

2.1 Social Network Sites

During the first decade of the new Millennium, social network sites (SNS) have become a fundamental part of the web. At the time of writing, the most popular network Facebook has now more members than there are inhabitants of Europe⁷ and it is one of the most frequented web sites in the world.⁸ SNS offer novel communicative possibilities; above all they link-up its members and map their offline networks. This seems to offer an attractive potential for academic communication as well.

While it is undisputed that the well-known examples like Facebook, MySpace or the newcomer Google+ are SNS, the exact definition is less clear and unequivocal. Different authors use different versions of the term, from “social network services” or “sites” to “social *networking*”, “networking platforms”, “social network communities” and many more (cf. e.g. Mack et al. 2007; similar in German: Richter and Koch 2007; Schmidt 2009, 23). In most cases these terms are used synonymously. However, some authors also discuss differences:

“We chose not to employ the term ‘networking’ for two reasons: emphasis and scope. ‘Networking’ emphasizes relationship initiation, often between strangers. While networking is possible on these sites, it is not the primary practice on many of them, nor is it what differentiates them from other forms of computer-mediated communication (CMC).” (Boyd and Ellison 2007)

We shall leave open at this point whether Boyd and Ellison are right in assuming that SNS would prefer not to initiate relationships (see also Beer 2008; Fuchs 2009, 4ff.) and will follow, for pragmatic reasons, the terminology of these authors, because the term “social network site(s)” seems to be most widely used. Note, though, that the terms are not used uniformly in the literature, probably resulting from the technical complexity of the various platforms. Accordingly the cited literature in this chapter sometimes diverges from our understanding of the term. As SNS have multiple functions it is difficult to set a selective definition, hence it depends on the specific definition whether a platform will be counted as a SNS. For instance, Schmidt (2009, 23) focuses in his definition on the possibility to set up a personal “profile” with information about oneself, such as interests

⁷ www.socialmediaschweiz.ch/html/landerberichte.html.

⁸ In June 2011 Alexa has put Facebook on the second rank on its list of global top sites: alexa.com/topsites.

and activities, within a digital space that can usually only be reached after registration. Starting from this profile, users initiate and entertain social relationships to others, making them explicit through interlinking; the members interact and navigate on the platform, which is basically formed by these networks of “contacts” or “friends” (as they are called e.g. in Facebook). We find it necessary to focus on the central function of *profiles* in order to distinguish SNS from other services. Networking alone is also a characteristic of other platforms that are typically not seen as SNS, such as the voice-over-IP service Skype or the microblogging service Twitter. As for the latter, the profiles are minimalist and the timeline of messages, not the profile is at the center of the platform (cf. section 2.2). We observe that also in these other services increasingly SNS-like functions are added: for instance, Twitter now also offers automatic proposals for other users to follow. Therefore it may be very reasonable to call such services SNS and some of them gradually transform into one.⁹ However, in this chapter we focus on SNS in which *profiles of the users are central network nodes*, which can be addressed through various channels.

There are many differences between the various SNS, in particular when it comes to the available communication tools or how users can configure their profiles (cf. Boyd and Ellison 2007). Two core functions are always present: *identity management* and *contact management* (cf. Richter and Koch 2007). The profiles map—more or less in the public domain—the contacts of a person and enable access to further members on various paths, i.e. networking. See Figure 3 below for a screenshot of a profile in ResearchGate, a SNS specialized on academia.

As the technical functionality and target groups vary, we may distinguish different types of SNS: There are variations according to the *intended usage forms*. In some SNS private purposes prevail (e.g. MySpace), in others professional fields of application dominate (e.g. Xing, LinkedIn, ResearchGate); in others private and professional use overlap (e.g. Facebook, Google+). *Requirements for access* also vary: some are open, that is they only require a simple registration which, in principle, can be done by all Internet users (cf. Richter and Koch 2008). This is the case with many popular SNS (e.g. Facebook, MySpace). Other platforms offer limited free access, but charge user fees for the full service (so-called “freemium” services; e.g. Xing). Finally there are specialized networks that are open only for certain

⁹ For example, the SNS “Tencent QQ” (qq.com), popular today in China, started as an instant message service (chatting platform), see Boyd and Ellison (2007).

communities, such as a company or research group (e.g. in Ning, a platform for customizable SNS, it is possible to establish such, mostly small SNS). The *available communication forms* vary according to different needs. For example, to nudge someone online (e.g. “poking” on Facebook or “gruscheln” on StudiVZ) is used in a private context, whereas many professional networks offer additional functions such as bibliographic search (for a detailed description of the various functions see below 2.1.1).

The screenshot shows the ResearchGate profile of Michael Nentwich. The profile includes a header with navigation tabs (Home, Researchers, Groups, Events, Literature, Jobs) and a sub-header (Overview, My contacts, My followers, My bookmarks, Colleague finder, Track invitations, Researcher's Profile). The main profile section features a profile picture, name, and contact information. Below this are sections for 'Personal Information', 'Research Experience', and 'Education'. The 'Personal Information' section includes a bio, research area, and science disciplines. The 'Research Experience' section lists various roles and institutions. The 'Education' section lists the College of Europe. On the right side, there are sections for 'Following Michael Nentwich', 'Contact connection', 'Contacts', and 'Groups'.

Figure 3: Detail of a profile in ResearchGate

Overview and timeline of SNS

Table 1 gives an overview of a series of relevant SNS with a focus on profiles; the table is not comprehensive and puts particular emphasis on science-related SNS.¹⁰ We distinguish between *general SNS*, characterized by

¹⁰ See also the category “Social Network Sites” of the Cyberlinks collection, listing a larger number of SNS with short descriptions and Internet addresses: www.oeaw.ac.at/cgi-

Table 1: Overview of SNS

<i>Name</i>	<i>Members</i>	<i>Access</i>	<i>URL</i>
<i>General SNS</i>			
Facebook	800.000.000	Free	facebook.com
MySpace	100.000.000	Free	myspace.com
LinkedIn	135.000.000	Premium	linkedin.com
Google+	40.000.000	Free	plus.google.com
VZ group	16.000.000	Free	www.studivz.net
Xing	11.400.000	Premium	xing.com
<i>Science-specific SNS</i>			
Mendeley	1.392.000	Free	mendeley.com
ResearchGate	1.200.000	Free	researchgate.net
Academia.edu	822.000	Free	academia.edu
Sciencestage	270.000	Free	sciencestage.com
Vivo	40.800	Free	vivo.ufl.edu
Nature Network	25.000	Free	network.nature.com
Epernicus	20.000	Free	epernicus.com
research.iversity	11.500	Free	iversity.org
LabRoots	4.000	Free	labroots.com
Research Cooperative	3.590	Free	researchcooperative.org
myExperiment	3.500	Free	myexperiment.org
arts-humanities.net	1.500	Free	arts-humanities.net
ScholarZ.net	433	Free	scholarz.net
Science 3.0	574	Free	science3point0.com
AtmosPeer	125	Free	atmospeer.net
iAMscientist	>100	Invitation	iamscientist.com
edumeres.net	100	Free	edumeres.net
EPTA Ning	87	Invitation	eptanetwork.ning.com
ScienXe.org	NA	Premium	scienxe.org
SciSpace	NA	Free	scispace.com
Ways.org	NA	Free	ways.org

Sources: For status quo of numbers of members see footnote 11.

usr/ita/cyber.pl?cmd=get&cat=64. A comprehensive list of general SNS can be found on Wikipedia: en.wikipedia.org/wiki/List_of_social_networking_websites; see also the list of German sites: netzwertig.com/2008/04/15/zn-aktuelles-ranking-149-social-networks-aus-deutschland.

11 All URLs have been last visited end of November 2011: Facebook: facebook.com/press/info.php?statistics; MySpace: [web.archive.org/web/20101104105953/](http://web.archive.org/web/20101104105953/http://) <http://>

their rather broad and not specified purpose of usage, and *science-specific* SNS, which have been developed with a view to serving academic purposes. Although only including a subset of existing SNS, the table gives an impression of the heterogeneity and quantity of the observed phenomena. They range from sites with less than hundred members to those serving millions. Note that due to the different available sources and methods the accuracy may vary and not all numbers are up to date. For a further discussion see 2.1.3).

The following Figure 4 shows that the very first SNS appeared as early as by the end of the 1990s, and that the big wave of formation started in 2002/2003. Interestingly, today's largest platform was founded only in 2004—also the year of the foundation of the two first science-specific SNS, Vivo and Ways.org. In the case of Vivo the implementation started at first locally, whereas the supra-regional start only took place in 2010. Summing up, most science-specific SNS have been founded from 2007 onwards; hence it is a relatively new phenomenon.

www.myspace.com/pressroom/fact-sheet (November 2010); LinkedIn: press.linkedin.com/about_de; Google+: mygoogleplus.de/2011/10/offizielle-google-plus-nutzerzahlen-40-millionen; VZ-Gruppe: meinvz.net/1/about_us/1/ (July 2010); Xing: corporate.xing.com/no_cache/deutsch/presse/pressemitteilungen; ResearchGate: researchgate.net/researchers; Mendeley: mendeley.com; Sciencestage: geozon.info/2010/04/15/comparison-chart-of-scientific-networks (April 2010); Academia.edu: academia.edu; Vivo: vivo.slis.indiana.edu/images/gallery/activity_poster.pdf (July 2010); Nature Network: network.nature.com; Epernicus: epernicus.com/about/public_site; Research. iversity: iversity.org/pages/digital-campus-opens-its-gates; LabRoots and myExperiment: see Sciencestage; arts-humanities.net: Procter et al. (2010, p. 41; June 2010); ScholarZ: scholarz.net/community_others/search (search for all members within the SNS); Science 3.0: www.science3point0.com/members; AtmosPeer: see Sciencestage; iAMscientist: iamscientist.com/people; Edumeres: according to Andreas L. Fuchs at the conference DigiWiss 2010 in Cologne, Sept. 21, 2010, www.scivee.tv/node/25099; EPTA Ning: eptanetwork.ning.com/profiles/members (only visible with registration); Research Cooperative: researchcooperative.org/profiles/members.

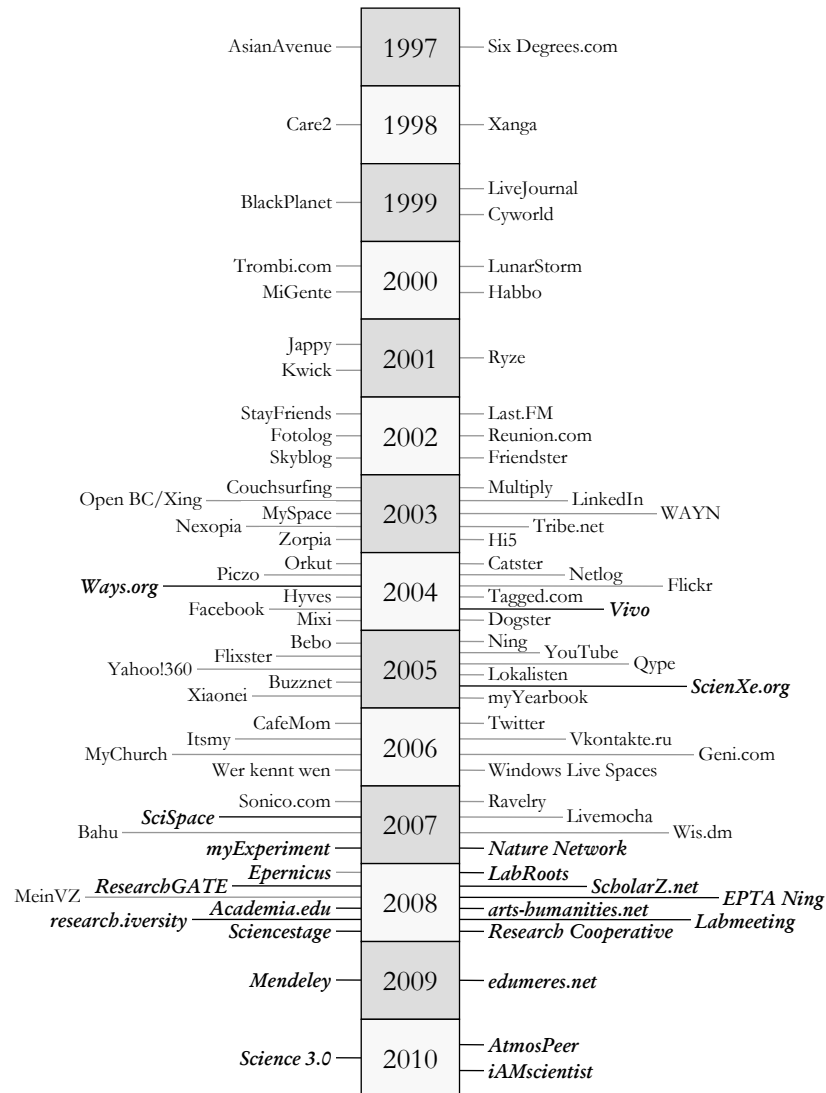


Figure 4: Examples of Foundations of SNS 1997–2010

Source: The figure is based on Heidemann (2010); science-specific SNS in bold and italics; amendments from 2008 onwards only for science-specific SNS. Note that the definition of SNS used by Heidemann partly differs from ours; therefore some not profile-centered platforms might be included here, too.

The economics of SNS

SNS differ with regard to their sources of funding. We observe roughly seven models, which are not mutually exclusive and are often combined:

- *User-specific advertisement*: The substantial data shared by the users gives a comprehensive picture of the interests of persons or groups. This makes them commercially attractive as it is possible to place personalized advertisement and gather valuable knowledge about markets. In order to attract as many people as possible, the network is usually for free in this model, but users have to allow analyzing their data. Therefore this has been labeled the “service-for-profile model” (Elmer 2004; Rogers 2009), as applied e.g. in Facebook, but also in other platforms, such as Google’s.
- *Scattered advertisement*: Apart from personalized advertisement, also less targeted, general advertisement may be presented, for example on start pages (e.g. StudiVZ).
- *Fees*: Some SNS charge fees for premium functions (e.g. Xing), such as specific services, or enriched profiles for commercial users. Some of the job exchange services are free for members, but not for those advertising jobs (e.g. Xing).
- *Subsidies*: Some SNS are financed via public money in the form of project grants (e.g. Vivo, research.iversity, ScholarZ.net).
- *Donations*: As the commercial models have often been criticized—in particular with regard to data protection and privacy issues of the service-for-profile model—some users are prepared to donate in favor of non-commercial offers. One trailblazer is Diaspora¹², which is being developed as a future competitor of Facebook. In order to raise donations, the Internet is used in the form of the so-called “crowd funding”.
- *Out of the marketing budget*: There are cases where SNS are seen as part of the public relations strategy of an institution or enterprise and is therefore funded from the marketing budget (e.g. NatureNetworks).
- *“Start-up”*: Frequently, SNS are set up as start-up companies, which invest first in the infrastructure and in collecting members. Only when the site has a large number of users—the SNS’ capital—it may generate earnings (e.g. ResearchGate, Mendeley).

¹² joindiaspora.com.

In the context of institutional academic usage of SNS it is mainly a policy decision which strategy to choose. Most existing general SNS, such as Facebook, have the advantage of a freely available infrastructure and a high number of users. The drawback is that one is dependent on a commercially oriented enterprise and that one has to accept its terms (this problem is, however, not specific to SNS platforms, but similar to other services, such as Google, see section 2.5). In contrast to commercial SNS, science-specific ones do not have to be conceptualized in terms of financial earnings, as long as they are financed by other sources, such as subsidies, fees or donations. Independently from the issue of sourcing, all SNS have to compete with other providers—unless this market pressure is suspended, for example when universities put pressure on their faculty to join a particular platform (e.g. Vivo). As the value of a SNS is crucially tied to the number and activity level of its members, it is not sufficient to provide an effective and well-financed infrastructure. The well-established incumbents have a considerable advantage presenting a barrier for market entry to all newly founded SNS. One should not underrate this factor given the many providers both on the general and the science-specific SNS market.

2.1.1 Main functions

Despite the differences between the SNS, a number of features can be observed repeatedly. In general, these services provide multiple channels allowing for various types of communication (for a typology of academic communication forms see Nentwich 2003, 30ff.): among users (one-to-one, one-to-many and few-to-few) and between users and machine (searching; proposals based on semantic algorithms). SNS provide for some known communication media (in particular web mail, chat) directly on the platform, others are only offered as links from the profile pages (e.g. Skype). In addition, the exchange of status messages and the integration of external microblogs increase the density of communication among those not present in the same place. In the following, we present the functions and forms of communication that are typical for SNS, though not all of them are necessarily available in each individual SNS (some are only available in certain science-specific SNS).

(1) *Profiles*: User profiles are digital representations of the users and as such the central nodes of SNS. The following kinds of information can be made available to other members in a pre-structured way:

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- Contact information (e.g. address, e-mail, phone, website)
 - Personal information (e.g. date of birth, interests)
 - Pictures of users and other photos
 - Status messages (microblogging on current events etc., indications regarding one’s professional and personal relationship status etc.)
 - Tracking of user activities (e.g. messages regarding changes of the profile, the joining of groups etc.)
 - Record of contacts, affiliation to groups etc.

In some SNS it is also possible to have specific profiles for organizations. In Facebook, for instance, these are called “pages”, but their structure and functions are similar to “groups” (see below). Thus profiles are like enhanced calling cards of individuals, organizations and groups. To some extent, it is possible to control the visibility of all or some specified data of the profile, for instance for all members of the SNS, or only for certain contacts/friends).

(2) *Communication*: Various web-based tools are available in order to communicate with other members:

- *Web-based messaging*: Bilateral sending and receiving of simple text messages between individual members or groups. Some platforms (e.g. Facebook) also offer e-mail addresses, hence allowing even non-members to contact their users.
- *Chatting*: Synchronous instant messaging among individual members (e.g. Facebook, Ning).
- *Discussion forums/groups*: Thematic groups offer a forum-like space for discussion and exchange.
- *Microblogging*: By writing textual status messages one can notify contacts/friends according to the one-to-many principle. Sometimes one can include pictures, videos and external links directly in the message; the messages of others may also be commented on. This can be done either via a platform-specific service or via linking up to other services. In ResearchGate, for example, one can send platform-internal messages to other services, or vice-versa one can integrate platform-external messages (e.g. from Twitter) in ResearchGate (for more information on microblogging and its academic potential, see 2.2).
- *Nudging functions*: Via “poking” (Facebook) one can make other members aware of oneself, without necessarily having any follow-up communication.

- Inclusion of *videoconferencing* tools (e.g. as add-on feature on the Ning platforms).

The integration of different communication channels within one platform is a distinctive feature of SNS, as compared to various other web-based communication tools.

(3) *Networking*: As networking is one of the basic functions of SNS, all sites offer various tools to promote it:

- *Contacts/friends*: Network members can add other members, represented by their profiles, as “contacts” (“friends” in Facebook) and administer them in lists and groupings. As a rule, the other member has to confirm the contact request; in some SNS it is possible to unilaterally “follow” another member (e.g. ResearchGate and Academia.edu).
- *Automated propositions*: On the basis of semantic analysis of the information given in profiles and the activities of the members, the SNS produces proposals for new contacts, related groups, interesting publications or events etc.
- *“Manual” propositions*: Other members can trigger requests and recommendations by themselves.
- *Search function*: Users may find members, groups etc. by search terms.
- *Automated search* of potential contacts is supported via the contact lists of one’s own e-mail, microblogging or other SNS’ account.
- *Invitation*: Users can invite potential new members via external mail (possible with most SNS), also with tracking of invitations (in particular with ResearchGate)
- *Bookmarking* of profiles, in order to keep persons in mind who are no contacts or whom one does not follow (e.g. ResearchGate).
- *Gift service*: User can give presents to other users (e.g. the “Give a gift” button in Ning).
- Automatically generated *requests* to welcome new members or propose something or someone to them (e.g. Ning, Facebook).
- *Network presentation* in various forms: as a list of all contacts or all members like a directory; visualization and analysis of one’s own network in form of an interactive picture (e.g. as a wheel with spokes in ResearchGate; as an additional application in Facebook, see Figure 5); in Academia.edu all institutions are presented as directory tree.

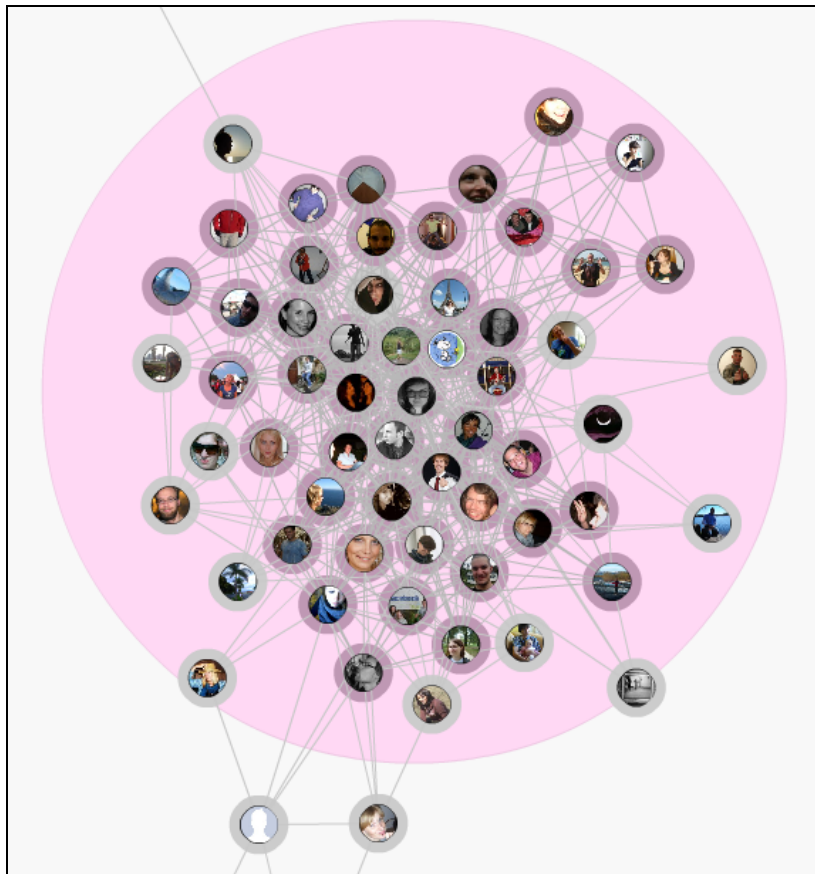


Figure 5: Network visualization by “Social Graph” in Facebook

(4) *Directing attention:* The great variety of opportunities to communicate and network in SNS suggests further tools to establish the relevance of content and to direct the attention of its members towards particular items. We observed the following:

- *Start page:* The personal start pages present in structured manner information about the current events within the SNS. They show status messages and further activities of one’s contacts as well as news, dates, contact requests, propositions etc.

- *External notifications*: Without being logged into the SNS, users are kept informed via e-mail of all kind of news (contact requests, group information and invitations, uploads, status messages, new events etc.).
- *“Like this” button/ “Share-this” function*: Contributions of other users may get additional attention by clicking on such buttons. This may concern individual comments or status messages, but also certain profiles, links to external offers etc. (e.g. Facebook, Google+, ResearchGate). The trailblazer is Facebook, which makes money by offering such buttons even on web pages outside the platform. These data may be used in the future as indicators for relevance, discussed under the label of *social search* (e.g. Biermann 2010).
- Special tools for *attention direction regarding literature* (see below).

(5) *Groups*: All users can found thematic groups. By usually offering the following functions, groups enable the detection of and networking with members with similar interests and they provide a digital environment for discussion and collaboration:

- *Discussion forum*: In the forum of a group members can write and read contributions in threads. Moderators with extended rights may facilitate the discussions.
- *File upload*: Users may upload documents, photos and other files in order to make them accessible to other group members. In this respect ResearchGate provides rudimentary version control, i.e. a tool to keep track of successive versions of a document; in ScholarZ.net the file archive has been developed into an information management tool, where users can attribute keywords, notes and projects to items in the archive with a view to integrating them directly in common texts. Ning offers the option to link directly to an external document management system.
- *Collaborative writing environments*: Some SNS offer for example a wiki tool or other collaborative online text editors¹³ (e.g. ScholarZ.net, arts-humanities.net, edumeres.net, Ning). In ScholarZ.net this function is implemented with further features, such as using notes to bibliographic quotes in common texts, which may be later exported for instance as a Word document.

¹³ E.g. Zoho writer (writer.zoho.com) or Etherpad (etherpad.org).

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- *Teaching and events*: There are special tools to administer participants in events (e.g. research.iversity; see also below).
 - *Selective access*: Groups may be open to everyone or made accessible by group members or the administrator only upon invitation or request. Thus it is possible to create protected work and discussion spaces.
 - *Passive membership*: Group memberships is usually shown on one's profile; even without one actively participating in the group; this serves as a tool to manifest one's interests or opinions.

(6) *Calendar*: Some SNS offer their users, in particular members of groups, calendars in order to coordinate dates, plan and market events of all kinds. We observed the following typical functions:

- Publish dates for events, meetings etc.
- Invite members to participate
- Register accept and decline (e.g. Facebook, research.iversity)
- Checking for dates in groups (similar to the service Doodle; e.g. ResearchGate)
- Exporting appointments to other digital calendar systems.

(7) *Literature-related functions*: Given the central position of publications in academia, science-specific SNS also offer a number of literature-related functions:

- SNS support *searching for academic literature* by giving access to other, external, mainly open access databases (e.g. ResearchGate), as well as internally in the publication lists and database entries of members (this is the main function of Mendeley).
- The platform automatically provides hints to other literature in the database by computing *semantic relationships* to the members' own publications. A special feature is the support of an author's search for publication opportunities based on a so-called "similar abstract search" or keyword search (e.g. ResearchGate).
- *Compiling bibliographies*: Science-specific SNS support the compilation of lists of one's own publications and of reading lists that may be published in one's profile. Mendeley, for example, is specialized in organizing quotes of academic literature for direct use in word processing software, similar to the EndNote plug-in for Microsoft Word.

- *Open access archive*: ResearchGate provides a platform for self-archiving of the full texts of one’s publications according to the principle of Green Road Open Access.
- A number of further functions help *direct attention to literature*: one receives notes when new literature in one’s area of expertise is published (e.g. Mendeley); there is a “Have read” button to highlight one’s reading (e.g. Academia.edu); one can comment on or rate database entries of literature; with the “Share this” function one can post a hint on literature found in the SNS, e.g. via an external microblogging service or in the framework of social bookmarking; some SNS offer access statistics to show what has been most frequently read or downloaded (e.g. ResearchGate, Academia.edu)
- Vivo offers a tool to *visualize networks of co-authors* (see Figure 6).

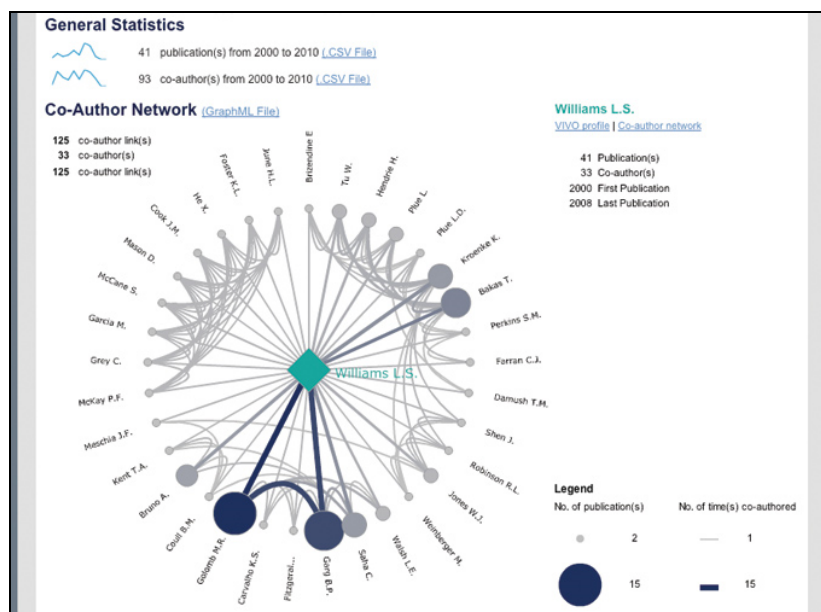


Figure 6: Co-author network in Vivo

Source: vivo.slis.indiana.edu/gallery.html#coauthor

(8) *Further services*: In addition to these functions, further specialized and target-group-specific services are offered:

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- *Job exchange* services help matching offer and demand for open academic positions.
 - *Blogging*: Some SNS offer their own blogging platforms and/or have collective blogs, edited by a board on the basis of blog posts on the platform (e.g. ResearchGate).
 - *Embedding of services of external providers*: Additional functions may be included in the SNS via so called “apps” (applications), thus creating interfaces between the SNS and other services (e.g. integrating Twitter or Academia.edu in Facebook) or providing additional possibilities. Most prominent are social games such as “Farmville” on Facebook, which also make use of the existing social networks of the platform.
 - *Advertisement*: It is partly possible to buy space for advertisement in SNS (e.g. for “pages” in Facebook; see above).

SNS members may also use many of these functions via specialized client software or browsers in mobile devices, thus connecting the members beyond their desktops.

2.1.2 Potential for science and research

Obviously the providers of science-specific SNS see a potential for academic use of these platforms and have consequently developed a series of sophisticated tools serving this very specific and demanding target group. A systematic analysis of the potentials for academic SNS use starts with the four core areas of scientific activity (see above 1.3) and reveals that SNS provide functions for all four areas, namely knowledge production, processing and distribution, as well as institutional settings (cf. Figure 7 below).

Knowledge production: The various functions of directing attention may be helpful in the process of acquiring information, particularly with regard to literature. Shared data archives potentially help working groups to administer their files.

Communication (processing of knowledge): The multiple possibilities for communication are the core of each SNS; thus these platforms are, at least from a technical perspective, functional for academic communication as well. Through the various channels, knowledge can be presented and offered for academic discourse. The group functions may support collaboration. We see a particular potential of integrated text editors to help organiz-

ing the collaborative production of texts within working and project groups.

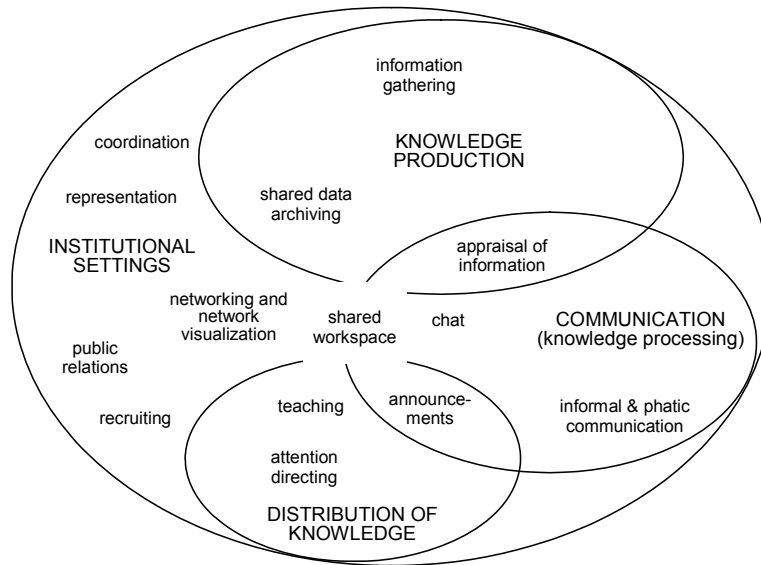


Figure 7: Scholarly activities and social network sites

Distribution of knowledge: SNS are not currently an adequate place for publication, even though in principle documents may be published within the network (e.g. file upload in groups; open access archiving in ResearchGate). However, as it is usually necessary to register, access to documents is hampered. In addition, there is no formalized peer review process in any of the observed SNS, thus the knowledge distributed via this channel will not be reputable and less relevant to many. Hence, publications within SNS seem inappropriate at the moment. By contrast, SNS may be a valuable additional channel for pointing at texts that have been published elsewhere. They provide a number of functions in that respect: profiles, means of internal communication, tools to direct attention, group functions and literature-related services. SNS may also be used as e-learning platforms.

Institutional settings: At the organizational level, SNS are potentially useful as a digital infrastructure. For example, SNS serve as a dynamic list of contacts and as “digital calling cards”. Obviously SNS may help to set up

networks of scientists with similar interests as a pool of potential cooperation and communication partners. Using SNS for public relations is another option. In particular academic organizations such as research institutes, universities, scholarly associations and networks, but also individual researchers may use SNS, in particular the general ones, as a platform for public outreach and prestige advertising. In this sense, SNS may be considered an additional “window in the ivory tower” (Nentwich 2010a, see also section 3.2).

Corresponding to these multiple options, different user practices are conceivable: SNS could serve multilaterally as a discussion forum or as a platform for exchange of information, similar to other web forums and in particular e-mail list-servers. Furthermore, they may be used as bilateral communication channel, asynchronously via web mail or synchronously as chatting platform. Finally, SNS may serve as platforms for microblogging to exchange science-related or day-to-day information, and for e-learning. Thus we note that SNS seem to be functional for a number of essential academic activities. We may expect that the technical functionality may increase as these sites mature, in particular when additional functions provided by external suppliers are integrated via the application programming interface (API).

2.1.3 Usage practices and impact

In the next step of our analysis we investigate how academics actually use and shape SNS. First, we consider the current diffusion of SNS in academia; second we analyze the usage practices that may be empirically observed, distinguishing between general and science-specific SNS.

The diffusion of SNS in academia and the intensity of usage

A first indication for the diffusion of SNS in the academic world is the number of members, mostly published by the SNS themselves, and their growth rates. ResearchGate, for example, had 150.000 members in August 2008, 700.000 in December 2010, and announced on the website a million by May 2011. We observed similar growth of other SNS (cf. Table 1), but the figures may not hold in practice, given their origin. The member count, in any case, does not necessarily correlate with actual use, because there

certainly are some (partly) inactive accounts. Therefore, more differentiated usage studies would be needed.

Nevertheless, some studies provide first insights into the diffusion of SNS among scientists. In an online survey among researchers of German universities ($n=2.361$) a majority of 64 percent indicated that they use “social networking tools”¹⁴ never or very seldom, and 23 percent answered that they use them often or very often (Koch and Moskaliuk 2009). This study, however, does not give any answers regarding the purpose of the SNS use; the average age of the respondents was rather low ($a=30,15$) and we may expect that usage is lower among older scientists. SNS use is much more widespread among students, as shown by a representative study for German universities (Kleimann et al. 2008): a majority of 51 percent ($n=4.400$) uses social communities such as Facebook or StudiVZ frequently or very frequently; among them are 34 percent whose use is study-related. We may expect that the proportion of SNS users among scientists will increase as the younger generations move up in academia. There is an online survey in British universities ($n=1.308$), of which the authors say it is “reasonably representative”, but note a “bias towards social sciences and economics” (Procter et al. 2010, 17). It shows that a significant minority of researches use “social networking services” in a broad sense: Facebook is used by 24 percent. We may, however, assume that most of this usage is not of professional, i.e. academic, but private as Facebook is a general SNS (but see below).

With regard to future studies we propose to differentiate types of activity levels and usage intensities, which we have observed:

- “*Me-too presence*”: These users just set up a rudimentary profile with only some basic data; they have only occasional contacts and never, or only sporadically, become active. This is probably the most frequent case, also in the science-specific SNS with huge numbers of members, such as ResearchGate and Academia.edu. These users rarely visit the SNS.
- “*Digital calling card*”: These users set up a more detailed profile with contact data, research interests, possibly a publication list—like a type of additional personal homepage or digital calling card. This type of user also practically never becomes active. This is probably the second

¹⁴ We cannot disregard the possibility that the study design or the participants referred to platforms that do not correspond to our above definition of SNS.

most frequent case at the moment. These members use the SNS seldom, perhaps only at the occasion of receiving a contact request or a direct message, forwarded by e-mail.

- *“Passive networking”*: In some cases the previous type of user searches the network in the beginning and thereafter in irregular intervals for other members whom she/he knows; or the user reacts to automated suggestions to contact other users. Then she/he either turns them into bilateral contacts or “follows” them unilaterally. This type of user visits the SNS irregularly and rather seldom and has sporadic communication with other members.
- *“Active networking and communication”*: Some SNS members are regularly online, use further services, such as publication search, and participate in group forums. They actively search for potential networking partners, beyond those they know in the offline world, in order to follow their activities or even introduce common ones.
- *“Cyberentrepreneur”*: A few are not only active participants in the network, but also serve as moderators or animators of group forums, they administer groups, are in charge of institutional profiles, or give feedback to the site developers. This is obviously the rarest form of participation of researchers in SNS (cf. Nentwich 2003, 175ff.).

These are certainly ideal types and in practice appear mixed. We observed repeatedly the above usage types, but cannot offer results regarding their precise empirical distribution. In any case we need to consider that the activity levels and usage types vary considerably. Consequently, member counts do not lead to insights into the vitality of a SNS. This is confirmed by the study of Procter et al. (2010, 19) on the scientific use of Web 2.0: only 13 percent of the participants fall into the category “frequent users”, 45 percent are “occasional users”, and 39 percent do not actively use Web 2.0. A large qualitative study with 160 interviews and focus group discussions with US researchers (Harley et al. 2010) notes that SNS are not widely used in academia—they investigated archaeology, astrophysics, biology, economics, history, musicology and political science. However, they also report exceptions, for example archaeologists who actively promote SNS in science (ibid., 96). Some interviewees noted that while they would not use SNS themselves, they nevertheless see a need for it; they wished for a “Facebook for researchers” (ibid., 583) or a “Facebook for astronomy” (ibid., 178).

At this point, we may draw the following conclusions: SNS are not yet part of the academic mainstream, but we observe growing numbers of members in science-specific SNS—a trend that will presumably continue in the future. This hypothesis is supported by our analysis of the theoretical potential (see 2.1.2), which is even acknowledged by non-users and by the forceful international trend of SNS in general. The more users SNS have, the greater their potential benefits. It nevertheless remains difficult to assess whether scientific SNS may reach the tipping point, because users may never experience the benefits as long as a certain threshold of users is not reached—despite all theoretical potential (cf. Harley et al. 2010, 686). For a further discussion of this issue, see also section 3.1.

Academic usage practices in general SNS

What is known of academic usage practices in SNS? If researchers decide to deploy SNS for professional purposes, they have multiple options to choose from. We distinguish between general or multi-purpose SNS, which can also be used for academic purposes, and those SNS that have been designed with researchers as the main target group in mind. Both types of SNS differ in what they offer for professional activities and consequently in usage practices, thus we shall analyze them separately, beginning with the general SNS.

Many scientists have become members of multi-purpose SNS, such as Facebook, LinkedIn and Xing, not least because they are widespread and accepted. Usage practices are heterogeneous because these SNS are not particularly focused on academic users. Consequently, academics use these services in a variety of ways, hence it is difficult to separate professional and private identities or roles.¹⁵ There are techniques to enable users to separate their roles; Facebook, for example, allows users to exclude in part or fully other members from otherwise public messages or to make certain content only available to pre-defined groups of contacts. Nonetheless, this is no simple task and there are multiple privacy conflicts as noted by many authors (among others Ferdig et al. 2008; Lehavot 2009; Lewis et al. 2008;

¹⁵ By “identity” we mean the reference to a real person with its correct name and real attributes; “roles” point at the option that persons may play different social (private, professional, etc.), but also fictitious roles, whereby they are able to delimit these roles from each other in the SNS.

Barnes 2006; Fuchs 2009; Cain et al. 2009; Lack et al. 2009). We shall return to this issue in section 3.5.

We observed the following science-related practices in SNS: communication with colleagues, e-teaching, public relations of research institutes and self-marketing, job exchange:

Communication with colleagues: We found that general SNS are not only used by academics for private or non-professional purposes, but to some extent also for bilateral and multilateral communication among colleagues using the different channels introduced above. In Facebook, for example, there are many thematic groups, in which experts communicate alongside lay people. The experts exchange hints to scientific events or new sources etc. In part, information from other sources, such as specialized news networks, is fed into the forum by automated robots. Analyzing the content of the information exchanged in such open groups, we conclude that they are mostly targeted at the professional communities and may not be considered part of public relations activities (see below). While the members of such groups are rather unspecific and broad, and group discussions are not used intensively by many, one can also find closed science-related groups, in which academics tackle certain research questions in a more shielded environment.

E-teaching: As SNS are widely spread and accepted among students, some teachers experiment with these platforms for e-teaching: an option is to organize group work among students; another is to promote exchange both between the teacher and the students and among the latter. Some report experiments with tutoring at a distance (Griffiths and Brophy 2005, 80). University libraries also attempt to reach students via SNS: “If librarians truly wish to be where students are, Facebook is an effective way to reach them” (Mack et al. 2007). While there are indeed some success stories (Mack et al. 2007; Mathews 2006), others report of students who reject this channel especially because of a perceived threat to their privacy (Connell 2009; Mendez et al. 2009).

Public relations: The wide reach of the big SNS makes them attractive to target a large part of the public. Indeed, many scientific organizations are present in SNS such as Facebook with pages, groups and profiles. We know of one example of an extra-university social science institute in Austria, whose staff have been asked to become members of Xing and a group

devoted to this institute.¹⁶ The German-speaking community of technology assessment discussed the necessity not to neglect the new Web 2.0 platforms (including SNS and Wikipedia) because of their potential medial outreach (cf. Nentwich 2010b). Similar to our observations regarding Twitter (see 2.2.3), it is not always clear who is responsible for these Web 2.0 representations. Often they have been founded by students and not on the initiative of the public relations department; hence one does not necessarily find official positions. However, also in this context, we observe a tendency towards formalization. Some SNS allow verifying such offerings; so-called “Edelprofile” (“classy profiles”) are, for example, used for official appearances of universities in StudiVZ.¹⁷ As a consequence we have a heterogeneous picture consisting of professional representation handled by public relation departments and unofficial groups in which students exchange information about study-related issues, opinions about university politics, practical advice regarding the university etc. It seems likely that academic organizations will become increasingly aware of the impact of these platforms. Correspondingly, we expect more and more formalized institutional appearances and SNS optimization strategies.

Job exchange: In this context academic job advertisements are communicated. In the professionally-oriented SNS Xing, in particular, these are posted in science-related groups. SNS with a large scope, such as Facebook, may serve as multipliers. As an example, the career portal *academics.de* publishes advertisements and news via Facebook so that they can be further distributed by other members.¹⁸ In addition, job opportunities are also a frequent topic of messages distributed in SNS, apart from these “official” channels. For instance a researcher, interviewed by Harley et al. (2010, 178) stated:

“I think there’s a fair amount on MySpace that goes on by kids younger than me... it’s not my generation, but I think... I remember being told when students were deciding what department they were going to go to for a Ph.D., other students knew via the MySpace universe.”

¹⁶ Source: Oral communication of a member of the said institute in December 2010.

¹⁷ studivz.net/Sitemap/All/category/65/o/desc/c/cnt/p/1; similar “verified accounts” in Twitter, see 2.2.1. In practice, it may, however, be difficult for a scientific institution to control an institutional profile by itself. SNS such as Facebook are not equipped to conduct the verification of identities or handle disputes over trademarks adequately.

¹⁸ facebook.com/academics.de.

Self-marketing: Individuals seize the opportunity offered by wide reaching SNS to promote themselves, as a kind of “individualistic public relations”. While the accessibility of personal data may be disadvantageous from the point of view of privacy protection (see 3.5), it may also be used in a positive manner. It is possible to generate publicity for oneself and reach a public whose size and effectiveness depends on one’s individual network. For example, SNS may be used to make one’s latest publication known among colleagues and one may build up a reputation as someone knowledgeable in forum discussions.

In summary, we note that on the basis of present empirical studies and our own observations, general SNS play a minor role in the practice of research communication, even though we may expect it to grow given the overall increase in usage of platforms such as Facebook.

Academic usage practices in science-specific SNS

Since about 2004, and more intensely from 2007, SNS that target specifically research communities have come into existence alongside the general ones. In almost all cases they offer science-specific functions, such as special literature search, job exchange devoted to academia, groupware services to support online cooperation among researchers, for instance with a view to writing texts jointly (see 2.1.1). Today there are a number of such platforms (see Table 1), among them we highlight the following:

- *ResearchGate* started in the life sciences, but is now multidisciplinary in scope, with more than 100.000 social scientists,¹⁹ but still a large majority in the natural sciences. It is, at the time of writing, the science-specific SNS with most members (over a million accounts); it offers inter alia literature search in a number of databases and the typical group functions, but has a few features not implemented by its competitors, such as similar abstract search.
- *Mendeley* specializes in the exchange of scientific articles and offers, in addition to the web platform, desktop bibliographic software to integrate literature as quotes in word processors.

¹⁹ See the interactive statistical graph on the start page of ResearchGate in June 2011, based on members’ self-assignment. We added the figures given for “political science” (10.064), “social sciences” (45.920) and “economics” (47.961), see researchgate.net.

- *Nature Networks*, offered by the publishing house of the same name, provides, among other things, blogs and subject forums.
- *Vivo* is an US-American software-based SNS with (still) a national focus, developed originally at Cornell University and later subsidized by the National Center for Research Resources (NCRR) of the National Institutes of Health (NIH).
- *Academia.edu* started as a worldwide directory of universities, research institutions and researchers, but now offers services similar to Facebook.
- *ScholarZ.net*, developed as a spin-off of a research project at the University of Würzburg (Germany), is much smaller than the others and perceives itself as providing integrated online software for scientific work.

When we observe this young and dynamic market we find, first, that there is indeed a significant market, which supports our hypothesis that SNS are, in principle, functional for academia. Second, the dynamics of the market show that there is no convergence yet towards one single provider—unlike Facebook in the field of general SNS. According to the special intentions and needs, the target group for these types of SNS is much narrower. Market concentration is less likely as long as all workers in a specific field join one particular SNS. However, given the trend towards broad interdisciplinary cooperation encompassing SNS, covering many, if not all, fields may be useful (see 3.4).

The explicit focus on academic needs leads to different usage practices as compared to the general SNS. We observe the following activities in science-specific SNS: limited public relations of research institutions and self-marketing; communication and cooperation with colleagues; job exchange; e-teaching.

Public relations and self-marketing: Because of their limited target group, these SNS are of limited use for public relations, as you can hardly reach larger groups outside the science communities.²⁰ By contrast it is potentially easier to target workers in particular fields by means of the sophisticated mechanisms for networking that most SNS provide. Similar to general SNS, self-marketing is also possible in science-specific SNS, focused

²⁰ Note, however, that the profiles can, at least to some degree, also be visited from outside the network site and often are listed among the first search results in Google. ScienXe.org, for example, advertises the site by promising that the members' pages are ranked high in search engines.

on one's peer group, for example by drawing attention to one's own publications. Based on our observations, this is currently probably the most widely used activity.

Communication and cooperation: One specific strength of science-specific SNS could be their potential to support communication and cooperation among researchers. We did not observe, however, efficient and successful working groups in these SNS. A few self-experiments in our own area have been only modestly successful. They mainly failed because of a lack of potential cooperation partners inside the chosen SNS as we were not able to motivate all relevant colleagues to actively participate in that particular SNS. In contrast to the attraction of large general SNS, the rather young and small science-specific networks suffer of a lack of sufficient numbers of active users.²¹ We observed the following further obstacles:

- technical limitations, in particular lacking platform or browser independence of the software, and long response times;
- lacking experience of the participants in exposure to these new platforms;
- skepticism regarding file security and the associated loss of control with regard to the documents uploaded to the SNS;
- the need to develop first a common culture of online collaboration, for instance with regard to the intrinsic value of a common file archive; of having a protocol of the common activities in a forum; discipline when communicating via threaded web forums etc.); and finally notably
- the problem of “multiple channels”, i.e. the need to watch over yet another channel besides the usual ones; this problem discourages many users from the outset or after a few first tries because of the additional time effort (more on this in the next sub-section, see also 3.4).

In order to reach a sufficient level of participation, the platforms need to be designed as much as possible according to the practical needs of researchers (on this see in particular: Harley et al. 2010; Procter et al. 2010). This is no guarantee though for broad acceptance, which depends on a number of factors that are not easily controllable. In particular, disciplinary differences (Becher 1989, 95ff.; Nentwich 2003, 168ff.) play an important

²¹ For example, arts-humanities.net counted in June 2010 1.500 members of which only 50 contributed regularly, see Procter et al. (2010, 41).

role. For instance, Harley et al. (2010, 283) cite a biologist who says with science-specific SNS in mind:

“I would ban my students from using Nature Network because they could be saying all sorts of stuff about what we’re thinking and working on that I don’t really want anyone else to know.”

E-teaching: We did not observe that science-specific SNS are used frequently in teaching. There are specific functions to support it, for instance in research.iversity, but there is not much known yet about their actual usage. Obviously, these professional networks do not seem particularly attractive to students, in contrast to Facebook and other general SNS, because they fit less well with their day-to-day needs and more with the workaday life of a scientist. Hence, students are hardly reachable via this channel, except in experimental settings. However, certain effective student-orientated platforms exist, for example Carnets2 Descartes²² at Paris Descartes University. In any case, SNS may turn out being a good platform for exchange among teaching scientists when they prepare their courses.

Mixing private and professional roles is less of a problem as compared with general SNS and the related privacy conflicts are attenuated: We observed that most researchers reveal only their professional identity. This is usually supported by the set of information one is supposed to enter when setting up one’s profile: the form asks for biographical information relevant in academia and less for private facts such as relationship status. Note, however, that even ResearchGate asks for pet books and hobbies, but receives answers only by a few according to our observations (see also 3.5).

Job exchange: These services have the advantage of having a pre-selected target group in science-specific SNS as opposed to general ones. In June 2011, for example, we found more than 1.800 job offers on ResearchGate, mainly from biomedical enterprises, and only very few on Academia.edu. The extent, to which these job exchanges are actually used, is unknown to us.

Assessment of potentials and impacts

On the basis of our description of the functions of SNS (2.1.1), of a theoretical analysis of what may be relevant for academia (2.1.2), and finally of our summary of what is known about the practical usage of SNS by aca-

²² carnets.parisdescartes.fr.

demics today (see above), we take the next step by discussing some of the issues that will influence the future development. Will ever more and, perhaps at some point, most academics use SNS—as they use e-mail today? What consequences may this have? In order to answer these questions we will focus on the following puzzles: Is the necessity to observe multiple channels in parallel possibly dysfunctional for science communication? How important are network effects? Will the trend towards multifunctionality and one-stop-services generate the necessary network effects? What potential do SNS have for informal communication among academics, with what effects? What roles play identity, pseudonymity and anonymity in scientific SNS? Will there be important privacy issues?

Observing multiple channels: Together with the more traditional communication channels, such as the telephone and e-mail, SNS are yet another one to keep track of—or indeed multiple channels, if we take into account that SNS include forum discussions, status messages etc. This is indeed a big challenge, which is probably mastered by only a few and by most only insufficiently. Me-too presence or accounts that are not actively used are probably the consequence in many cases. However, even if one tries to tend accounts and profiles actively and conscientiously (as the authors of this study did during the experimental phase), it becomes obvious that the present state of Web 2.0 is suboptimal for professionals under constant time pressure. While there is no doubt that the multitude of communication channels is a value in its own right and may be useful in the workaday life of scientists, we note that tending several SNS profiles is inefficient. However, this is indispensable at this point if one wants to network with one's own scientific community that is distributed over many SNS. As long as not all or a majority of the colleagues in a field communicate via one specific SNS, it cannot be used as a central platform of mutual exchange. Possibly we are only facing a transitional phenomenon, as SNS have existed for a few years only. We could imagine the following development paths:

- The first is monopolization. It could be that one SNS for all research fields or, more likely, one for each particular field establishes itself as the market leader and produces an irresistible attraction.
- Alternatively, the providers continue²³ to harmonize the interfaces (APIs) between their sites, which would allow the creation meta-

²³ It is already possible in many SNS to automatically distribute status messages beyond the

services, so that the individual user may administer his/her multiple profiles via only one interface.

- In parallel to and partly supporting the above two ongoing developments, we observe a trend towards multi-functionality. The SNS constantly develop further; their providers observe each other; take over promising ideas; and implement ever more functions. At the end of the day, some SNS might have become platforms satisfying practically all academic electronic needs for communication, cooperation, search for literature, provision of information etc.—quasi “one-stop-services 2.0” integrating microblogging, groupware, e-mail, calendar etc.²⁴ This strategy may add to the overall attractiveness of the most successful SNS.

If neither monopolization nor interface harmonization is realized, the problem of multiple channels will persist as a central hurdle for academic use of SNS (for a detailed discussion see section 3.4).

Network effects and informal communication: One of the central functions of all SNS is that they support the maintenance of existing and creating of new social networks. In so doing users expect that SNS may produce surplus value for their scientific work. There is no doubt that effective networking among researchers is desirable and SNS offer an infrastructure to do so. Whether this infrastructure is actually fulfilling its promises, mainly depends on the activity levels of the members, on individual networks and on the individual’s ability to cope with them. As noted above, we cannot observe as yet that many researchers are active in the SNS, even though we expect the level to rise. Thus we need to mark time and explore empirically if any and which of these effects may be realized on a larger scale.

By offering multiple electronic paths to reach and chat with members of the research community, SNS may increase the possibility and likelihood of informal communication. It will be interesting to see what impact this may have on the structure of the science system. We may also ask whether the SNS may contribute to formalize the informal by making social networks of researchers—the so-called “invisible colleges” (Crane 1972)—more transparent.

borders of one SNS; many allow registering simply by using an existing Facebook account; finally SNS usually offer the option to find new contacts in the networks by uploading automatically contacts from other networks.

²⁴ Google is obviously striving to offer such a one-stop-service, integrating webmail, group functionality, the new SNS Google+, shared documents etc.

Identity, pseudonymity and anonymity: With regard to private use of SNS, pseudonymity instead of having a profile with one's real identity is frequently practiced, though discouraged, for example, by Facebook and Google+. Thus it is possible to differentiate between different roles. Anonymous accounts are not usually possible. By contrast, in professional SNS, which also serve as public calling card directories, pseudonymity would be counter-productive, because the users need to get in touch with or hire "real" people. Similarly, pseudonymity is dysfunctional in academia. Science communication rests on the premise that you communicate, whatever the medium, with actual persons in order to be able to cooperate or co-author. In other words, merits need to be attributable: researchers definitely expect that behind a profile in a SNS is another researcher who has actually written the papers listed in the publications attached to the profile. Some SNS try to guarantee this by verifying the identity on registration (e.g. BestThinking).

However, there are two cases where temporal or functional anonymity is in the interest of academia: In many fields, the peer review process is usually double-blind. We may conceive that also the various rating systems within SNS, most of which are not anonymous as yet, may be implemented in a way allowing anonymous rating. The other case is when it comes to testing new ideas in a creative forum space or during collective brainstorming. Here it may fuel creativity when the relation between callow thoughts and the originator would not be registered permanently in a written archive. (For a more in-depth and comparative discussion of these issues see section 3.5.)

Privacy issues: People using SNS leave their digital marks and traces, and so do researchers. There is currently an intensive discussion about privacy concerns in the general SNS, such as Facebook. At least some of researchers' reluctance to join SNS may be explained by fear of losing control over their privacy. In science-specific SNS, the data needed to enable efficient networking based on automatically generated suggestions, is to a very large extent professional in nature, such as curriculum vitae, publications, research interests, office contact, etc. Nonetheless, if researchers are very active on various Web 2.0 platforms, they create significant digital traces that can be analyzed by data-mining tools (see section 3.5).

Identity theft (OECD 2008) is another salient issue. Profiles may be hacked with the intention of damaging somebody's reputation or false identity may be pretended in order to gain some benefits. On the big plat-

forms, such as MySpace and Facebook, there is a broad discussion about this.²⁵

2.1.4 Interim conclusions

Social network sites, in particular those specializing in academia, are a moving target, as there are many different providers and the various sites still experiment with new functions targeting academic needs. As researchers are distributed across many platforms, potential benefits are not fully realized and hence activity is not very high in any particular site. The platform per se, that is without communication, upload of publications or exchange of information taking place, is not too attractive for academia; it is after all not much more than a directory of people. It all depends on the diffusion among relevant scientific communities and on what the researchers actually do or will do with it.

The few empirical studies focusing on the academic usage practices, coupled with our own systematic observations, show that academics' use of SNS is steadily increasing, but not widespread yet; practice is often experimental and hardly institutionalized, as exemplified by a lack of systematic SNS policies by higher education institutions and low-key reflection on the privacy issues involved, in particular as related to the general SNS. There are, however, already first examples of learning effects and the evolution of good practice. Whether the potential of SNS for academia will be realized in practice will not only depend on technical improvements alone. We assume that even a technically less advanced site may be successful, if it manages to mobilize enough researchers to break through and when it chooses a sustainable model of financing.

When assessing the potential of science-specific SNS, we need to take into account competition with the established general SNS, which are standard applications of the current web and exercise an enormous attraction. Their sheer size has already attracted many researchers and will attract even more in the future, at least for private reasons. One possible scenario may be that add-ons to the general SNS provide more and more of those functions that are now mainly typical for the science-specific SNS and so become even more attractive. Two serious issues speak, however, in favor of separation between the two worlds. First, concerns regarding data pro-

²⁵ Cf. www.combat-identity-theft.com.

tection, misuse and privacy infringements are a main reason for many not to use Facebook et al. (Initiative D21 and TNS Infratest 2010, 25). These concerns are particularly pertinent where private data and messages are part of everyday practice and the provider's business model is based on interpreting and utilizing them commercially. Here the advantages of the solely professional and in particular the academic network sites are obvious, as they do not rely on private data and are usually funded without the exploitation of user data. Furthermore, it seems likely that academics will want to separate their private and professional roles with a view to avoiding conflicts and distraction by mixing both. We face, however, a dynamic development, which is not restricted to the academic world, but encompasses our societies at large. We simply do not know yet, in which direction the knowledge society will evolve, when it comes to the separation of identities and the perception of privacy.

Both the general and the specific SNS line up to change practices in a, technically speaking, more or less well functioning academic communication and information space. Researchers who are able to satisfy their main communication needs well with cyberscience 1.0 tools would rather not switch to another communication channel unless they detect a convincing surplus value of that new channel. E-mail is a strong competitor in this respect as practically all academics are "on e-mail", but only a small fraction is "on SNS". Thus, finding a substantial majority of all potential communication partners on a new platform may be essential for the last to switch, but there has to be something else to convince the majority in the first place. Even when we take into account that most science-specific SNS have had only a very short time to collect enough members, it seems that none of the current platforms has as yet found the essential lever, the convincing unique selling point (USP) or "killer application", to make itself indispensable in the eyes of a majority of researchers in any particular field.²⁶ It is difficult to speculate what such a USP might be. It needs to be something that researchers have difficulty to get elsewhere or that they have access to within the platforms much more readily; it may also be solutions to current problems of the academic information and communication space. There are a few candidates: structured and well managed access to scientific literature and to everything which is available on open

²⁶ We are convinced that even the impressively high numbers of members of some science-specific SNS are no sign of a break-through. As analyzed above, a majority of all accounts is of the "me-too" type and hence not active.

access, but currently scattered; encompassing groupware tools for project groups that are very easy to handle and need no further set-up; discipline-wide interactive calendars of scientific conferences and workshops; transparent solutions to the current peer-review system; strong incentives for interdisciplinary and cooperative research; etc.

One particular factor that could promote the diffusion of SNS far beyond the current path of a bottom-up construction of these networks would be top-down initiatives by relevant institutions. One such example is the fast growing Vivo (Gewin 2010), which is heavily supported and promoted by a few large US universities. This approach would have the advantage that the problems of financing and data security were attenuated. The obvious disadvantage is that enforcement and even indirect pressure is not very welcome in academic circles and may possibly lead to passive resistance.

In summary, our case study of SNS shows that they are, in principle, functional for academic communication and that they have a serious potential in academia, despite some hurdles and as yet rather cautious use by researchers. Whether the potential will be realized depends on many complex factors, which need to be researched further in more detail, in particular as there are, up to date, only limited large-scale empirical studies. In particular, we encourage detailed studies on the concrete impact of SNS on the daily practices of academics (some relevant hypotheses will be discussed throughout chapter 3).

2.2 Microblogging

“Blogging” is the writing of a “blog”, which is a usually public webpage that is comparable to a diary or journal as it can be assigned to the author(s) of that webpage and is in reverse chronological order. The term “blog” is short for “weblog”, derived from “web log book”. “Microblogging” is a form of blogging with the characteristic feature that the entries in the diary are not small articles, but short textual messages—hence the prefix “micro”. In other words, the term microblogging is used to refer to those services which make it possible for Internet users to send short messages in real time, i.e. with no more than a brief delay, to anybody who is interested. The content of these messages ranges from what is known as