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Leibniz-Informationszentrum Wirtschaft Leibniz Information Centre for Economics

# **D-Lib Magazine**

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# The Role of Libraries in Science 2.0: Focus on Economics

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#### Abstract

The presented empirical study explores the role of modern libraries in Science 2.0. The main focus lies on the researchers' needs for an optimised use of Web 2.0 for scientific work. The participants were economists of different academic levels. We used a multi-method approach. First, three focus group interviews were conducted gaining information about the use of Web 2.0. Second, three individual interviews investigated the behaviour of frequent Twitter users. Third, to receive quantitative data on the issue, an online survey was conducted. The findings revealed that researchers were in principle open to the new opportunities of Web 2.0. However, so far, the Web 2.0 services of libraries were often unknown. Besides others, there were two remarkable findings: there was a wish for privacy which is reflected in the discrete use of different social networks for private versus professional purposes. Additionally, researchers express the need for academic, reliable networks but often did not know about existing ones (e.g., ResearchGate, Academia). The findings suggest that researchers are often not aware of the possibilities of Web 2.0 for their scientific work. Libraries could close this gap and provide necessary information about appropriate Web 2.0 services.

Keywords: Library 2.0, Science 2.0, Social Media, Web 2.0, Focus Groups, Individual Interviews, Online Survey, Economics, Information Services, Scholarly Communication

# 1 Introduction

In recent years many Internet services and instruments were established to create a collaborative, communicative and participative environment. This so-called Web 2.0 includes many diverse applications like Skype, wikis, blogs and microblogs (e.g., Twitter) as well as social networks such as Facebook and ResearchGate. Web 2.0 not only changes private life and communication but also has a high impact on business as well as on scientific work. The participative and interactive possibilities of Web 2.0 offer new prospects for cooperation and collaboration which in turn influence the way information is produced, distributed and shared in the scientific community. The use of Web 2.0 services for scientific work is the core issue of Science 2.0: "Science 2.0 deals with the investigation of new fields for research and development, originating from the application of new participative and collaborative internet technologies in all phases of research." (Leibniz Association, 2014). The Leibniz Research Alliance Science 2.0 is dedicated to the ongoing process of Science 2.0, i.e., how Internet and web technologies change science and research processes, which needs and expectations researchers have and how public institutions can cope with it. The Leibniz Research Alliance addresses this issue by multiple projects. One of the projects aims at the "value added of a user-centred Library 2.0". The study presented in this paper is part of this project.

One cornerstone of Science 2.0 is the role of information centres, namely libraries 2.0 (as defined by Maness, 2006). This brought up the questions of if and how Web 2.0 was used for scientific work and research and how the classical information providers like libraries have to extend and adapt their roles in the face of Web 2.0 and Science 2.0, respectively.

The presented empirical study focused on the current and future roles that libraries 2.0 have in the context of Science 2.0. It explored which needs and expectations researchers have with respect to modern libraries and which information and services they need to support their daily scientific work. These issues were addressed by the use case of the fields of economics. The study was initiated by the <u>ZBW – Leibniz</u> <u>Information Centre for Economics</u> which is the world's largest library for economics, with locations in Hamburg and Kiel, Germany. The overall practical aim was a better understanding of the needs and requirements of the ZBW's users.

The next section of this paper presents the theoretical background and prior related research. Subsequently, the research questions and the methodology of the study are presented. Afterwards, the results and interpretation of the findings are described. The paper closes with an overall discussion.

# 2 Theoretical Background

#### 2.1 Web 2.0

The term Web 2.0 is used to denote several innovations on the Web 1.0 in recent years. A good overview on Web 1.0 versus Web 2.0 is given by Cormode and Krishnamurthy (2008), who pointed out that the differentiation between Web 1.0 and Web 2.0 is often indistinct and many websites cannot be strictly categorized. Nevertheless, there are some site features that mark a Web 2.0 site, e.g., the possibility to post content and to establish connections between users ("friending" etc.). Popular prototypical instances of Web 2.0 are Facebook, Twitter or Instagram.

Generally said, Web 2.0 services are web services combining social networks, integrated services and tools which offer easy ways for communication, collaboration and participation (O'Reilly, 2005). These services provide the possibility to consume and to produce information (Procter et al., 2010). Research showed that the users' motives are related to the users' activities and use of Web 2.0. For example, Shao (2009) analysed the use of Web 2.0 from a uses and gratifications perspective. The uses and gratifications approach (Katz, Blumler and Gurevitch, 1974) assumes an active recipient who selects media and its diverse contents for different purposes. The approach was originally formulated for television. Revised versions of the approach were also successfully applied to interactive media in the sense of Web 1.0 (e.g., Dimmick, Kline and Stafford, 2000; Ferguson and Perse, 2000; LaRose, Mastro and Eastin, 2000) as well as Web 2.0 (e.g., Shao, 2009; Park, Kee and Valenzuela, 2009). Based on the uses and gratifications approach, Shao (2009) described for Web 2.0 three separate but interdependent uses that are connected with different user motivations: Consuming (for information and entertainment), participating (for social interaction and community development) and producing (for self-expression and self-actualization). However, with respect to Science 2.0 it is still an open question if and how these motivations differ for private versus professional use of Web 2.0. The answer to this question is of crucial importance for the understanding of researchers' needs and requirements with their double role as a scientist and as a private person.

#### 2.2 The Use of Web 2.0 in Science 2.0

Many studies already had investigated the researchers' scholarly communication (Procter *et al.*, 2010) and the professional use of Web 2.0 services. Prior findings indicate that wikis and bookmarks are often used for professional purposes, but mainly in closed groups or by an individual (Koch and Moskaliuk, 2009). Wikipedia is often a rough starting point to information search, but mostly used in a passive way (Koch and Moskaliuk, 2009). Video community portals and active cooperation in Wikipedia are operated less frequently (Pscheida and Köhler, 2012). Social networks, microblogging, content sharing and blogs are used intensely. However, a general blogging does not take place (Harley *et al.*, 2010; British Library / JISC, 2012). In order to learn about the latest research results and news, personal discussion with colleagues, as well as mailing lists and email communication, are still in first place (Harley *et al.*, 2010). In addition, print media, online journals and search engines are consulted (British Library / JISC, 2012).

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Generally, researchers are open and positive towards Web 2.0 services and use them very often for their private activities (Pscheida and Köhler, 2012; Harley *et al.*, 2010). Contrariwise, Web 2.0 services are only used by a minority of researchers in their scientific work. So far, the academic use does not take place systematically and comprehensively (British Library / JISC, 2012; Harley *et al.*, 2010; RIN, 2010). However, the trend is growing and the potential has not yet been exhausted. Several studies come to the conclusion that science practice so far has not changed fundamentally due to Web 2.0 (RIN, 2010; Bader *et al.*, 2012). Important factors that hinder the use of Web 2.0 for scientific work are the time factor and a loss of reputation (British Library / JISC, 2012): Web 2.0 services are assessed as very time-consuming. Furthermore, they are seen as risk-bound; for example, when one gets involved in a public debate and thereby makes himself/herself vulnerable (Harley *et al.*, 2010). Usage mainly occurs if the scientists can obviously benefit from it (RIN, 2010). The services are only used if they make working more effective, can be integrated into existing processes or were recommended by colleagues (British Library / JISC, 2012; Bader *et al.*, 2012; RIN, 2010).

# 2.3 The Role of Libraries 2.0

Nowadays several public institutions like universities and libraries are connected with Web 2.0. They are present in social networks (e.g., Facebook) and offer several opportunities for interaction (e.g., via wikis and blogs). Whereas there is some first evidence how students use the Web 2.0 services of universities (e.g., Karl and Peluchette, 2011), there is only limited research on the roles of modern Libraries 2.0. Accordingly, Nesta and Mi (2011) claimed that the various implemented Web 2.0 services of libraries lack evaluation and validation. In their investigation they find a low acceptance of Library 2.0 applications and stated that the existing social networking tools don't fit the core business of libraries. However, our own first findings suggest that users in principle appreciate the presence of libraries in Web 2.0 even though the Web 2.0 services of libraries are often unknown or ignored (Linek, Schafrick and Tochtermann, 2013).

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To sum up, it is still an open question if and how the needs and wishes of the users and scientists can be addressed by special Web 2.0 services of a library. Especially in the face of the mentioned factors that hinder the use of Web 2.0 (time factor and loss of reputation), libraries could play an important role in filtering and bundling information as well as providing the base for alternative reputation criteria. However, in order to establish appropriate Web 2.0 services of a library, it is important to explore the needs and wishes of the scientists. Why and how do they use Web 2.0? Is there a different use of Web 2.0 for private versus professional activities? Which Web 2.0 services of libraries do they already know, what do they need and what do they miss — and how can a Library 2.0 serve the different requirements of the scientists? In the following we present our empirical study that addresses these questions.

# **3 Research Questions**

This study explored user behaviour, user motivations and users' requirements with respect to the role of a modern Library 2.0. As a use case, the field of economics was selected. We chose economics for practical reasons, because the findings of this study were also needed for concrete insights into the users' requirements of the world's largest information centre for economic literature, namely the <u>ZBW</u>.

The following research questions (RQ) were addressed:

**RQ1**: Which Web 2.0 services do researchers in the field of economics know and use for their daily scientific work?

**RQ2**: How do researchers (economists) use Web 2.0 services? What motives and reasons do they have for using or not using them?

**RQ3:** How do researchers (economists) estimate the role of a modern library? Are there wishes and requests for the future use of Web 2.0 or Science 2.0 services of a modern Library 2.0?

The focus of this study was on the popular social networking services Facebook and Twitter, because these were commonly used and well-known by the target group.

# 4 Method and Procedure of the Study

The research questions were addressed by a multi-method approach with three stages. We used a mix of qualitative and quantitative methods to get a widespread look into the research object and a mutual validation of the results. Thereby, several focus groups and individual interviews were conducted. Based on a first analysis of the semi-structured interviews, an online survey was developed to receive quantitative data. (The original instructions and questions were presented and written in German, since it was directed at German-speaking participants.) For all methods pre-tests were conducted regarding comprehensibility, timing and handling.

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### 4.1 Participants

The sample consisted of researchers in the field of economics at universities and professionals working in research at different economic institutions in Germany. The participants were economists from different levels of the academic hierarchy, namely postgraduates (PhD students), post docs, professors and scientific assistants. All fields of economics, including business administration, economics and interdisciplinary studies such as business informatics and mathematical economics, were represented.

#### 4.2 Focus Groups

Focus group interviews are interviews with five to eight participants talking about a special topic. The method helps to provide an insight into attitudes, opinions, intentions and feelings of the participants (Krueger and Casey, 2000).

For the presented study, focus group interviews with economists from in and around Hamburg (Germany) were conducted to get an insight into the work environment and use of Library and Web 2.0 services for scientific work. The participants were recruited by email and by telephone. Each participant received a 20 € voucher from a popular online shop as reward for the participation. In total, three focus group interviews with 12 researchers were arranged. The sample consisted of eight men and four women (at average 28.9 years old). Eleven postgraduates and one research associate were interviewed. On average, the participants worked at the university for 2.2 years.

The focus group interviews were executed in July 2013 at the ZBW location in Hamburg. Every interview was recorded on videotape in the usability laboratory of the ZBW. The usability laboratory consisted of two rooms. The wall between the two rooms had a large one-way mirror. In the test room three video cameras and a microphone were installed. The duration of the interviews was about one and a half hours. During the interviews drinks and sweets were offered in order to foster motivation throughout the session. Before starting with the interview, the participants were explicitly instructed that they should not be polite but honest, and that there are no wrong or right answers. Additionally, participants were informed about privacy issues and that their answers and data would be handled anonymously. Furthermore, each participant had to fill out a questionnaire for the assessment of control variables (age, gender, university affiliation, position, years working at the university, main occupation, discipline and Internet use). An interview guideline with open questions was used in all interviews in order to assure comparability and equivalence of the interviews. The guideline included six sections with one main question; in case additional questions for further input and information were asked. The six sections (with the leading question) are listed below:

- 1. Welcome and introduction of the participants: What are you currently working on?
- 2. Information research and behaviour: How do you get the information needed for your work?
- 3. Concept Web 2.0: What do you think when you hear the term Web 2.0?
- 4. Role of the library: Please finish the sentence "For me libraries are ..."
- 5. Facebook: What experiences do you have with Facebook?
- 6. Twitter: What experiences do you have with Twitter?

The results of the focus groups showed that the participants of the focus groups used Web 2.0 only rarely for

their scientific work. (The detailed findings will be reported in the section results.) Accordingly, the data from the focus groups didn't provide sufficient information on how Web 2.0 was used for scientific work (if it was used at all). Thus, to receive deeper insights into the possible scientific use of Web 2.0, interviews with frequent users were also conducted.

# 4.3 Individual Interviews

With the individual in-depth interviews we wanted to get a deeper insight into the attitudes and experiences with using Web 2.0 for scientific purposes. For examining Web 2.0 use, we concentrated on frequent users of Twitter. For the recruitment of this special target group (i.e., frequent users of Web 2.0/Twitter), we made a search on Twitter to find economists who were active and frequent users of Twitter for their scientific work. The participants (from different German cities) were reached by email. The interviews took place in August and September 2013 via telephone and were recorded for later examination. Each interview took about half an hour. The same interview guideline from the focus groups was used, but shortened. The main focus of the interviews was on the Twitter network. After the interview each participant received a 20 € voucher for a popular online shop as a reward for his participation.

All three participants were male, average age 33.7. They worked at universities for about 3.3 years. The sample consisted of a postgraduate, a post doc and a professor. Two of them were solely doing research; one was also teaching.

# 4.4 Online Survey

To quantify the results from the focus groups and the individual interviews, an online survey was conducted with the help of the free online tool <u>SoSci Survey</u>. The invitation to participate in the online survey (including the link to the questionnaire) was sent via email to about 500 economists from Hamburg. The email addresses were harvested from university websites. A reminder was sent out one week later. Answering the survey took about 10 to 15 minutes. To raise the motivation to participate, fifty vouchers over 20 € were offered in a lottery. All data were handled anonymously.

The survey addressed all three RQs with a special focus on users' activities and motives. The questionnaire had three main sections:

- 1. Socio-demographic questions: At the beginning of the questionnaire socio-demographics were assessed (as control variables), including age, gender, university affiliation, position, years working at university, main occupation and discipline.
- 2. Questions on the general use of Web 2.0 services for private and professional purposes: Based on the findings of the focus groups and the individual interviews, we asked separately for private versus work-related use. The section started with the assessment of the frequency of use of explicit Web 2.0 services. Subsequently, the importance of different activities and motivations were asked. Based on Shao (2009) we assessed the three main kinds of Web 2.0 activities (consuming, participating and producing) with one typical item. Additionally, we included some specific activities, that were mentioned as important by the participants of the focus groups and the individual interviews, we included the following motivations in the item list: information, community management in the form of maintaining contacts and establishing new contacts and social interaction. Additionally, we asked for other typical media motivations like entertainment, procrastination, pastime and relaxation (Conway and Rubin, <u>1991</u>). Furthermore, we also asked for the perceived usefulness of Web 2.0 services.
- 3. Libraries and their services in Web 2.0: This section addressed the publicity of libraries and their Web 2.0 services. There were special sections on Facebook and Twitter (as popular examples of Web 2.0 services) to determine how they were mainly used with respect to libraries.

The survey was conducted over two weeks (September 04 to September 15, 2013). In total, 72 people completed the questionnaire; 58% (n=42) were men and 42% (n=30) were women. On average the participants' age was 34.6, in a range between 24 and 67. Postgraduates account for 32% of the overall sample, followed by professors (16%) and post docs (7%). The majority worked in research and teaching (75%). Additionally, 65% worked in the field of business administration, 21% in interdisciplinary fields and 14% in private enterprises.

# **5 Results**

The data gathered from the focus groups and the individual interviews were analysed in a qualitative way. The data from the online survey were analysed in a quantitative way. The analysis was done for each of the three methods (focus groups, individual interviews, online survey) separately. In the following sections we present the results structured by the different stages of the multi-method approach and the findings on the RQs. (The findings also revealed several other insights into user behaviour of economists that were of special interest to the ZBW, but that have no impact on the broader audience of this paper and therefore are not reported in this paper. For further information and details please contact the first author.)

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#### 5.1 Results of the Focus Groups

#### Insights on RQ1:

Overall, the results of the focus groups showed that Web 2.0 services were widely neglected in the scientific workaday life. Even though the participants were familiar with Facebook, Twitter and Skype, the term "Web 2.0" was partly unknown and had to be explained by the instructor. The presence of libraries in Web 2.0 (e.g., Facebook, Twitter) was widely unknown.

#### Insights on RQ2:

The participants used Web 2.0 mainly in a passive (consuming information) or participative way, to consume news and other content and to connect with friends, family and only sometimes with colleagues. The work-related exchange mostly happened in personal face-to-face contacts, via email or by mailing lists. The use of Web 2.0 was mainly for private reasons. The high expenditure of time was a main reason for not using Web 2.0 services for work related purposes on a regularly basis.

The answers about the special instances of Web 2.0 (i.e., Facebook and Twitter) showed a similar pattern: Facebook especially was primarily used for private purposes. Additionally, the participants' answers revealed that there was a need for a separation between private and working networks. For their research activities, the participants expressed the wish for a professional network to connect with colleagues, share literature and discuss ideas.

#### Insights on RQ3:

Asked about the role of the library, the participants still concentrated on the classical services, i.e., the access to literature, online journals and databases. The future personal wishes of the participants for a modern library referred mainly to improvements of the classical services, for example better access to journals with more freely available literature (in the sense of open access) and a more attractive interface of the website and the literature catalogue.

#### 5.2 Results of the Individual Interviews

#### Insights on RQ1:

The frequent Twitter users knew about and also used several other services of Web 2.0 (e.g., Skype, Facebook), but relied mainly on Twitter as their work-related network. They did not express the wish for any other additional academic (research-related) social networks.

#### Insights on RQ2:

For the frequent Twitter users (daily use) interviewed, the microblogging service Twitter was seen as a professional network, kept strictly for a work-related use. The interviewed participants mainly followed other researchers in the same field because this was seen as a helpful and efficient way to get an overview on new articles, conferences and research activities. For example, they asked for a specific article via Twitter and got answers, often within minutes.

For information search they had two main sources (besides Twitter): one is classical literature searches via

databases of their libraries and search engines, as well as Google scholar and Google books. The second is their trust in their own data assessment capabilities, or the use of freely available data and statistics, in the Internet. For the exchange with colleagues they used Email, Skype, Google Groups and mailing lists.

Overall, their use of Web 2.0 in general was mainly passive and participative and only partly activeproductive. They consumed news and other content to keep up to date in their professional field and got an overview of current scientific discussions. They participated in the scientific exchange and used Web 2.0 to sustain their existing contacts or to find new contacts. Accordingly, the main motivations for Web 2.0 use refer to gaining information, social interaction and community management in the sense of maintaining existing contacts and finding new contacts. Additionally, they produced and spread their own content and expressed their opinions, e.g. in a blog or by working on Wikipedia.

In contrast to Twitter, the social network Facebook was mainly used for private matters. The participants practiced a separation between private and work-related networks (and Web 2.0 services, respectively) but also considered that this was not always possible.

# Insights on RQ3:

The results concerning libraries and their Web 2.0 services were similar to the results of the focus groups. Libraries were seen as an important source for literature, especially for online literature search. The participants did not know any Web 2.0 services of specialised libraries. For them such services seemed unnecessary or of secondary importance.

5.3 Results of the Online Survey

# Insights on RQ1:

Overall, Facebook was the most popular Web 2.0 application for private purposes; Skype was the most popular Web 2.0 service for work-related use. Facebook, Google +, Twitter, YouTube, Xing (www.xing.com – a mainly German social network for business life), Wikipedia and Skype were (at least) known by all participants. Flickr, RSS feeds, Blogs, Wikis, Research Gate and Mendeley were somewhat unknown. This was most pronounced for Mendeley and ResearchGate: about one third of the participants didn't know them.

# Insights on RQ2:

For a better understanding of the main forms of use, the leading motivations and the underlying reasons, we concentrate on the "frequent users" of the Web 2.0 services. We defined "frequent users" of a network for private/scientific reasons as users who used a social networking service for those purposes at least once a week.

Overall, Web 2.0 services were mainly used for private purposes. The use of Web 2.0 for scientific work was rather low. However, there were substantial differences between the Web 2.0 services. Figure 1 illustrates these findings. The bar diagram shows how many participants reported a frequent use of the different Web 2.0 services for private versus scientific purposes.



Figure 1: Portion of frequent users of selected Web 2.0 services: private versus professional use.

Facebook was by far the most privately used network and had the largest discrepancy between private and scientific use. The Web 2.0 services with the highest portion of frequent professional use were Skype, Xing, wikis and blogs. Besides (undefined) wikis, ResearchGate and Mendeley were the only Web 2.0 services with a higher portion of frequent professional use than private use. Overall, the separation between private and professional use of a network was most pronounced for Facebook and ResearchGate. ResearchGate showed a mirror-inverted gap between private and professional use like Facebook (on a lower level).

For the activities and motivations for the use of Web 2.0, we analysed if the activities and motivations were important versus unimportant for the participants. In this respect a distinction was made between professional versus private use. Table 1 shows the percentage of participants that qualified the listed activity or motivation as important for themselves.

	Professional Use (in %)	Private Use (in %)
Main Activities		
Read content from other users (consuming/passive)	33.33%	68.06%
Share content (participating)	18.06%	47.22%
Communicate own opinion (producing)	15.28%	22.22%
Specific Activities		
Chat with others	27.78%	50.00%
Arrange meetings with colleagues / friends	20.83%	50.00%
Motivations		

Community management 1: maintain contacts	54.17%	81.94%
Information: inform themselves about current affairs	40.28%	54.17%
Community management 2: establish new contacts	38.89%	20.83%
Social interaction: exchange with friends and acquaintances	31.94%	59.72%
For procrastination	9.72%	33.33%
For pastime	5.56%	37.50%
For entertainment / to have fun	4.17%	55.56%
For recreation	1.39%	27.78%

Table 1: Importance of Web 2.0 activities and motivations, private and professional use (n=72), ranked by professional use,

The finding on the main activities showed that passive activities were the most important followed by participative and productive activities. This held true for private as well as for professional use. However, all activities were less important for professional use. A similar pattern was found for the specific activities (chat with others, arrange meetings).

Overall, the participants confirmed the usefulness of Web 2.0 services for their private life as well as for their research work. In total, 56.9% of the researchers thought that Web 2.0 tools were "very or rather useful" for their work. This value was even higher for their private use (79.2% confirmed the usefulness).

# Insights on RQ3:

Only a few participants knew of social media sites or other Web 2.0 services of libraries (10.3%), and even fewer liked or followed them. The Web 2.0 instances of libraries mainly became known via the official main website of the libraries.

Most participants had no interest in the Web 2.0 services or pages of libraries. Regarding Facebook, 45.8% had no interest in a Facebook page of their library. For Twitter, even more (69.4%), reported that they had no interest in Twitter accounts of libraries.

The main requests for Web 2.0 services of libraries were as follows:

- 1. linkages to scientific papers and lectures, new publications (41.7%)
- 2. advice on research life and work (e.g., research tips), recommendations and comparisons of bibliographic software (38.9%)
- 3. surplus information on articles (37.5%)

Furthermore, in the open answers, some postgraduates expressed their wish for a scientific network, where it is possible to make suggestions for new articles, get recommendations from colleagues or comment on articles. It is worth noting that academic platforms such as ResearchGate and Academia, that already at least partly offer such options, were often unknown by the participants.

# 6 Discussion and Outlook

The study investigated the role of modern libraries in the context of Web 2.0 and Science 2.0. The use case was the field of economics. The results showed that only a small percentage of economic researchers were using Science 2.0 services for their work. They were interested in and open to the opportunities of Web 2.0, but mainly used it for private activities. The merit of Web 2.0 services for scientific work was often unclear to them, and the regular use of Web 2.0 was estimated to be very time consuming. Many were still doubtful if Web 2.0 services can be helpful for work and did not see the possible relevance for their work. Thus, in the view of the participants Web 2.0 was not appropriate for their daily routine in scientific work. This finding matches prior related studies (British Library / JISC, 2012; Bader *et al.*, 2012; RIN, 2010). Even though Web 2.0 services of libraries were widely unknown, specialised libraries played a huge role in the working life of researchers. The supply of literature, especially online journals, was the most important aspect. This result was concordant with prior findings in literature (Housewright, Schonfeld and Wulfson, 2013). Additionally, our findings revealed a great need for a separation between private versus professional social networks and other Web 2.0 services. While Facebook was seen as a private network, the economists questioned expressed the wish for specialised academic or research-related social networks, but the already existing instances like ResearchGate and Academia were widely unknown or unused.

So far our results were limited to the field of economics and German researchers. Researchers from other disciplines or other countries as well as subjects with a different academic background, e.g., undergraduate students, may perform differently. However, our results are very well in line with prior research about researchers of various disciplines, on the acceptance of Web 2.0 for work-related activities.

Our pattern of results also suggested some preliminary insights into why Web 2.0 in general, and services of libraries 2.0 in particular, lack popularity and acceptance so far. One problem might lay in the chosen instances of Web 2.0. Some popular social networks like Facebook might not be appropriate for the specific purposes of a scientific Library 2.0. The need for privacy on the one hand and the main purpose (or image) of the concrete social network on the other hand, seemed to be of special importance. Researchers wanted a separation between personal and professional activities also in the context of Web 2.0. If they used a social networking site originally mainly used for private life, they did not want to mix it up with professional activities. This is similar to the findings of Karl and Peluchette (2001) on students' behaviour on Facebook, i.e., they use Facebook to stay in contact with their friends and family at home as well as for connecting with other students; but they do not use Facebook for their actual work at university or the communication with the university staff. Accordingly, work-related information and services should be offered on other instances of Web 2.0.

Indeed, according to our results there were some other social networking sites and Web 2.0 services that were used for professional activities to an equal or even higher degree than for private purposes. Namely, the work-related network Xing and the academic network ResearchGate were used at an equal or even at a higher extent for professional versus private activities. From our findings with German economists, the (mainly German) social network Xing was seen as a more appropriate and adequate network for professional use. This indicated that (at the moment) the set-up of Web 2.0 activities for professional purposes might be more appropriate at Xing, at least in Germany. On an international level, academic social networks like ResearchGate seemed to be the better option.

Concerning this matter, it is important to note that academic social networking services and other Web 2.0 applications that were originally designed for work-related purposes were widely unknown. Thus, the communication and promotion of the existing possibilities seems to be a critical factor with respect to a more general problem of Science 2.0: so far, most research-related academic networks are rarely used for scientific work because scientists do not see a benefit in using them. One reason could be that the critical mass of active scientists in the Web 2.0 is not yet reached (Procter *et al.*, 2010). This means that not enough people participate with their scientific work to animate the further growth of the academic network.

Interestingly, the expressed requirements for a work-related social network fitted at least partly with the opportunities of the already existing ones (Academia, ResearchGate). For example, on ResearchGate it is possible to follow a specific research topic, including the ability to ask questions and provide expert answers. This seems to be similar to the groups on Facebook and offers the possibility of social exchange and scientific discussion with other researchers. However, there are also remarkable differences. For

example, one big difference to Facebook is the lack of a personal timeline. The profile page on ResearchGate is designed rather like a business card and less like a personal individual page. In other words, it has less "social appeal" compared to Facebook. This might be one reason (above others) that the academic network ResearchGate appears as platform for the exchange of publications and a registry of researchers — but not as a real social network. However, this interpretation has to be proofed by further empirical studies.

To sum up, scientists are open to Web 2.0 and Science 2.0 but they are also demanding and exacting regarding the appropriate Web 2.0 services for their research activities. Furthermore, the presentation and implementation of such services have to be done in a way that respects the researchers' needs for privacy, i.e., a separation between the private use of Web 2.0 and work-related use in the sense of Science 2.0. Thereby, it is also a critical factor to communicate information about the specialised services for research and the existing academic social networks.

In that line of reasoning, a Library 2.0 should not only provide the important information and services for literature and literature search but also could be the important catalyst for promoting appropriate and useful Web 2.0 services in the context of Science 2.0. In this sense, libraries can provide personalized advice for selecting the most appropriate Web 2.0 services for individual researchers.

Further research should explore *how* libraries can fulfil their role as modern information centres for Science 2.0 and *what* are appropriate ways of communicating, activating and promoting the use of Web 2.0 at its best for science.

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