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a scoping review

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Researchers' use of social network sites: A scoping review

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Abstract

The study is a scoping review of 80 research articles in LIS and related fields (2004-2014) on the use of social network sites by researchers. The results show that social network sites are used as part of scholarly life, yet with disciplinary differences. It is also shown that the area lacks methodological, theoretical and empirical coherence and theoretical stringency. The most salient strands of research (General uptake, Outreach, Special tools/cases, Assessing impact, Practices/new modes of communication) are mapped and ways to improve research in the field are identified. This provides a first step towards a more comprehensive understanding of the roles of social network sites in scholarship.

1. Introduction

During the last decade a number of new social media tools have emerged, not only for personal use, but also for professional settings. Facebook, LinkedIn and Twitter have made their way onto the desktops of researchers and blogs have been around since the late 1990s. YouTube, Flickr, and various social bookmarking tools have been available for quite some time. Most of these are not specifically directed to academics and research purposes. Rather than being audience-specific, they address what could be called a horizontal communication purpose that is shared by many groups. Most recently, social network sites that are specific for academics have emerged. The most prominent among these Academia.edu, ResearchGate and Mendeley. All combine features that are characteristic of social media (visible networks of followers and the opportunity to share updates of a network) with features useful to academia, specifically related to sharing and finding literature and to making academic qualifications and achievements visible.

In the wake of this development, a number of studies have tried to understand how researchers make use of such tools in their academic life. These studies have been carried out most often in library and information science (LIS), but also in

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neighboring fields such as educational sciences, computer science, sociology and political science. The present research provides a structured overview of these studies of the use of social network sites by researchers; this includes the use of social network sites specifically for research and of general purpose social media for research related purposes.

2. Problem statement and research questions

Along with the growing importance of social network sites in many areas of scholarship, an interest in alternative mechanisms for research evaluation is developing. For this purpose social media based metrics are often specifically highlighted (Piwowar, 2013) and even special tools for so-called altmetrics are being developed. Yet, research on the use of social network sites by researchers is scattered, not only throughout a large number of articles, but it also stems from different disciplines. Thus, knowledge on this issue is fragmented and a structured mapping of the area is missing. Given that these tools and the new metrics they are generating are advanced as auditing tools along with bibliometrics and other forms of evaluation, this lack of understanding can be problematic and have far reaching implications. Hence a rigorous understanding of the dominant theoretical and empirical groundings and methodological approaches of existing studies on researchers' use of social network sites is needed, together with a broad mapping of use and non-use of social network sites by researchers in different disciplines and in different situations. As well, areas that are in need for further research need to be identified.

This research addresses the following research questions: (1) How can studies on the use of social network sites and social media by researchers carried out from 2004 to 2014 be characterized in terms of the theories and methods used? (2) What is known about the use of social network sites and social media by researchers during this time and what relevant areas have been inadequately researched or not studied?

3. Literature review

Scholarly communication is intimately tied to how research disciplines are structured—within and in relation to each other as well as to other surrounding actors and fields—and thus to how they work. Becher and Trowler (2001) identify differences in disciplinary practices, which include both research and communication style. Scholarly communities are shaped by organizations and how research is performed, and are thereby influenced by both social and epistemic aspects (Knorr Cetina, 1999). How research is presented as believable and trustworthy varies between disciplines (Borgman, 2007) and depends on the epistemic culture (Knorr Cetina, 1999) of which it is a part. The conventions and norms for establishing what is believable in a given discipline or culture emerge and develop over time (Bazerman, 2000).

In the field of LIS, scholarly communication has often been studied by investigating the outcomes of research in formal publications, mostly the journal article and to a lesser degree the monograph, chapter or edited volume, and their bibliometric relationships to each other. The focus is often on the assessment of research impact or patterns of scholarly communication by employing a variety of bibliometric analytical approaches. Another strand in scholarly communication studies in LIS focuses on

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informal communication, typically face-to-face communication, which is not traditionally recorded, stored, or quantified. The in-between status of a variety of new informal scholarly genres (e.g., websites, blogs, mailing lists) has already been highlighted by Borgman (2007), who calls attention to the ways in which they are constitutive of a discipline, yet not formal enough to be considered publications in the strict sense of the word. Specifically, she points out that “they can be captured because digital communications leave a trace” (p. 99). It is exactly here, in this space between formal and informal scholarly communication, that social network sites and social media in academic settings are found, and this is the focus of this study.

4. Method

In line with the requirements of a scoping literature review, which aims to summarize and map prior knowledge often in order to identify trends and gaps, the study is based on a comprehensive search strategy (Arksey & O'Malley, 2005; Paré et al., 2015). This means that a set of explicit inclusion and exclusion criteria was established and then applied. It was necessary to approach material collection in a way that accounted for the fact that the disciplinary background of the articles found is likely to be varied. Thus, the approach is based on techniques developed for scoping review (Arksey & O'Malley, 2005) whereby surveying a large thematic area is considered and managed in steps and allows for the inclusion of both empirical as well as conceptual studies (Paré et al., 2015).

The search strategy has deliberately been broad. Some of the terms that are used as part of the criteria, e.g. “researcher” or “scientist,” are very general and it was challenging to limit the search. Several databases were searched to cover disciplinary areas from the humanities to computer science. Only peer-reviewed articles or conference papers are included in the final selection. The period searched for was 2004 to 2014. The following exclusion criteria were applied: articles not based on original research (e.g. an editorial or op-ed piece); articles for which researchers are studying a different phenomenon by using social media data; articles focusing mostly on the use by students or teachers of social media; articles with suggested work but with no completed study, and articles on the technical development of platforms. Also excluded were articles under four pages long (e.g., long conference abstracts).

The following four databases were searched: Web of Science, EBSCO LISTA, EBSCO Academic Search Elite, and SCOPUS. They were selected in order to balance a broad range of articles from different areas (e.g., Web of Science) with a topically focused scope (e.g., EBSCO LISTA). The search string applied to each specific database was based on the following query (researcher* OR academic* OR scholar* OR scientist*) and ("social media" OR blog* OR weblog* OR "reference manager*" OR microblog* OR "social network site*" OR sns) and (twitter OR facebook OR linkedin OR academia.edu OR researchgate OR mendeley)¹. The searches were executed in April and May, 2014. The references retrieved were imported to a reference manager (RefWorks). Management of references during review was performed in accordance with the workflow shown in Table 1.

¹ Some words like scientific, social bookmarking, YouTube, Instagram, Flickr, podcast, website, Internet and their inflected forms are not included in the search, which means that there can be a potential loss of articles. However, the search string is still very broad and captures most relevant areas.

[Table 1 here]

4.1. Analysis and coding

In total 80 articles were retained and analyzed (Appendix A). Each article was carefully read and coded to account for the following criteria: author discipline, social media tool studied (according to a predetermined list), method used, analytical approach presented, theories applied (if any), type of material (including informants) investigated, data presented, author country, country studied (if applicable), research area studied, stated aim, and the results presented (the codebook appears in Appendix B.)

During coding, themes of broader groups that stemmed from the reading emerged and the articles were grouped accordingly. Extracting the main purpose from each article together with the stated results showed various approaches to studying the use of social network sites and social media. Overlap exists between articles and one article can be categorized into several themes. The themes (based on objectives) are:

- General uptake—understanding who is using the tools and what tools are used
- Outreach—opening the door to science/research outside academia
- Specific tools and cases—examining one particular tool (this theme was subdivided in the subcategories blogs, SNS/SRM (social network sites/social reference managers), microblogging and other)
- Assessing impact—using traces from digital tools for impact measures
- Practices and new modes of communication—understanding digital communication practices by researchers

This consolidation formed the basis for a further round of reading and coding of the articles in order to allocate them to these themes.

5. Findings

5.1. Characteristics of the articles

In total articles from 58 different journals were retrieved. However, only 12 journals published more than one article (Table 2). There was a noticeable increase in the number of articles from 2004 through 2014 (Figure 1).

[Table 2 here]

[Figure 1 here]

The journals or conferences containing most of the articles are from the LIS field as broadly understood, which includes journals in information science, library studies, library and information science/studies and bibliometrics. This is also evident when looking at the areas within which the studies are published based on the affiliations of

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first authors. The top five are: LIS² (25 articles), educational sciences (12 articles), computer science (12 articles), bibliometrics (10 articles) and medical and health science (5 articles) (see the categories for coding of disciplines in Appendix B). Bibliometrics could be grouped together with LIS; yet since the number of articles from the field of bibliometrics is so substantial, it has been assigned a category of its own.

The most frequently appearing author is Mike Thelwall, who is a scholar working in the field of webometrics (bibliometrics) and who often publishes together with others. He is co-author of ten articles. The second most published author is María José Luzón, who is the single author of five articles.

The distribution of quantitative and qualitative methods is fairly balanced, with 35 articles reporting the use of quantitative methods, 27 qualitative methods and 18 mixed approaches. The methods used range from surveys with over 2000 participants (Nicholas & Rowlands, 2011; Rowlands et al., 2011) to interviews with a small group of researchers about their lived experience (Veletsianos & Kimmons, 2012). The majority of articles are not explicitly situated in a theoretical framework; where exceptions are found, they are mostly in articles based on qualitative and mixed methods (Table 3).

[Table 3 here.]

Canada, the UK and the United States dominate as the countries in which most first authors are based. In total, only 20 countries are represented in first author affiliations. This is not reflected in the empirical focus of the articles surveyed. The majority of research is not specific to any one country. If countries are stated, the United States dominates, followed by Germany and the UK (Table 4). A study of the use of blogs by Swedish academics (Kjellberg, 2009) is an example of a country-specific study in this area.

[Table 4 here]

5.2. Descriptive content analysis

There were considerable differences in how the reported studies were carried out, which makes it impossible to compile and directly compare the results. Instead, an interpretative approach based on a descriptive content analysis, as recommended for the purpose of a scoping review (Paré et al., 2015), was employed. Accordingly, the articles in each theme were analyzed to map the main trends addressed in the theme and to place them in relation to each other. An article can be part of several themes.

[Table 5 here]

² Information studies was used instead of LIS in the coding. The nomenclature stems from the Swedish Standard of Classification of Disciplines, which is based on the international OECD model. However, in the rest of the article LIS is used.

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5.2.1. Theme 1: General uptake

Fourteen articles deal with the use of social network sites and social media in a scholarly context (Table 6) and with the uptake of these tools in supporting research activities in a more general way. Eleven of them stem from LIS, and in the remaining three articles, the authors come from the same area as the researchers included in the study: medical and health sciences, and social and economic geography.

[Table 6 here]

Quantitative methods dominate. Eleven articles include surveys, six concern a particular discipline or research field and three pertain to a specific geographic area. The differences in what is included as examples and categorizations of social media tools make it difficult to directly compare results. Yet some trends can still be discerned.

In 2009 Gu and Widén-Wulff (2011) surveyed the use of Web 2.0 tools and how they are part of scholarly communication at Åbo University in Finland. Only a few researchers reported using microblogging (22.6%). Online documents were most frequently used (89.1%) both for staying up to date and interacting with others who commented on the research. In 2010 a large international survey about the use of social media in research workflow was carried out (Nicholas & Rowlands, 2011; Rowlands et al., 2011). Almost 80% of the researchers reported using some type of social media tools in their work. The most commonly used tools supported collaborative authoring, conferencing and the scheduling of meetings. The authors displayed a complex picture with respect to demographics and usage; age was not found to be a predictor of social media use even though younger researchers (under 35) were slightly more likely to use at least one social media tool than older researchers. Also in 2010, Gruzd, Staves and Wilk (2011; 2012) conducted an interview study with STS researchers about their use of social media. Their results showed that researchers are increasingly aware of the use of social media as a part of their everyday professional practices. Junior faculty members were found to use social media tools more often than senior faculty members. In a survey of social scientists in 2010/2011 (Gruzd & Goertzen, 2013), listserv lists were still the dominant tool for scholarly information dissemination and communication (84% of respondents). Yet this study also showed that most of the scholars used a wide range of social media tools, most often non-academic networks and wikis. In 2010 Wilson and Starkweather (2014) carried out a survey of the use of social media tools by academic geographers. SNS were used by 40% and that 20% frequently (at least once a day) visited blogs or microblogs. In this study, the most common online activity was the maintenance of a website, either professional (97%) or personal (41%), or a blog (30%). Almost all blogs had a primarily professional purpose. Also in 2010, Allgaier et al. (2013) surveyed neuroscientists in Germany and the United States to establish their use of various media channels, including social media tools. In addition they inquired about the perception by scientists of the impact of different media. The results showed heavy reliance on what is called journalistic information, with low use of social media and blogs.

In 2011 Madhusudhan (2012) conducted out a survey at the University of Delhi to explore the use of a wide variety of digital tools. Facebook and wikis were found to dominate. The same year Tenopir, Volentine, and King (2013) surveyed UK

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academics on their use of social media for work-related purposes and any change in their reading habits. Even though most respondents reported using social media for work, few contributed content to social media. The use was more occasional, but nearly half of the respondents occasionally read, viewed or participated in situations facilitated by one or more of the tools. Also in 2011, Keller et al. (2014) found in a survey of public health researchers that the majority did not use social media in their work. YouTube, Facebook, Twitter and blogs were used, but for private purposes. When they were used for work, it was mostly for disseminating research. They also found that researchers with more recent degrees were more likely to have used social media. This could be indicative of age as a relevant factor in determining the likelihood of use of social media for work-related purposes.

In a 2012 study, Haustein et al. (2014a) investigated the use of social media by bibliometricians. LinkedIn was found to be the most popular SNS tool (over 60%) while Academia.edu, Mendeley and ResearchGate were used by only one-fifth of the respondents. Over half of the researchers replied that social media were a part of their professional life and almost half of them had a Twitter account. Other social media had a considerably lower uptake in this group. Cruz and Jamias (2013) surveyed researchers at the University of the Philippines Los Baños on their use of social media. They found that awareness of social media did not indicate use. Collaborative authoring and social networking tools were the most common. The study found no link between age, research style, and the inclination to use or not use social media.

These studies were carried out between 2009 and 2013. The uptake of different tools varies among the groups of researchers studied. However, the most popular tools are not necessarily the ones primarily intended for direct interaction or communication, but rather for maintaining a network or to support (collaborative) writing. The differences in use among various groups of researchers in terms of demographics are not clearly connected to age or seniority, even though some of the articles have concluded that junior faculty are slightly more inclined to use social media tools in the context of their work. Across the studies surveyed, however, the term “use” is employed inconsistently, in some cases it appears to imply reading, in others creating/contributing, and in others both.

5.2.2. Theme 2: Outreach

Eight articles explicitly address how social media are used for making science public and how researchers use various digital tools to communicate science to others more than to fellow researchers. The studies are based in the humanities and social sciences and most of them employ qualitative methods.

Five articles study blogs in various ways (Cao & Yin, 2009; Colson, 2011; Kelly & Autry, 2013; Luzon, 2013a; Thorsen, 2013). One article is about podcasting (Alegi, 2012), one about a wiki (MacKenzie, 2013) and one is based on a survey of how researchers disseminate their results to various stakeholders (Wilkinson & Weitkamp, 2013). The blogs and podcasts are used as platforms for scientific journalism and to facilitate access to the results of science. One example is Thorsen's (2013) study of blogging by scientists about climate change in Antarctica as an outreach activity. Luzon (2013a) investigates the rhetorical strategies that come into play when scientific information is re-contextualized in blogs. She highlights how several

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strategies are directed to creating dialogue and personal expression, and how bloggers use the resources of digital media to communicate with a diverse audience.

A more nuanced image of access to science is advanced in two articles. Kelly and Autry (2013) consider broadening the audience for original scientific research articles by combining the publication of research articles with blog entries. They study a selection of PLoS articles and what has been blogged about these articles. They suggest that open access should be seen as an opportunity for accommodating various audiences and not only as a technological solution for making articles freely available. MacKenzie (2013) studied how researchers in synthetic biology make use of a social media space in the form of a wiki. This is an investigation of how scientists in a field where science is not only made public, but made *in* public, engage the public in processes of validating and participating. He concludes that wikis make scientific history accessible as it is being made, which enables the public to contribute to scientific progress. Yet, he also highlights the complexity of the notion of open science by emphasizing that it is necessary to object to how something is being carried out in order to really make a contribution to science and research as it is being conducted.

In all the articles surveyed in this group, non-researchers are part of the community investigated. The articles share a basic assumption of a need to democratize knowledge production through enabling public participation in science. Various social media are seen as facilitating opportunities for making science freely available to groups outside academia, or what is called “the general public.”

5.2.3. Theme 3: Specific tools and cases

Fifty articles deal with the use of specific tools in academic settings. Within this set of articles, three groups of tools stand out and have been studied from several angles and different disciplinary perspectives. They are blogs, social network sites (along with social reference managers), and microblogging (i.e., Twitter).

Four articles could not be assigned to any of these three groups. Bender et al. (2011) studied a wiki used for open peer review. Jacobs and McFarlane (2005) investigated an IRC (Internet relay chat)-based conference backchannel discussion. Meyer and McNeal (2011) studied online discussions in the forum of an e-journal. Bukvova's (2011) analyzed various online profiles of researchers in order to create a framework for their online self-presentation.

| *Blogs*

The majority of the 18 articles focusing on the use of blogs by researchers are written within the humanities and social sciences, with almost one third from LIS. There is a uniform distribution between qualitative and mixed methods. Only two articles use quantitative methods exclusively.

Three articles sought to construct frameworks of scholarly blogging. All three highlighted format and motivations or reasons for blogging in different ways. Bukvova et al. (2010) described a categorization of researcher blogs in a framework grounded in the information in the blogs and patterns of blogging. They concluded

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that the blogs can be seen as a form of publishing and as a way of presenting the researchers. In an interview study exploring how blogs could manifest digital scholarship, Heap and Minocha (2012) found that researchers have multiple reasons for blogging. They described a framework for digital scholarship that guides the practice of scholarly blogging. Kjellberg (2009b) suggested a framework for understanding scholarly blogs based on genre theory and the aspects of aim, form, content, and context, and how these are interlaced in the blogs.

Six articles specifically deal with characteristics and functions of academic blogs and researchers' motivations to blog in their profession. Blogs were generally seen as integrating different functions, identities, readerships and ways of engaging different disciplines. Shema et al. (2012) focused on bloggers who write about academic research. A typical research blogger in this study was male and a graduate student or PhD. They found that the bloggers preferred articles from high impact journals. Hank (2013) combined a survey and interviews and found blogs to be seen as part of the cumulative record of the researcher's scholarship, but considered to be part of the unpublished communications. Kirkup (2010) highlighted the potential of blogs for contributing to an identity as a public intellectual. In a content analysis supported by a webometric analysis, Kjellberg (2009a) found that blogs serve as an interface between four arenas: the university, the research field, the general public and private life. In a later interview study, Kjellberg (2010) found that the motivations of academic bloggers can be connected to the ways in which blogs combine different functions and that they are seen as different from other scholarly communication because of the opportunity to reach multiple audiences. Mewburn and Thomson (2013) concluded from their content analysis of blogs that the intended audience most often consists of other higher education staff. However, they also pointed to the hybrid function of a blog as bringing together public and private spheres.

In the research about blogs used by researchers, the frameworks are part of understanding digital communication and the use of new ways of publishing and presenting oneself. In addition, most articles discuss the role and aim of blogging for researchers and often conclude that academic or scholarly blogs are a new form of communication that spans a broad spectrum of possibilities, functions and audiences. It is diversified but still clearly related to communicating science and research in other formats.

SNS/SRM

The 16 articles about SNS or SRM almost exclusively use quantitative methods and are carried out within computer science, bibliometrics or LIS. Only three articles employ qualitative methods.

Eight articles considered the functions SNS/SRM serve for researchers. These can be seen to span the entire spectrum of activities researchers in which they engage. Alhoori and Furuta (2011) compared SRM to a digital library and concluded, based on results from interviews and a survey, that SRM is important for several scholarly activities, both for managing articles and for communicating them. Almousa (2011) investigated differences in the use of Academia.edu in relation to disciplines and academic positions. A comparison between anthropology, chemistry, computer science and philosophy showed small differences in profile completeness and relationships in the network. Coppock and Davies (2013), in a longitudinal study of

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social networking sites for researchers, highlighted barriers to adopting SNS, the major one being lack of clarity about the benefits. Miniaoui and Halaweb (2011) investigated how Facebook can form the basis for communities of practice (CoP), a concept developed by Lave and Wenger (1991). Thelwall and Kousha (2014), similar to Alhoori and Furuta (2011), studied Academia.edu and found that it mirrors both scholarly and social networking norms to some extent. However, they found no correlation between Academia.edu measures and traditional bibliometrics, which could mean that the site measures can instead say something about informal communication. The work by Veletsianos and Kimmons (2012) stands out as being theoretically grounded in a phenomenological approach with an interest in the lived experiences of the researchers. They conclude that there is a tension between personal and professional aspects in relation to social network sites. The researchers can reject parts of the functionality of SNS if it influences their perception of themselves too much.

Two articles are demographic studies reporting how many people use SNS and what for (Mahajan, Singh & Kumar, 2013; Nández & Borrego, 2013). Mahajan, Singh and Kumar (2013) surveyed two universities in India, finding that Facebook was the most frequently used tool and SNS were most commonly used for personal activities. Nández and Borrego (2013) analyzed the profiles in Academia.edu from twelve Catalan universities and also conducted a survey of this group about the reasons for using SNS. Users are young, mostly lecturers and doctoral students from the social sciences and humanities. Getting in touch with others, dissemination, and following others are the most common activities. However, the analysis of the profiles shows that they did not always take full advantage of the opportunities that SNS offer. Bullinger et al. (2010) took a different approach and interviewed founders of social network sites that target researchers. They developed a framework to categorize SNS based on four types of functionalities (information management, collaboration, identity, and network management and communication). Four different types of sites with varying functions were found to predominate: research directory, awareness, management, and collaboration.

Four studies explore the construction of groups in SNS/SRM. Jeng et al. (2012) applied social group theory to descriptions from Mendeley groups. Specifically, they examined group outcomes in terms of changes to the number of group members and articles shared. They concluded that some social group theories are also useful in loosely formed social groups. Jiang et al. (2013) analyzed interdisciplinary structures in Mendeley groups. The results indicated that Mendeley can be used to identify patterns of interdisciplinarity by using strengths of connections in the network. Jung and Wei (2011) studied user participation in groups in Mendeley, to assess the degree to which different disciplines gather in groups. The results showed diversity in the composition of group members and how the groups facilitate multidisciplinary collaboration. Kadriu (2013) proposed a way to use data from ResearchGate to describe research groups with the help of social network analysis metrics.

Four studies looked at how SNS can be used for impact measures. Thelwall and Kousha (2014) suggested measuring informal communication in their study of Academia.edu. Li and Gillet (2013) used a dataset from Mendeley to study the difference between academic and social measures. Li et al. (2012) used both CiteULike and Mendeley to correlate bookmark patterns for a set of articles with

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citation impact and concluded that SRMs might be useful for measuring impact. In a similar study of Mendeley readership, Mohammadi and Thelwall (2013) suggested that bookmarking in SRM offers other perspectives on measuring impact by making visible knowledge transfer between disciplines and the possibility of measuring the impact at an earlier stage than citation counts.

The SNS/SRM articles all explore different aspects. Most of them, however, focus on the functions SNS and SRM have for different research groups or disciplines. This serves as a starting point for studies seeking to explore opportunities afforded by SNS to investigate group dynamics and interdisciplinarity. Articles in Theme 4 (Assessing impact), below, take this one step further and consider opportunities for using the tools as data for impact analysis and looking at new ways of measuring scholarly communication.

Twitter

Of the nine articles about microblogging, only two employ qualitative methods and those are from educational sciences. Three articles use a mix of methods and four are based on quantitative methods. The articles are uniformly distributed between computer science, LIS and bibliometrics.

Holmberg and Thelwall (2014) studied levels of retweeting, conversation, or sharing of links as occurring in 10 different disciplines. They concluded that differences can be discerned among the disciplines. Kieslinger and Ebner (2011), in an explorative, qualitative case study, found that Twitter is mostly used for broadcasting and very little for direct communication. Veletsianos's (2012) study of Twitter as a social network practice was based on how 45 researchers use the service. The results showed seven themes, from sharing information to more conversational activities and engaging in self-promotion. He highlighted the complexity and multifaceted character of the uses and how digital participatory activities meet the aims of the individual and suit the individual's personal ideas of how to be a researcher.

Four studies concern Twitter use at conferences. The general tendency is that Twitter is used at conferences in ways that are directed inwards, between peers and for community building. Letierce et al. (2010) analyzed the use of Twitter during a conference in the semantic web community, asking who tweets, about what, and what connections exist. They concluded that even if Twitter is said to be used to spread science outside a community, the activities mostly concern messages to peers. McKendrick et al. (2012) studied Twitter use at an anesthesia conference and discussed potential use at medical conferences in the future. Ross et al. (2011) analyzed the use of Twitter as a backchannel at a digital humanities conference. Twitter was used more for jotting down notes than actually commenting on what was said in the front channel. They concluded that Twitter activities are part of making oneself known and of sharing what is happening in the community. Sopian et al. (2013) used monitoring technology to study how new connections were made between tweeters at a conference.

Two articles investigate Twitter as a basis for impact studies. Priem and Costello (2010) looked through Twitter for citations, i.e., considering linking in the tweets as a form of citing articles. The study is based both on an analysis of tweets and interviews. Haustein et al. (2014b) explored how often Twitter is used for the

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dissemination of journal articles in biomedicine. They argue that impact measures in social media must be treated differently than traditional metrics.

Most of the articles on the use of Twitter by researchers are descriptive and technical. They contain reports about the ways Twitter is used by researchers and show patterns of retweeting, linking, and network connections. Some are comparative and highlight disciplinary differences in the use of Twitter by researchers. Twitter is in many ways a transient method of communication, as information quickly passes by. This is one of the most prominent features of the service and is also emphasized by the studies showing connections and flows. Yet tweets do have a permanent life, and some of the ideas which begin to emerge in Theme 3 can take the form of measurements and can then become the basis for impact studies founded on altmetric indicators, explored in Theme 4.

5.2.4. Theme 4: Assessing impact

General purpose social media like Facebook, LinkedIn and Twitter, as well as specialized tools for researchers such as Mendeley, ResearchGate and Academia.edu, offer options for tracking and monitoring scholarly communication as expressed by how links and documents are disseminated and discussed. Studies of how these options for tracking and monitoring could be used to determine impact or as a basis for metrics on which to base evaluations have emerged over time, and are often called altmetrics. Sixteen articles include either elements of discussing the impact of social media use or focus specifically on how to develop impact measures in this area. Quantitative methods dominate: 13 articles use quantitative methods and two use a mixed approach.

Two articles concern attitudes to including social media in assessing the scholarly record. Gruzd et al. (2011) interviewed social scientists and they reported a belief that this type of measurement will eventually be a component of tenure decision making. Haustein et al. (2014a) studied the use of social media by bibliometricians. In this group the perception was that social media have the potential to be a source for collecting impact data.

Fourteen articles discuss impact measures from various angles. Haustein et al. (2014b) studied the dissemination of journal articles about biomedicine on Twitter. They concluded that impact in this setting differs from that established through traditional metrics. The uptake is low and varies depending on the specialty, but the tool can still be used to form a new social media based metric. Kousha et al. (2010) tested an impact indicator based on citations in five online sources and concluded that such impact metrics can complement those from traditional sources, such as Web of Science or Scopus. Li and Gillet (2013) studied the difference between academic and social measures and the way that social measures represent a new way of making an impact. In Li et al. (2012), the patterns in CiteULike and Mendeley were shown to be correlated with citation impact. This suggests that these platforms could be useful for measuring impact at some time in the future. Liu et al. (2013) extracted article level metrics from PLoS and correlated them with each other. The results indicate that altmetric measures correlate to traditional measures and can complement the assessment of societal or social impact. Más-Bleda et al. (2014) analyzed linking behavior from the web sites of scientists and found a complex network of

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relationships. They confirmed that important disciplinary differences have to be taken into account when constructing alternative indicators.

In their study of Mendeley readership, Mohammadi and Thelwall (2013) showed that measuring Mendeley bookmarks creates latitude for other perspectives on impact than what citation counts can offer, including knowledge sharing between disciplines and earlier impact measurement. Peters et al. (2012) describe the use of various social media and what to take into account if these different tools and their metrics are to be used for altmetrics. For example, publication lists are inconsistent and too few researchers use social reference managers for reliable statistics to be based on them. Priem and Costello (2010) focused on Twitter citations to analyze how they can form the basis for citation analyses. They showed how citations on Twitter differ from other contexts. They are often indirect and part of a broader conversation. Shuai, Pepe and Bollen (2012) found that Twitter mentions are statistically correlated with arXiv downloads and early citations in favoring frequently-mentioned articles. Sugimoto and Thelwall (2013) use various measures and statistical analyses of TED videos to show that they have more impact on the general public than the academic community. In a comparison between altmetric measures and Web of Science citations Thelwall et al. (2013) suggest that time must be part of the use of altmetrics for articles. They emphasize that use is still low for several of the sources, though not for Twitter. Thelwall and Kousha (2014) studied Academia.edu to see how it performs in relation to what is known about use in general-purpose social network sites. The profiles of the researchers on the site were compared using bibliometric measures. No correlation was found, nor was there any correlation between the new measures and traditional bibliometrics. The authors suggested that measures based on Academia.edu may say something about informal communication instead. A study by Torres-Salinas et al. (2013) of Spanish researchers in communication studies compared traditional bibliometric measures with altmetrics. They highlight the problems that emerge when various metrics are related to each other.

Most of the studies of altmetrics agree that more measures can be added to traditional impact factors. New aspects, pertaining to social impact or public visibility, of what can be measured apart from citations are added to the toolbox of quantitative assessment. At the same time, the articles present a complex picture of the role of social network sites and social media in academia and emphasize 1) the difficulty of creating new online impact measures that are rooted in disciplinary differences, and 2) the varying practices of researchers when it comes to using tools. The articles also emphasize that the options for collecting data through social media are considerably less accurate than traditional formal databases offer.

5.2.5. Theme 5: Practices and new modes of communication

This theme includes 13 articles, six of which have been discussed in relation to other themes above. The articles are within humanities and social science disciplines. Ten use qualitative methods and three employ mixed methods. For this theme, explicit theoretical framing of the research is considerably more common than in previously established themes. Theoretical approaches include phenomenology (Veletsianos & Kimmons, 2012) and evaluation theory (Luzon, 2012), as well as approaches that are grounded in scholarly communication research and theories of academic practices.

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Acord and Harley (2013) describe the way that cultural drivers from academic conditions, as well as personal values in terms of credit, time and personality, influence sharing practices. They explore open peer review and data sharing to understand disciplinary differences, concluding that as disciplines become more and more specialized, it is unlikely that the models for scholarly communication and adoption of new communication tools will look the same. At the same time the blurring between informality and permanence in social media activities can cause disorder and make scholars avoid new technologies. Carpenter and Drezner (2010) used mainly their own experiences in the field of international relations to study the reshaping of professional activities by social media. The context is altered by the use of social media, hierarchies are set in motion, and new forums for communication are generated. Lievrouw (2010) considered Web 2.0 to be the basis for a revival of little science grounded in informality, reciprocity, and interaction, making science reflect social communication as opposed to the case with big science policies. Murthy et al. (2013) analyzed the content of a site that targets female scientists. They discussed the ways that a digital social platform contributes to forming group identity and serves as a support and mentoring function. Veletsianos and Kimmons (2013) explored how a type of networked participatory scholarship can be interpreted by analyzing the situation of contemporary researchers from a historical perspective based on the relationship between technology and scholarship. They concluded that there is a trend toward scholars who participate online and share, make reflections, and criticize, and that this is part of a new type of scholarship.

Gregg (2006) discussed blogs as part of research practices in cultural studies. She saw blogs as making the researcher aware of how identity is part of a perspective on the world. This may be motivated by the will to connect, but also can be counter-professional, competing with the resources of good ideas and time which are needed as an academic. Nicholas et al. (2014) carried out 14 focus groups with researchers in 2013. Their main goal was to understand how researchers perceive trustworthiness and authority in the digital era. One of their conclusions is that social media are of minor importance for the communication researchers do but are mostly tools for the promotion and generation of ideas when used. One aspect of new modes of communication is the self-expression that is made visible through various tools or that reflects the shaping of an online academic identity. Luzon has found in several different studies (2009, 2011, 2012, 2013b) that blogs are a new context of scholarly communication and form a basis for constructing an identity of academic blogger's as skilled or expert in their research communities. In a study of online scholarly practices, Veletsianos (2013) concluded that social media are a place where scholarly practices are openly played out but they also include presentation of a self which is separate from the academic context. Veletsianos and Kimmons (2012) reported on a phenomenological study of researchers and their experiences of social networking sites. The tension between the personal and professional, and the option for researchers to not use SNS, show a kind of participation and identity management strategy that plays out in digital settings in relation to digital literacy skills.

In several of the studies, the focus was on how informal communication is made more permanent, that it is possible to archive and retrieve. This is discussed in relation to scholarly communication and its influence on participatory knowledge production. However, the digital tools are seen as shaped by the contexts in which they are used rather than forcefully driving technological change in scholarship. The research

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summarized by this theme is connected to a more theoretically driven understanding of the work or practices of researchers in digital settings. In addition, some studies also see self-expression, personal values, personality and the shaping of an identity as being part of the more general blurring of the boundaries in a digital setting. Nevertheless, the tension between being personal and professional is purposefully employed by researchers who either make use of a tool or choose not to.

6. Discussion

The first question guiding this mapping of the field on the use of social network sites and social media by researchers asked how the studies, published in 2004-2014, can be characterized in terms of theory base and methods used. This review shows a quite heterogeneous collection of studies, including articles from a range of disciplinary areas and published in a large number of different journals. Still, most studies were conducted within computer science related areas and LIS—even more so if the disciplinary categories LIS (sometimes also called information studies), and bibliometrics are merged into one. One reason may be the choice to include LISTA as one of the databases for collecting the articles to be surveyed. However, Web of Science and Scopus are large interdisciplinary databases that provide access to sources in a broad range of disciplines. Another more important reason for the dominance of LIS might be the discipline's longstanding interest in scholarly communication (Borgman, 2007). In this sense, the use of social network sites and social media by scholars is just an empirical widening of an established field of investigation.

The use of quantitative and qualitative methods is fairly evenly divided between articles. The majority of the articles are of a descriptive nature, without explicitly relating to theoretical understandings of science or scholarly communication. Authors based in the United States dominate, which largely mirrors other research in the disciplines involved. However, the majority of articles do not empirically investigate the situation in particular countries, at least not explicitly so. This might indicate that social media are a global phenomenon, and are also studied as such. It might, however, also indicate that a largely Western and North American phenomenon is presented as the norm and thus not described in terms of cultural and regional affiliation.

The interpretative section of the results answers the broad question: What is known about the use of social network sites such as social media by researchers during this time and what are the blind spots? Social network sites and social media used by scholars are investigated from a number of different perspectives and using a number of different methods. The field is under development and there is a clear trend toward more published studies in recent years. Articles based on quantitative methods dominate, with surveys and various statistical methodologies, similar to those used in bibliometrics. The articles often describe how either the uptake plays out in general or how a certain tool is used. The descriptive character seems in many cases to have pushed theoretical underpinnings into the background. That might be explained by the fact that a fairly recent phenomenon is being investigated.

Although 14 articles concern how researchers use digital tools in a more general manner, it is hard to synthesize the results because there is no consistency with

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respect to the tools that are included in the studies. However, a few broader trends can still be made out. A number of studies show how researchers make use of specialized tools that do not immediately come to mind when talking about social media in general; mostly these are collaborative authoring tools (e.g. Google Drive, wikis). The studies also show that awareness of the tools is not necessarily connected with contributing. Still, several studies (Haustein et al., 2014a; Gruzd and Goertzen, 2013) indicate that researchers expect that social media and web presence will grow in importance in the future in various ways. The articles on impact and evaluation share this belief that there will be more use over time and therefore explore options for the use of metrics based on these new digital sources.

A small group of studies dealt explicitly with the aspects of outreach and of how social media can be used to make science more openly available. Mainly they discuss the dissemination of and access to science/research. Some attempts are made to problematize reciprocity (Kelly & Autry, 2013; Lievrouw, 2010; MacKenzie, 2013) and a related discussion can be seen about blogging and various target groups (Luzon, 2013a). Only a handful of articles touch on how scholars use social media to promote their identity as trustworthy (Kirkup, 2010; Luzon, 2009, 2011, 2012, 2013; Veletsianos 2012, 2013; Veletsianos and Kimmons, 2012, 2013). This focus on both open science and trustworthiness could enrich the research with an understanding of how social media contribute to new ways of creating trust in scholars, and in their work and science at large, as well as how researchers appraise credibility in the use of new communication options. These perspectives could also help the researchers develop an understanding of the societal and cultural aspects of social network sites and social media in academic settings.

The results clearly show that social network sites and social media are used as part of scholarly life, however they are used differently among various groups of researchers, which can be related to differences in disciplinary practices (Becher & Trowler, 2001; Knorr Cetina, 1999). Regarded as an area of research, the growing body of studies on the use of social network sites and social media by scholars remains fragmented and shows some weakness. The often descriptive character of the studies makes the area very conditioned by the time of investigation, which in turn makes it susceptible to quickly becoming out-of-date. Despite the fact that much of the research might be seen as an offspring of more traditional research on scholarly communication, many articles demonstrate difficulties in formulating or being grounded in a broader body of knowledge to which the individual work is supposed to contribute. Hand in hand with the descriptive character goes a lack of theoretical awareness that might have bridged the many disparate empirical studies. Despite investigating scholarly communication, too few articles ground their analysis in theoretical understandings of science or scholarly communication. Such perspectives could make the results more sustainable despite investigating rather time-sensitive technologies. They could also facilitate the development of a more comprehensive understanding of the role of social network sites and social media in scholarly life by bridging gaps in an otherwise fragmented area of research.

Conclusion

Social network sites and social media have become more and more important for scholarship and are increasingly used by researchers for different purposes and to

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differing extents. In the wake of this development social media based metrics have emerged and are seen as opening up new possibilities for evaluating research and researchers (Piwowar 2013), not least in order to measure social impact and outreach activities, and ultimately to allocate resources. A thorough understanding of the research carried out on researchers' use of social network tools is paramount in understanding contemporary scholarship and also to make informed decisions on whether to employ such metrics and if so on which premises. This field of study lacks methodological, theoretical and empirical coherence, though in a way this can also be enriching in that it potentially enables multifaceted perspectives. However, together with the lack of theoretical rigor and stringency, this lack of coherence needs to be addressed. Identifying this weakness and mapping the most salient strands of research in the area is a first step on the way to a more comprehensive understanding of the roles of social network sites and social media in scholarship and of ways to advance research in the area.

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Wilkinson, C., & Weitkamp, E. (2013). A case study in serendipity: Environmental researchers use of traditional and social media for dissemination. *Plos One*, 8(12), 1-1.

Wilson, M. W., & Starkweather, S. (2014). Web presence of academic geographers: A generational divide? *Professional Geographer*, 66(1), 73-81.

Table 1. Workflow for inclusion of relevant studies in the review.

1. Potentially relevant references from applying search strings in the databases
 - Web of Science n = 1300
 - EBSCO LISTA n = 1039
 - EBSCO Academic Search Elite n = 2260
 - SCOPUS n = 2643
2. Potentially relevant abstracts after exclusion based on title and abstract
 - Web of Science n = 59
 - EBSCO LISTA n = 35
 - EBSCO Academic Search Elite n = 75
 - SCOPUS n = 116
3. Total after de-duplication
 - n = 186
4. Potentially relevant full texts after review based on title and abstract
 - n = 103
5. Potentially relevant studies after review based on full text
 - n = 80

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Table 2. Journals with more than one published article

1	First Monday	4
2	Journal of the Association for Information Science & Technology	4
3	PLoS ONE	4
4	Proceedings of the ASIST Annual Meeting	4
5	Journal of Medical Internet Research	3
6	Scientometrics	3
7	Electronic Library	2
8	Information Services & Use	2
9	Internet and Higher Education	2
10	Journal of Computer Assisted Learning	2
11	Journal of Documentation	2
12	Learned Publishing	2

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Table 3. Theories explicitly mentioned by authors.

Method	None mentioned	Mentioned	Total
Mixed	11 (20%)	7 (29%)	18 (22%)
Qualitative	12 (21%)	15 (63%)	27 (34%)
Quantitative	33 (59%)	2 (8%)	35 (44%)
Total	56 (70%)	24 (30%)	80

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Table 4. Geographic setting specified

Country	Total
N/A	58
United States	7
Germany	3
UK	3
India	2
Spain	2
China	1
Finland	1
Belgium	1
France	1
Macedonia	1
Philippines	1
Sweden	1
United Arab Emirates	1
Total	83

Note: Three articles reported findings about more than one specified country.

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Table 5. Articles in themes.

Theme	No of articles
General uptake	14 (17%)
Outreach	8 (10%)
Specific tools and cases (total)	50 (62%)
blogs	18
SNS/SRM	18
microblogging (Twitter)	9
other	5
Assessing impact	16 (20%)
Practices and new modes of communication	13 (16%)

Note: The percentages exceeds 100% in total since one article can be placed in several themes

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Table 6. Studies in the theme General uptake.

Reference	Year of study	Type of study	Researchers included - geographic or discipline	Tools included as written by authors
Allgaier, Dunwoody, Brossard, Lo, & Peters (2013)	2010	Survey	Neuroscientists'	blogs or personal accounts, content in social networks, journalistic sources
Cruz & Jamias (2013)	2012	Survey	Researchers at University of the Philippines los Banos	Facebook, Google+, LinkedIn, Academia, Mendeley, Scribd, Slideshare, Wordpress, Blogger, Wiki, GoogleDocs, Twitter, Skype, Youtube, Flickr, Multiply
Gruzd & Goertzen (2013)	2010/2011	Survey	Social scientists'	listserv lists, blogs, microblogs, non-academic social networks, academic social networks, online document management, video/tele conferencing, wikis, media repositories, bibliographic management, virtual worlds, social bookmarking, presentation sharing sites
Gruzd, Staves, & Wilk (2011)	2010	Interview study	Library and Information Science researchers	virtual worlds, presentation sharing sites, social bookmarking tools, academic social networking tools, bibliographic management sites, microblogging tools, media repositories, online document management tools, video/teleconferencing tools, blogs, listserv groups, non academic social networking tools, wikis
Gruzd, Staves, & Wilk (2012)	2010	Interview study	Library and Information Science researchers	virtual worlds, presentation sharing sites, social bookmarking tools, academic social networking tools, bibliographic management sites, microblogging tools, media repositories, online document management tools, video/teleconferencing tools, blogs, listserv groups, non academic social networking tools, wikis
Gu & Widen-Wulff (2011)	2009	Survey	Researchers at Åbo University	blogs, mini blogs, RSS, wikis, tagging, social networks, multimedia sharing, and

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				online documents
Haustein, Peters, Bar-Ilan, Priem, Shema, & Terliesner (2014)	2012	Survey	Bibliometricians'	Facebook, LinkedIn, Twitter, Google+, Mendeley, Academia.edu, ResearchGate, CiteULike, Delicious, Xing, MySpace, Connotea, BibSonomy
Keller, Labrique, Jain, Pekosz, & Levine (2014)	2011	Survey	Public Health researchers	blogs, Facebook, Twitter, Youtube
Madhusudhan (2012)	2011	Survey	Researchers at University of Dehli	blogs, Delicious, Facebook, Flickr, LinkedIn, Library Thing, MySpace, Orkut, Slideshare, Youtube, Wikis
Nicholas & Rowlands (2011)	2010	Survey	Researchers from UK and US	social networking, blogging, microblogging, collaborative authoring tools for sharing and editing documents, social tagging and bookmarking, scheduling and meeting tools, conferencing, image or video sharing.
Nicholas, Watkinson, Volentine, Allard, Levine, & Tenopir (2014)	2010	Focus groups	Researchers from UK and US	social media
Rowlands, Nicholas, Russell, Canty, & Watkinson (2011)	2010	Survey	Researchers from UK and US	social networking, blogging, microblogging, collaborative authoring tools for sharing and editing documents, social tagging and bookmarking, scheduling and meeting tools, conferencing, image or video sharing.
Tenopir, Volentine, & King (2013)	2011	Survey	Researchers from UK	blog, online video, RSS feeds, Twitter, user comments, podcasts
Wilson & Starkweather (2014)	2010	Survey	Geographers'	social networking sites, blogs, microblogs, search engines, mapping sites, traditional media sites, social media sites

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Appendix A. Articles (full citations are listed in References)

No	Article
1	Acord & Harley (2013)
2	Alegi (2012)
3	Alhoori & Furuta. (2011)
4	Allgaier, Dunwoody, Brossard, Lo, & Peters (2013)
5	Almoussa (2011)
6	Bender et al. (2011)
7	Bukvova, Kalb, & Schoop, (2010)
8	Bukvova (2011)
9	Bullinger, Hallerstedde, Renken, Soeldner, & Moeslein (2010)
10	Cao & Yin (2009)
11	Carpenter & Drezner (2010)
12	Colson (2011)
13	Coppock, & Davis (2013)
14	Cruz, & Jamias (2013)
15	Gregg (2006)
16	Gruzd, & Goertzen (2013)
17	Gruzd, Staves, & Wilk (2011)
18	Gruzd, Staves, & Wilk (2012)
19	Gu, Widen-Wulff (2011)
20	Hank (2013)
21	Haustein, Peters, Bar-Ilan, Priem, Shema, & Terliesner (2014)
22	Haustein, Peters, Sugimoto, Thelwall, & Larivière (2014)
23	Heap & Minocha (2012)
24	Holmberg & Thelwall (2014)
25	Jacobs, & McFarlane (2005)
26	Jeng, He, Jiang, & Zhang (2012)
27	Jiang, Ni, He, Jeng (2013)
28	Luzon (2013a)
29	Luzon (2012)
30	Luzon (2011)
31	Luzon (2009)
32	Jung, & Wei (2011)
33	Kadriu (2013)
34	Keller, Labrique, Jain, Pekosz, & Levine (2014)
35	Kelly & Autry (2013)
36	Kieslinger & Ebner (2011)
37	Kirkup (2010)
38	Kjellberg (2009a)
39	Kjellberg (2010)
40	Kjellberg (2009b)
41	Kousha, Thelwall, & Rezaie (2010)
42	Letierce, Passant, Breslin, & Decker (2010)
43	Li & Gillet (2013)
44	Li, Thelwall, & Giustini (2012)
45	Lievrouw (2010)

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46	Liu, Yue, Wu, Chen, & Ji (2013)
47	Luzon (2013b)
48	Más-Bleda, Thelwall, Kousha, & Aguillo (2014)
49	Mackenzie (2013)
50	Madhusudhan (2012)
51	Mahajan, Singh, & Kumar (2013)
52	McKendrick, Cumming, & Lee (2012)
53	Mewburn & Thomson (2013)
54	Meyer & McNeal (2011)
55	Miniaoui & Halaweh (2011)
56	Mohammadi & Thelwall (2013)
57	Murthy, Rodriguez, & Kinstler (2013)
58	Nández & Borrego (2013)
59	Nicholas & Rowlands (2011)
60	Nicholas et al. (2014)
61	Peters, Beutelspacher, Maghferat, & Terliesner (2012)
62	Pikas (2008)
63	Priem & Costello (2010)
64	Ross, Terras, Warwick, Welsh (2011)
65	Rowlands, Nicholas, Russell, Canty, & Watkinson (2011)
66	Shema, Bar-Ilan, & Thelwall (2012)
67	Shuai, Pepe, & Bollen (2012)
68	Sopan, Rey, Butler, & Shneiderman (2013)
69	Sugimoto & Thelwall (2013)
70	Tenopir, Volentine, & King (2013)
71	Thelwall, Haustein, Lariviere, & Sugimoto (2013)
72	Thelwall & Kousha (2014)
73	Thorsen (2013)
74	Torres-Salinas, Cabezas-Clavijo, & Jiménez-Contreras (2013)
75	Veletsianos (2012)
76	Veletsianos (2013)
77	Veletsianos & Kimmons. (2012)
78	Veletsianos & Kimmons (2013)
79	Wilkinson & Weitkamp (2013)
80	Wilson & Starkweather (2014)

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Appendix B. Code book

Author and Year

For matching with reference list with bibliographic data

Method/analysis

As written by authors

Method (qual, quant, mix) (based on terms used by authors as well as known quantitative/qualitative methods)

Qual

Quant

Mix

Theory(ies)

Full name of theory when explicit

N/A if not explicit

Informants/material

Who, how many, which disciplines

Social media tool

From list:

Blog

Web 2.0/social media	when mix of different types and social media, sometimes called web 2.0 (often in earlier research)
----------------------	--

SRM	Social Reference Manager + which tool if specified
-----	--

SNS	Social Network Site + which tool if specified
-----	---

Online profiles	not specifically connected to SNS
-----------------	-----------------------------------

Wiki

Twitter	also includes other micro-blogging tools
---------	--

Podcast

YouTube

Country (author)

Country of the author(s), number of author in parenthesis

If several authors, several countries

Country (data)

Country in which the research is performed if applicable

N/A

Aim/purpose

As stated in the article

Results/conclusions

As reported in abstract or in conclusions

Important note

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If something special from article to remember

Comment

Comment to researcher

Research area

Of the first author/researcher doing the study. Added sub discipline, from the nomenclature that stems from the Swedish Standard of Classification of Disciplines, which is based on the international OECD model (SCB), the first time an author came from a new area as when gathering data. Adjustments were made to add one level deeper for some disciplines. Bibliometrics was treated as a discipline because of high number of articles. Information studies includes information science, library studies, and library and information science/studies.

The following subjects were used:

- Sociology
- Political Science
- Social and Economic Geography
- Educational Sciences (including Educational Technology)
- Computer and Information Sciences (including e.g Information Systems)
- Media and Communications -> Information Studies (third level)
- Media and Communications -> Bibliometrics (adjustment, doesn't exist as third level)
- Media and Communications -> Journalism (adjustment doesn't exist on third level)
- Other Humanities -> Cultural Studies
- Languages and Literature -> English
- Medical and Health Sciences (first level in SCB)

Data

Which data are present about social media use by researchers? More than one type may be entered

- Interview data (includes focus groups)
- Twitter data
- Survey data
- Citation data
- Log files
- Wiki data
- Blog data
- Online profiles (also SNS)
- Personal use
- Field notes
- Other (e.g., literature)