (1)*, 6-11.

Thaler, R. and Sunstein, C. (2009). *Nudge: Improving decisions about health, wealth and happiness.* London, UK: Penguin Books.

Vallor, S. (2012). Social networking and ethics. In: E. Zalta (Ed.) *Stanford encyclopedia of philosophy*. Winter 2012 ed. Retrieved from http://plato.stanford.edu/archives/win2012/entries/ethics-social-networking/

Wan, S*., et al.* (2013). Informational friend recommendation in social media. *Proceedings of the International ACM SIGIR Conference on Research and Development in Information Retrieval.* Dublin, Ireland, 1045-1048.

Westin, A. (1967). *Privacy and freedom.* New York, NY, USA: Atheneum.

WGIG (2005). *Report of the Working Group on Internet Governance*. Château de Bossey, Switzerland: Working Group on Internet Governance.

YCharts (2012). *Internet content & information industry: Market cap and revenue quarterly*. Retrieved from
http://ycharts.com/industries/Internet%20Content%20&%20Information/market_cap,revenues

Yeung, C*., et al.* (2009). Decentralization: The future of online social networking. *W3C Workshop on the Future of Social Networking Position Papers.* Barcelona, Spain.

Zarsky, T. (2013). Transparent predictions. *University of Illinois Law Review, 2013 (4)*, 1503-1569.

Author Biographies

Hojung Kim is a Ph.D. student at the School of Engineering and Design. His research focuses on the role, impact and ethical issues of software agents in social network services to suggest possible benefits of the software agents through identifying users' behaviour, usage patterns, needs and perception of privacy.

Joseph Giacomin is a Professor and Director of the Human Centred Design Institute (HCDI), lecturing in Human Factors and specialising in Human Centred Design, Perception Enhancement and Energy Sixth Sense.

Robert Macredie is a Professor of Interactive Systems at the School of Information Systems, Computing and Mathematics. His research interests include human-computer interaction, information systems and virtual environments.
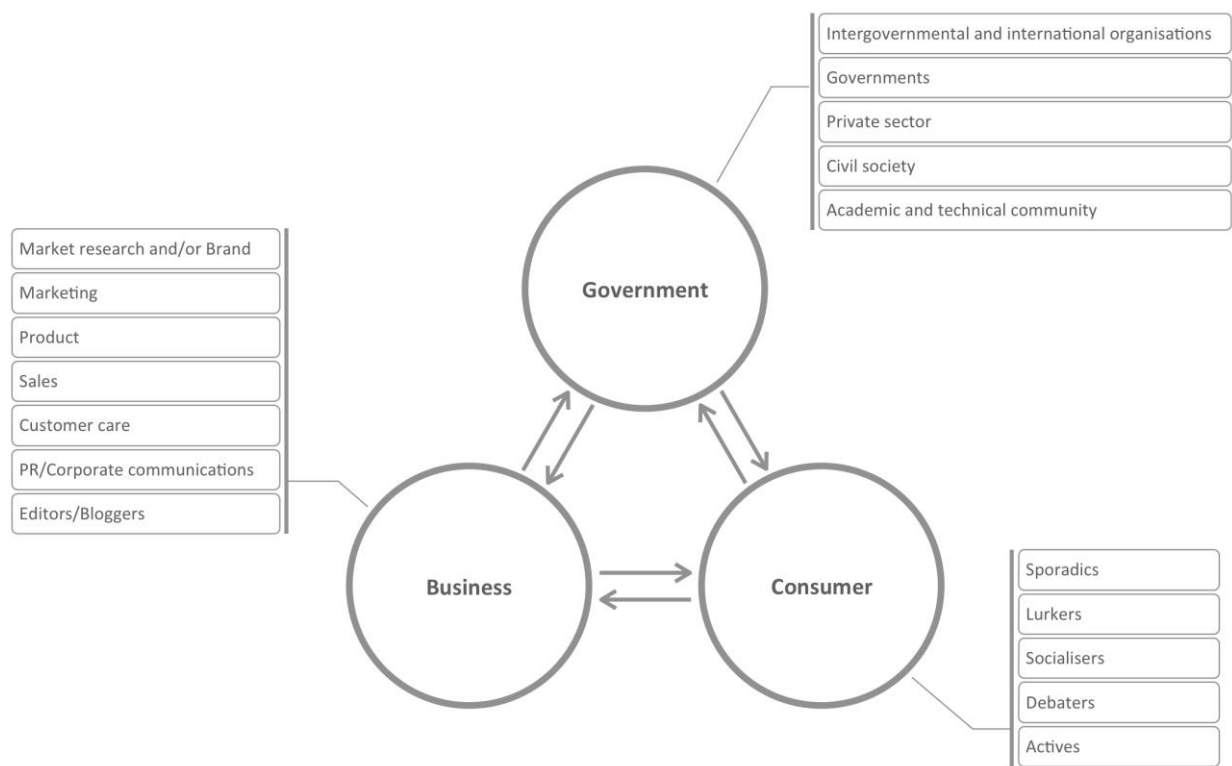
Figures

Figure 1

Figure 2

Deductive approach

Inductive approach

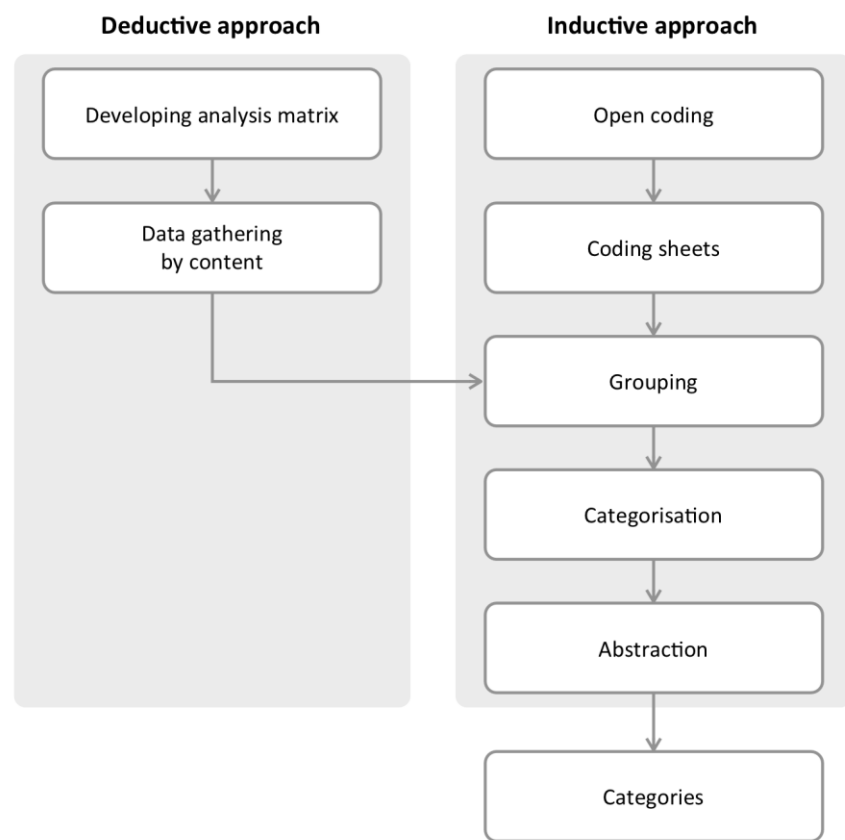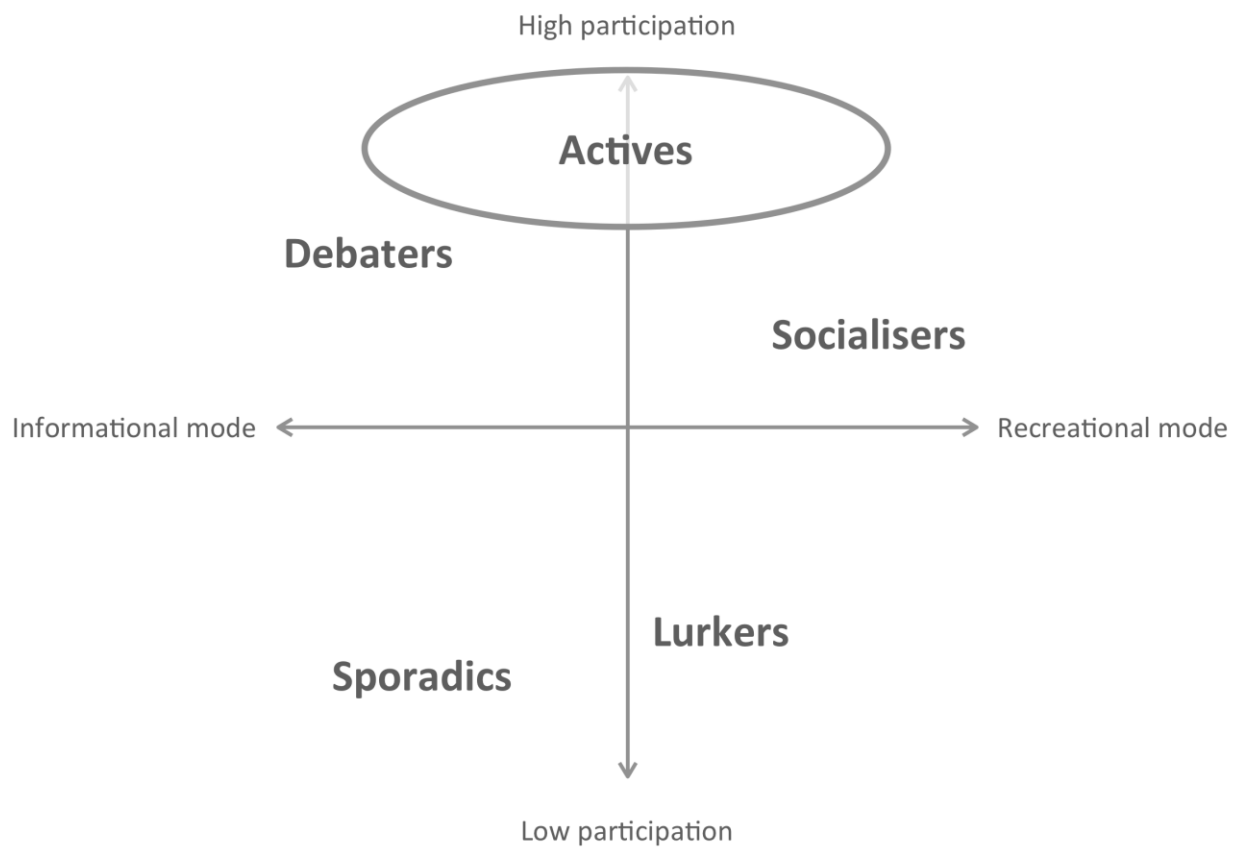| Deductive approach	Inductive approach
Developing analysis matrix	Open coding
↓	↓
Data gathering by content	Coding sheets
	↓
	Grouping
	↓
	Categorisation
	↓
	Abstraction
	↓
	Categories

Figure 3

Figure Captions

Figure 1. Stakeholder model in social network service sector (Source: WGIG, 2005; OECD, 2007; Lippay, 2009; Brandtzæg and Heim, 2011)

Figure 2. Process of qualitative content analysis (Source: Elo and Kyngäs, 2008)

Figure 3. How the different user types link to participation level and modes (Source: Brandtzæg and Heim, 2011) (Note: 'Actives' can be placed anywhere on the matrix, but they are high in participation in all activities.)

Tables

Table 1. Descriptions of Each Criterion for Narrowing Down the Interview Sample

Criteria	Qualifications	Reasons
Business sector	Web- and mobile-based services	Only mobile-based social network services are still in their infancy, thus providers that offer both web- and mobile-based services tend to have accumulated and sufficient experience.
Market capitalisation	More than $10 billion	According to Bloomberg (2012) and YCharts (2012), influential financial companies which provide market data and investment information, prevailing, experienced and long-lasting social network services worldwide have more than $10 billion market capitalisation.
Experience	More than five years	Most social network services that are currently in use have been in existence from 2003 onwards (Boyd, 2008), thus having more than five years of career or usage experience can result in haveing appropriate and sufficient knowledge.

Table 2. Categories Across Stakeholders Defined by the Interview Analysis

Subcategories	Generic Categories	Main Categories
Identity theft		
Unwanted disclosure of personal information		
Hacking	Privacy infringement	
Invisible features		
Unforeseen predators		
Sharing and socialising nature of social network services		
Inevitable privacy issue	Dilemma between networking and privacy concerns	
Impossible to be completely safe		Comprehensive understanding of users' perception of privacy
Users are keen to socialise with others		
Reassuring security		
Adequate privacy safeguards		
Users' risk awareness and appropriate privacy settings		
Users' responsibility for their own personal information	Need of rigorous privacy policy	
Policy for sharing information		
Rules/laws for sharing/owning information		
Security and privacy right education		
Businesses not considering the user type for customised services		
Governments applying all the same policies to every user	Difficulties in providing customised services	
Increasing difficulties in identifying users' varied behaviour		User type recognition algorithms for software agent development
Software agents which recognise the user type automatically	Software agents for user type recognition	
Software agents which assess users' personalities		

Expectation of more new functions added to the services		
No reason to choose new services with the same functions as Facebook	Market saturation in social network service sector	
Need of innovative and differentiated features to compete with existing services		Existing software agents enhancement
Need of enhanced software agents for innovative products and services		
Recommender system	Notable software agents in social network services	
Personalised web feed		

Table 2 (continued)