Changing styles of informal academic communication in the age of the web

Ellis, David; Foster, Allen; Shehata, Ahmed Maher Khafaga

Published in:
Journal of Documentation

DOI:
10.1108/JD-06-2016-0083

Publication date:
2017

Citation for published version (APA):
Ellis, D., Foster, A., & Shehata, A. M. K. (2017). Changing styles of informal academic communication in the age of the web: Orthodox, moderate and heterodox responses. *Journal of Documentation*, *73*(5), 825-842. https://doi.org/10.1108/JD-06-2016-0083

Emerald Journal of Documentation

Changing styles of informal academic communication in the age of the Web: orthodox, moderate and heterodox responses.

Journal:	*Journal of Documentation*
Manuscript ID	JD-06-2016-0083.R2
Manuscript Type:	Article
Keywords:	Scholarly communication, Social Web, Scholarly publishing, Information seeking, Informal communication, Scholarly collaboration

Changing styles of informal academic communication in the age of the Web: orthodox, moderate and heterodox responses.

Abstract

Purpose- The purpose of this paper is to report the findings of a study to investigate changes in scholarly communication practices among a group of scholars in the UK and build upon the results that were published in a previous paper.

Design/methodology/approach- The study deployed a naturalistic inquiry approach using semi-structured interviews as a qualitative research tool. A sample of 40 participants from four UK universities were interviewed to explore the changes in informal scholarly communication behaviour.

Findings- The analysis of the interviews revealed that there are three ideal types of behaviour: the 'Orthodox' uses formal and traditional scholarly communication approaches; the 'Moderate' prioritises formal communication approaches, but at the same time is trying to get benefits from informal channels; and, the 'Heterodox' uses all channels available in scholarly communication.

Originality and value - The value of the current study lies in using a naturalistic inquiry approach to investigate the changes in scholarly communication practices, and to explore different scholarly communication styles. In the context of this study, the use of a naturalistic approach and grounded theory principles in connection with coding provided a stance that allows for the gathering of rich information to enable understanding and explanation of scholarly communication activities in addition to uncovering themes that related to scholarly behaviour.

Keywords - Scholarly research, scholarly communication models, communication practices, scholarly publishing, scholarly collaboration, information seeking.

Introduction

In the past two decades, the scholarly communication process has changed significantly. An increasing number of researchers are using Web 2.0 applications to communicate with other researchers, collaborate with peers, publish and disseminate their research among scholarly community. In the past, researchers were restricted to journal papers, faculty hallways, and conferences to communicate and share knowledge. However, modern communication technologies changed how they communicate, blurring the boundaries between formal and informal communications, allowing them to share their research with a huge number of scholars without restrictions.

Scholarly communication is defined as "the system through which research and other scholarly writings are created, evaluated for quality, disseminated to the scholarly community, and preserved for future use. The system includes both formal means of communication, such as publication in peer-reviewed journals, and informal channels, such as electronic listservs" (Association of College and Research Libraries, 2006). While many definitions have been provided to explain the scholarly communication process, all of them categorised the scholarly communication process into two activities: formal and informal communication (Garvey and Griffith, 1971;Barjak, 2006;Folk, 2015) :

- Formal scholarly communication is "the published material that has been reviewed by peers, edited by publishers, and is retrievable through various information systems" (Pikas, 2006, P. 5). It allows researchers to create, disseminate, review, evaluate and retrieve scholarly work. Therefore, scholars and scientists carry out several physical and intellectual activities to achieve these goals. These activities include searching, collecting, reading, writing and collaborating (Regazzi, 2015 p. 8;Palmer et al., 2010).
- Informal scholarly communication describes the communication activities that happens between researchers outside the formal means of communication, such as scholarly journals or conferences (Pikas, 2006). This interaction

happens in many ways. For instance, informal communication could happen face to face, by telephone, fax, post, electronic mail, personal websites (blogs), conferences meetings, email lists and even through social networks available on the Internet. Informal channels differ from the formal ones in that they allow more interaction between the transmitter of the information and the receiver, which is difficult in formal channels (Russell, 2001). The obvious benefit of informal communication is that it can help to identify a suitable research idea and hypothesis, define the research approach, refine the findings, and put them in the context of other research (Mahmood et al., 2009).

Amidst a background of new scholarly communication channels, and the huge number of papers that discuss scholarly communication on the social web, it is notable that few researchers have investigated changes in the balance of approaches used in scholarly communication. The current study attempts to give a better view of the changes in research practices and scholarly communication practices .

Scholarly communication models.

A number of models of scientific communication have been developed over the years. The earliest model was that of Garvey and Griffith (1972). This model was considered by practitioners on the field to be applicable across both the physical and social sciences as it provides details of the stages of scholarly communication within a time frame, starting from initiating the research, to the integration of the research as an accepted component of scientific knowledge. At the end of the century a study by Roosendaal and Geurt (1998) explored the forces that plays a role in allowing the description of the scholarly communication dynamics of the market. The study also analysed the change from the traditional linear scientific information chain to the network form. In addition, the study identified four main functions of scientific scholarly communication which are registration, awareness, certification and archive.

The millennium saw increasing interest in scholarly communication models. Hurd (2000)a model which included “both modernized and transformed features”. This model considered the effect of the Internet and the digital environment in the process of scholarly communication. The study claimed that behavioural and organisational determinants are important factors in shaping the future of scholarly communication.

The UNISIST model was also one of the earliest models in scholarly communication literature, which described the scholarly communication process through traditional channels. Sùndergaard et al. (2003) presented a revision of this model in 2003. This study found that there is a need to revise the old model because of developments in electronic communication, which were not included in the earlier model. They proposed that there is a need to compare and emphasise the scholarly communication practice within the humanities and social sciences, as the UNISIST model has only covered scientific and technical communication as a whole. Therefore, it was suggested that there is a need for a model that is not only a descriptive model but also a theoretical perspective from which information systems may be understood and evaluated.

Bjork (2005) designed a "scientific communication life-cycle (SCLC) model". This model was described as a "process-oriented" model where all the scholarly communication elements were discussed. This model identifies and includes the activities of the participants in the scholarly communication process, including researchers, research funders, publishers, libraries, bibliographic services, readers, and practitioners. This model explains and demonstrates the complexity of the scientific communication process, highlighting the different stakeholders and their roles, and highlighting that scholarly communication is a continuous process in which researchers need to play the role of authors, peer reviewers, editors, and also as knowledge consumers. In comparison to earlier models, this model is more detailed and hierarchical and includes more elements such as activities, inputs, outputs, controls, and mechanisms. Khosrowjerdi (2011) argued that earlier scholarly communication models are not dependent on context, time, and scale. Therefore, his study developed a model that can be used in many contexts. The researcher claimed that his model is viable and can update itself over a period of years. Consequently, new elements of scholarly communication such as the Web 2.0 platforms could be integrated into the model.

Changes in the scholarly communication system.

In all of the previous scholarly communication models, the process of scholarly communication is based on a number of main activities: communicating, seeking, citing, collaborating, publishing and disseminating information. These activities are

the core of the scholarly communication system as it has been understand to exist. However, many of these activities have changed because of the influence of information technologies:

1- Scholarly publishing**,** for example, was exposed to many changes because of the integration of new technologies. Early studies thought that the Internet will change publishing, providing academia with great potential for becoming the leading publishing platform, which was considered a threat to the existence of the traditional publishers (Oppenheim et al., 2000;Borgman, 2000;Bohlin, 2004;Rowlands et al., 2004;Waltham, 2010;Cope and Phillips, 2014). The adoption of information technologies brought huge optimism among scholars, as it was found to increase researchers' productivity and publications (Hesse et al., 1993;Cohen, 1996;Kaminer and Braunstein, 1998;Walsh et al., 2000). It was thought that this would contribute to the overcoming of traditional scholarly publishing problems and limitations, such as pricing and geographical boundaries (Schauder, 1994), and enable authors to self-archive their publications, making the dissemination of the research faster (Borgman, 2000), and create new scholarly publishing platforms, such as open access journals and digital repositories, which were viewed as a solution and an additional alternative to the formal communication system (Raghavan, 2006;Yiotis, 2013;Assante et al., 2015).

2- Information seeking behaviour was affected by the change in information technologies as well. Studies found that channels such as newsgroups, Internet discussion groups, bulletin boards, conferences and discussions with colleagues in person, via e-mail or via the telephone would help the electronic exchange of information between researchers and they are extremely valuable (Ng, 1998;Matzat, 2004;Matzat, 2009;Mulligan and Mabe, 2011). Later, it was found that there is an increasing trend among researchers to use new forms of scholarly communication in research activities, as platforms such as blogs, Wikis, and online video services are increasingly utilised by academic staff to communicate, collaborate and seek information (Niu et al., 2010). Another study found that using social media to seek information would be a good method for researchers to find the information they need and, in addition,

they would receive personalised answers, which would increase their confidence in the validity of information (Morris et al., 2010).

3- Tools such as social networks were found to play a vital role in scholarly communication practices. It was found that the reasons most academics use social networks for are a) the ability to gain and develop new research ideas from the direct communication between themselves (Kirkup, 2010); and b) because these networks provide an alternative to the scholars' need to publish in traditional paper publications, such as scholarly journals (Sauer et al., 2005;Kirkup, 2010). Interestingly, a recent study by Nicholas and Rowlands (2011) found that social media are used for many reasons by researchers, as they benefit from these channels in authoring, conferencing, and collaborative work. However, despite all these benefits, it was found that the adoption of SNS has reached only modest levels so far (Procter et al., 2010;Gu and Widén-Wulff, 2011;Forkosh-Baruch and Hershkovitz, 2012;Nentwich and König, 2014).

In reviewing the literature it is clear that there are many useful contributions on the impact of information and communication technologies on some scholarly communication activities such as seeking information, citing and publishing information (Rowlands and Nicholas, 2005;Eysenbach, 2008;Procter et al., 2010;Jamali et al., 2015;Nicholas, 2015;Watkinson et al., 2016). However, none of these earlier studies covered the full range of formal and informal scholarly communication practice.

Methodology

The present study deployed a naturalistic inquiry research approach which is a "discovery-oriented approach that minimizes investigator manipulation of the study setting and places no prior constraints on what the outcomes of the research will be" (Patton, 2002, p. 39). The study exemplifies an approach to information behaviour research which is characterised by the adoption of a social science, and, in this case, a naturalistic perspective; a qualitative as opposed to a quantitative orientation; a focus on the modelling of information behaviour; and a concern with empirical validation and exemplification (Ellis, 2011). The study aimed for depth and richness of

information rather than high numbers of participants. A study guided by naturalistic inquiry does not seek to achieve statistical generalizability, the aim is to explore and provide a basis for understanding a point of view belonging to those participants and in naturalistic terms would look to transferability not generalizability (Lincoln and Guba, 1985).

A sample of 40 academic researchers in four universities were interviewed between September 2012 and October 2013. The universities – Aberystwyth University, Cardiff University, University of Birmingham, and University of Manchester – were selected based on geographical location. The sampling approach adopted was purposive in the sense of catering for inclusion of different institutions and locations, within the Higher Education sector in the UK; different disciplinary backgrounds e.g. science, social science; and different levels of academic experience. In this respect, it attempted to represent different characteristics of the population without being a statistically representative sample. The sample distribution is illustrated in Figure 1 below. The principle of inclusion of individuals from the different facets mentioned being used to guide the variation in the sample.

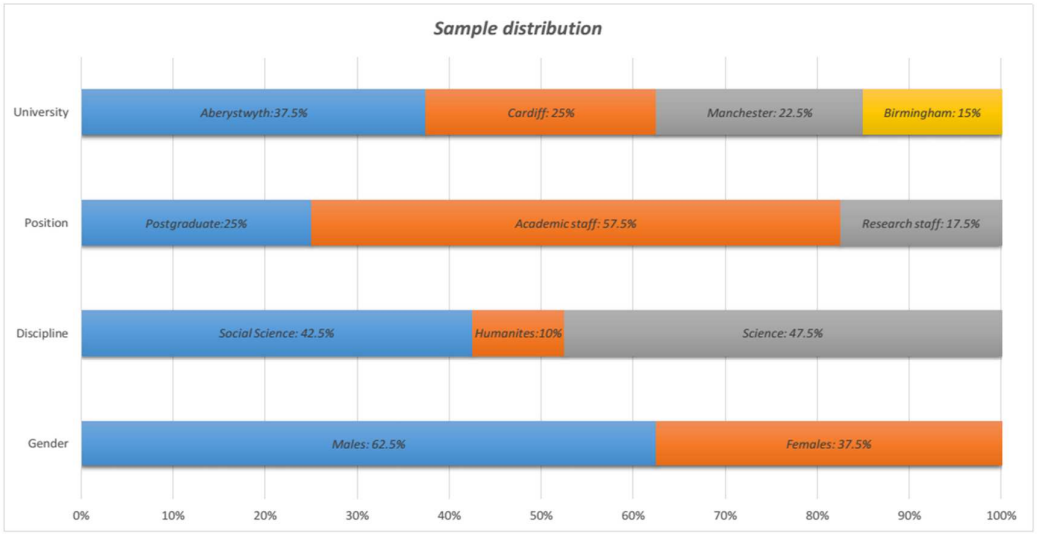

Figure 1 Sample distribution

Academics and researchers from different academic departments were asked to participate in the study. As a result, the researcher was able to interview participants

from science, social science, and humanities in departments in the four universities. Participants were first asked questions on what channels they used for communications, formal and informal, and how their scholarly practices changed during the span of their career. A second set of questions focused on scholarly publishing and collaboration behaviour. A third moved on to information seeking and citation behaviour with a focus on the use of social web to seek information. Following grounded theory principles, analysis was carried out in conjunction with data collection and saturation of data was reached after interviewing thirty-two participants as no new codes or different types of data were emerging. To confirm this eight more interviews with different participants were carried out, but no additional new codes were identified.

Data collection and analysis

The process of data collection and analysis involved several steps, starting with collecting qualitative data using semi-structured interviews, then moving to transcribe and code all the interviews, NVivo software was used to analyse and code transcripts, as it was found to facilitate the analysis process. Open coding was used at the first stage identifying the concepts that were recorded from the first group of interviews. Codes such as "Using social network sites in communication", "Change in information seeking behaviour", "Difference in scholarly communication between disciplines", "Opinion about informal scholarly communication" and "Informal channels credibility" were used at this stage of the research. Constant comparison was used as the main coding approach. Data were coded and checked against earlier interview transcripts in order to compare concepts and to find themes. Subsequently, many themes emerged. Axial coding was the next stage of the process: at this point, relationships were identified between the open codes in order to see the connections via inductive thinking. At the third stage, core codes were identified via selective coding.

Using a naturalistic inquiry approach entailed not having pre-determined categories, as the categories emerge from the data during the analysis process. Hence, existing models were not used to determine the categories. The analysis of the data allowed

independent identification of scholarly communication practices and allowed comparison with existing scholarly communication models as a separate stage of development.

The scholarly communication process could be summarised in terms of the following activities summarised in Table 1 (Shehata et al., 2015b):-

Table 1 Scholarly communication activites

Process	**Formal Channels**	**Informal Channels**
Interaction		
Interacting with peers to discuss ideas or seek help.	Wider audience venues, e.g. Conferences	Face to face Email lists Social Networks
Seeking information		
Looking for information related to the research project.	Searching online Databases Content Tables Reading books	Social Networks (send and receiving Notifications of updates Blogs
Citing information		
Citing information resources	In peer reviewed papers and conferences	Informal approaches by citing information in social networks or non-peer reviewed publications
Collaboration		
Building collaborations with peers existing and new	Conferences Meetings Working with colleagues in same institution	Informal approaches to peers and developing new peer relationships via project collaborations.
Publishing and dissemination		
Publishing and sharing the research results to a wider	Peer reviewed publishing channels	Pre-print sharing in Social Networks and Digital repositories

audience		Generating posts on Social Network sites.

Styles of scholarly communication

The study showed that researchers engaged in scholarly communication use different approaches or styles. As a result, they were categorised into three main groups of scholars (Shehata et al., 2015b):-

- **Orthodox** - for this type of scholars, traditional formal scholarly communication practices are the strongly preferred approach to research.
- **Moderate** - Moderate scholars adhere to traditional scholarly communication practices. Modern communication methods are used when it is necessary, though it is not used in activities such scholarly publishing or as a resource of information.
- **Heterodox** scholars use informal and formal scholarly communication in all scholarly communication stages. Heterodox scholars are heavily dependent on the social web to conduct their research.

Orthodox, Moderate and Heterodox are idealised activity profiles, they serve to highlight three patterns of informal scholarly communication, to which the actual information behaviour of individuals may correspond to a greater or lesser degree.

The three groups were confirmed as engaging in all scholarly communication activities; interaction, seeking information, citing, collaboration, publishing and disseminating information. However, there is a noticeable change in how those scholars conduct their research, which may change the traditional scholarly communication system in return. To illustrate this in more detail the different approaches to scholarly communication will be analysed in relation to the features of the scholarly communication model published by the authors (Shehata et al., 2015a) (see table 2 & figure 2).

Table 2 Characteristics of Scholars

	Orthodox	Moderate	Heterodox
Approach	Formal scholarly communication is *the* preffered approach. Avoidance of informal traditional and modern scholarly communication practices.	Formal scholarly communication is the main approach. However, informal channels are also used. Moderate Scholars always use mixed approaches, as they believe that will make communication more efficient.	Both formal and informal communication approaches are used by the Heterodox Scholar. Modern informal channels are heavily used by Heterodox Scholars in scholarly activities such as following their peers, collecting data, and seeking help.
Main Factors	Beliefs, Academic discipline. Type of use.	Preference, Awareness, Project type, Beliefs, Openness.	Preference, Academic discipline, Openness, Training.
Feeling	The prevalent feeling among Orthodox Scholars - both traditional and modern – is that informal channels lack credibility as information is hard to control for quality or reliability.	Acceptance of informal scholarly communication activities. Modern informal channels changed the way a Moderate Scholar communicates with other peers.	Heterodox Scholars feel that modern, informal channels have changed the way they engage in scholarly communication activities. Heterodox Scholars are biased towards modern, informal scholarly communication practices

Scholarly communication activity	Orthodox	Moderate	Heterodox
Communication	*I do not depend on the Internet too much to find communication opportunities. I usually create my research network through attending conferences and meeting people who work in my field (SS35A Business P.40)*	*I have quite a lot of informal communication with people working in the health sector hospitals, sometimes central health authorities. They are people I talk to on telephone informally, but again, I do not think that is informal or formal both overlapping talking about something formal but in an informal way through informal channels(SS30A Information Studies P.54)*	*I think we depend more on informal communication channels like blogs, maybe as I mentioned before like stack overflow. So when I used to stuck in coding instead of struggling with the problem alone in the past, I used to depend on trial and error and sometimes reading the help or the documentation. Sometimes if the problem is common, it is easier to find the answer through blogs(SS3P Computer Science P.96)*
Seeking information	*I know where to look for it I might find it by through Google so google is a huge source of information to tell me where I find things, and it leads me to a formal journal article I will read it, but if lead me to something less, then I will not bother to read it because I do not think it is reliable. (SS38A Computer P.33)*	*I use online resources a lot several times a day. The other thing of course about online resources it all linked to the official academic journals as well, so you can actually get informal information then download the relevant manuscripts from formal research publications so they give you the best both really [...]. (SS36A Bioscience School P.92)*	*I have a number of Google alerts set up for keywords. I also get Google scholar feed and check it on a regular basis. I also use search tools like Google scholar or Scopus for example I use it a lot. Web of knowledge is also another academic tool I use. Also, I guess talking to colleagues either at conferences or academic events.(SS5A Geography P.28)*
Collaboration	*Not through social networks. Any researchers I had collaborated with on a research project is based on another university, so I use university email. I tend not to use social channels, I know that they exist. (H22A Eurolang P.40)*	*If someone I want to work with I'd rather meet them before working with them. I think because it is important, I think it is important. I mean it is easier to talk to people to see what they like, see what they actually can work, but in the same time I think you can meet someone in a conference and have a chat with them and then email them. But I would not I do not think I have not so far approach anyone I have not met before just but maybe in the future. (SS8R Geography Science P.47)*	*When I was editing the collection I did a couple years ago and I was looking for potential contributors I knew a lot of people who I worked with them already. But there were a couple of people I approached as a result of they are in related area so I supposed they were counted as a research partners because they became contributors to that editing collection so yes I suppose I have . (SS15A Screen Studies P.46)*
Publishing & dissemination	*It is not seen as something that gives you what you need in the university environment you have to be publishing in well-established well-regarded journals anything else doesn't really count. (S13A Environment P.105)*	*If I go and publish in a journal I know that the journal is refereed. I know that there is like a citation or impact factor for that journal. So these things I care about, but for these informal channels you just put your research and not sure that it will have this impact.(S10R Computer P.102)*	*Yes, I use this website I told you about. I usually publish there when it accepted or almost accepted. It is different form of paper that I publish because we are not allowed to publish other places the stuff we submitted in journals, but it is the some scientific content. (S28R Astronomy P.98)*
Citing information	*Text books and Academic journals. I do not take information from informal channels. I use only information that have high level credibility and validity and I am not interested on anything else.(S29P Sport Science P.136)*	*I would not cite blogs or anything because I don't read them. I think particularly a researcher; I have access to him regularly. I would cite it if I found it to be to have validity if what he put on the blog was based on actual data.(SS30A Information Studies P.137)*	*Yes, I certainly have, and I am doing so at the moment, but I have to treat this information, I have to be very cautious about and make sure what data I am using and what limitation there might be. Because it is basically uncontrolled information that is self is a problem. (S14A Biosciences P.141)*

Figure 2 Sample of the interview

Interaction

Developments in communication and information technologies are changing the way in which scholars interact and share research with each other. Scholarly communication practices are also changing as researchers increasingly use new technologies to engage with other peers and discuss research with colleagues. Many differences and similarities among the Orthodox, Moderate and Heterodox scholars were identified; each group has different ideologies and beliefs. However, all of them share the same goal of producing knowledge and publishing it in peer-reviewed journals.

In interaction with peer Orthodox Scholars tend to rely on traditional formal approaches. These findings are also supported by the literature as it was found that many conventional scholars find using modern informal interaction approaches for research a waste of time. (Procter et al., 2010). In addition, traditional scholarly approaches proved to be more important than modern approaches (Mulligan and Mabe, 2011).

> *I tend to use in my area of study internet sources that has been setup by academia or organisation from the state. I tend to not use any source that is not attached to any university. So I do not use any social networks, there are too many, and I do not have time to find out what is going on there and I decided some years ago to disregard them completely […] I tend to tell my post-graduate researchers not to rely on resources that are not academically approved.*
>
> *(H22A Eurolang P. 27-33)*

Traditional formal and informal interaction methods are preferred by Orthodox scholars as they believe that these methods are more effective and better than using informal channels on the web.

> *I do not depend on the Internet too much to find communication opportunities. I usually create my research network through attending conferences and meeting people who work in my field. (SS35A Business P.40)*

Moderate Scholars are less conventional than Orthodox as they try to balance between the use of formal and informal approaches. They often use formal and traditional

informal methods, but at the same time use modern interaction approaches if they find a need to do that.

> *A mix of both, I make a great deal of use, increasingly more from search engines like google. In previous years, I suppose I have used peer reviewed databases to look for papers, but google so fast and so broad in what turn up it usually a good way to start and also now we have got google scholar and I also I would go and look at peoples' websites; if for example I am reading a paper and I am interested in one of the authors I may choose to check them out to see what they are doing, see where they are working that sort of things.*
>
> *(S20R Biological, Environmental and Rural Sciences P.27)*

Following mixed techniques would lead Moderate Scholars to unconsciously use informal interaction approaches without realizing that a they are overlapping while the moderate scholar is engaged in scholarly communication process.

> *I do not think that is informal or formal both overlapping talking about something formal but in an informal way through informal channels. (SS30A Information Studies P.54)*

However, Moderate scholars are more focused on formal approaches as they are more important in academia than informal approaches which might be useful to establish interaction or to find something new but would not be used to write a journal paper.

> *I think it is important, but not that important like the formal one. […]. Because it is informal you can't rely on it to write a paper or publish a paper or something you know for a promotion. (SS9P Information Studies P.35)*

Heterodox Scholars use all channels available for communication. In their opinion, as long as their peers accept this, they can use these channels for interaction. However, this behaviour does not preclude the use of formal communication channels. Formal approaches always have the priority for all the three types of scholars, but Heterodox scholars are found to use informal approaches without having the reservations of Orthodox and Moderate scholars.

> *Quite a few different systems that you can use. I personally use things like LinkedIn, ResearchGate. I am a part of forums and Facebook and there are other social networking sites which are not specifically to do with social networking but to get people together to share information and best advice and guidance to certain academic disciplines they are involved in.*
>
> *(S14A BiosciencesP.25)*

Not all heterodox scholars depend on the social web to engage informally with other peers. A number tend to rely on traditional informal approaches in a similar way to Orthodox and Moderate scholars rather than using social web channels.

> *I tried them all, but none of them really fit the model, non work for me. I think they do not fit comfortably into the way that I work, I did not feel they enormously useful […]. (S26A Computer Science P.71).*
>
> *I do not see a need to use them, because, in my view, email communication seems to be working the best.*
>
> *(H23A* History *P.69)*

Various factors were found to motivate or demotivate the different types of scholars to use new technologies for interaction. Orthodox Scholars were mostly influenced by their beliefs regarding scholarly research as they find that research should be done in a way consistent with the traditional scholarly system. Other factors such as time and academic discipline also play an important role in making scholar decision, however, scholar's beliefs play a significant role.

Because Moderate Scholars try to use informal channels at some stages of scholarly communication, other factors intersect with their beliefs such as preferences, the type of use and the awareness of the existence of such channels. Though Heterodox Scholars are driven by similar forces as Moderate Scholars, they use informal approaches more often than Moderate Scholars.

Heterodox Scholars find information technologies more useful in scholarly researh and helping to accomplish their goals. What increases the Heterodox Scholars tendency toward modern scholarly channels are factors such as training and the nature of the research. It plays a role in motivating Heterodox Scholars to be more engaged in informal practices than other scholars.

> *The university actually sent me on a course about using social media for public engagement. I never used Twitter before then and Twitter changed the way I'm doing my work completely to be honest because my feeling I want to communicate my research to a wider audience particularly practitioners in the field I work in.*
>
> *(SS37A Sociology P.95)*

Factors that may affect scholars' decisions regarding the use of channels such as blogs or social networks have been addressed in various studies. It has been found that academic discipline, speed, and age are the main factors that affect scholars' decision in using these channels. In addition, the personality of the scholar is a key element in the informal exchange of information (Barrett, 2005;Procter et al., 2010;Centre for Research Communications, 2011). On the contrary, lack of encouragement, skills, and awareness are the factors that prevent the scholars from engaging in informal activities. As the use of these channels is not encouraged or rewarded by academia, scholars feel that these practices are a waste of time and they lose the motivation to use these channels in scholarly communication activities (Procter et al., 2010;Birnholtz et al., 2010;Gu and Widén-Wulff, 2011). As a result, participants in the current study suggested that academia should play a role in encouraging informal communication activities. Similarly, many studies suggested that academia is not giving enough consideration to these activities and should increase its role in encouraging such practices(Collins and Hide, 2010).

Information seeking

All three types of scholars use blogs, Wikipedia and social networks "informal channels" as a springboard to discover more resources. Information resources such as Wikipedia contain numerous useful links to peer-reviewed articles. As a result, they consider these resources as a starting point, which would guide them to scholarly resources. Interestingly, a study found that using social media to seek information is a good method for researchers to find information they need. They receive personalized answers which increase the confidence in the validity of information (Morris et al., 2010). Many scholars use informal channels such as social network sites in scholarly communication activities, many use SNS for information seeking among other practices while they conduct their research (Veletsianos, 2012;Oeldorf-Hirsch et al., 2014).

Orthodox and Moderate Scholars do not trust informal channels as a reliable source of information because they feel that these resources lack credibility and reliability. In addition, these resources are not recognised as a proper source of information.

> *The problem with the informal channels, the problem with the internet is we do not have the time to analyse and decide what is good and bad, and therefore, we have to close that door. So what we doing is depend only books and journals and it is impossible to know what is credible and what is not. There is no time to analyse everything has been written and put to blogs.*
>
> *(H22A Eurolang P.87)*

The same is pointed by Procter et al. (2010) and Gu and Widén-Wulff (2011).They found that the credibility and reliability of information represent a challenge in the use of informal scholarly channels. As a result, many researchers are discouraged from using the new forms of scholarly communication because they do not trust informal resources that have not been subject to traditional review process.

Heterodox Scholars often use informal channels for information seeking. Notably, most Heterodox Scholars are researchers who have recently engaged in scholarly research, or only have short academic experience, such as postgraduate students and younger scholars. Those scholars are able to adopt and use informal communication channels and SNS because these channels were available when they started their research. They were motivated to make their research publications and profile available through these channels to enhance visibility.

However, that does not mean that senior scholars are not using informal channels to retrieve information. A number of moderate and Heterodox Scholars are senior researchers who have spent a long time in academia.

> *I prefer a kind of push communication rather than pulling communication. I prefer things that people would send to me. I prefer to subscribe to things that end on my inbox I can look quickly and delete it if I'm not interested. I do not really like having to go to a website to check what people doing.*
>
> *(SS32A International Politics P.27)*

A study by Rowlands et al. (2008) found the same results and that describing younger scholars only as google generation is wrong, as all researchers are capable to adapt and use modern information channels in their research. A recent study found that there is a change in researchers information seeking behaviour, however, this change is more visible among senior faculty members because they are able to adapt with Internet technologies and they might have already secured their position.(Gruzd and Staves, 2011).

Citing information

Orthodox and Moderate Scholars follow the same approach when citing information. Both search for related articles using scholarly databases and search engines, they filter the retrieved information and select peer reviewed articles only. Orthodox Scholars find that it is very difficult to confirm the credibility of information retrieved from other sources than peer-reviewed journals. As a result, they avoid reliance on informal channels for searching activities. Hence, Orthodox Scholars use citations from journals, books, and reports. Procter et al. (2010) pointed out the same results as they found that many scholars avoid using informal resources because they do not trust these resources.

> *I do not take information from informal channels. I use only information that have high-level credibility and validity and I am not interested in anything else.*
>
> *(S29P Sport Science P.136)*

Moderate Scholars find that these channels have the credibility to be used in research, but they have to have academic rigour. Interestingly, as long as Moderate Scholars trust that the information is peer reviewed they cite it in their work. Another difference is that most Moderate Scholars use informal resources as a springboard to find peer reviewed articles, as these resources usually contain links to peer reviewed publications.

> *I believe they are credible enough to be used in research, but it is not only about my personal opinion, it is about my supervisor's opinion, about examiner's opinion and about academic society's opinions. But I think it is credible enough to be used in research because all people who are sharing information there are coming from an academic background that is good enough to enable them to give credible information and it is up to the researcher to check if this information is credible enough or good enough to be used or not .*
>
> *(SS2P School of Hospitality P.74)*

Heterodox Scholars use informal resources heavily in their research. However, they understand that the scholarly community evaluates the quality of the references used in research, as a result, using many informal resources may affect their research and it may be rejected by the reviewers. In a similar way to Moderate Scholars, Heterodox Scholars use informal resources as a springboard to guide them to formal publications.

Moreover, many Heterodox Scholars also use informal channels to collect information from people who engage on these channels, as they believe that these channels are rich sources of information.

> *I teach film cinema so a lot of my work I am interested in how the audience received the film how they responding to that film and what are they doing with the film and in particular I do, I am very interested in , attitude towards politics gender, ethics, and sexuality and so on . So I do a lot of work about racist responses to films. And a lot of my research has been looking at Internet discussion forum postings on various groups this might be a general Internet website like the internet movie database where anybody can post about film or might be specialist website. So I have done some research around the British national politics load of websites to spend time on […] so, that would be the most immediate and the most relevant channel to my research would be discussion forums on various websites.*
>
> *(H15A Screen Studies P.20)*

A study by (Priem and Costello, 2010;Kousha et al., 2012) found that many scholars use information on Twitter and YouTube as a reference or to guide them to the original sources of data. Use of the links in the tweets confirms that scholars are dependent on informal channels for references. Scholars were also found to use other types of informal resources such as preprint repositories, blog articles, tweets and social media in their scholarly research (Shuai et al., 2012;Weller and Peters, 2012)..

Both Orthodox and Moderate Scholars believe that some informal resources contain useful information, and can be used for research. However, they may avoid using these channels, or mentioning their use, as they feel they have to follow traditional scholarly communication practices.

> *I really feel particularly the older people the more traditional academics look down on all of it. I used SurveyMonkey to do an online questionnaire, and I received feedback that asking me to use the traditional way to be honest, if I'm publishing my results I do not really know whether I would not mention that I used SurveyMonkey.*
>
> *(SS37A Sociology P.71)*

Collaboration

The different types of Scholars tend to use different techniques to collaborate with their peers. For Orthodox Scholars, collaboration opportunities arise from attending conferences and meeting with other scholars in the field. Conferences provide good opportunity for many scholars, especially in disciplines such as computer science to discuss their ideas and to meet other scholars who are interested in the same area (Franceschet, 2011). As a result, Orthodox Scholars find that scholarly conferences are very important for finding collaboration opportunities. Hence, face-to-face discussions, followed by formal emails are the techniques preferred by Orthodox Scholars to collaborate.

> *Many people tried to contact me, but I'm very rigorous about how I get involved in things like that. I prefer to know them before getting in collaboration with them.*
>
> *(S39A School Of Earth, Atmospheric and Environment P.49)*

Moderate Scholars tend to use formal approaches to establish collaboration with peers. However, informal channels are also used by them to support scholarly collaboration. Moderate Scholars tend to use traditional formal approaches to meet with peers and explore collaboration opportunities. Initiating collaboration is done through traditional approaches. However, once the Moderate Scholar is engaged in a collaborative project, they prefer to use informal channels to facilitate and support this collaboration.

> *If someone I want to work with I would rather meet them before working with them. I think because it is important, I think it is important. I mean it is easier to talk to people to see what they like, see what they actually can work, but in the same time I think you can meet someone in a conference and have a chat with them and then email them. But I would not I do not think I have not so far approach anyone I have not met before just but maybe in the future.*
>
> *(SS8R Geography Science P.47)*

In contrast, Heterodox Scholars tend to use informal channels at all collaboration stages. Heterodox Scholars find that informal channels are very good when it comes to build a network of peers, follow other scholars and contact them to ask for collaboration. Informal channels are used as a primary tool to establish collaboration In addition, Heterodox Scholars tend to accept invitations from peers received through informal channels to participate in a scholarly research project. Heterodox Scholars

are also dependent on informal channels to know more information about peers, their research activities and the latest updates, which help them to identify researchers who are involved in the same kind of research project.

> *I have been approached by somebody online and he sent me email to work on a project together, I certainly when I was editing the collection I did a couple years ago and I was looking for potential contributors I knew a lot of people who I worked with them already. But there were a couple of people I approached as a result of they are in related area so I supposed they were counted as a research partners.*
>
> *(H15A Screen Studies P.46)*

Blogs and SNS play an important role in scholarly collaboration as they provide scholars with the means to develop collaboration opportunities with other scholars who have the same research interest. Many scholars use blogs and SNS for that reason (Gruzd et al., 2012;Gruzd and Goertzen, 2013). However, the current study shows that blogs are used less frequently for collaboration. Heterodox Scholars tend to rely on sites such as Academia, ResearchGate, and LinkedIn to find collaboration opportunities. Blogs are utilized more by Heterodox Scholars to publish their research results or updates about their current research.

Publishing and dissemination

An essential mechanism that maintains the quality of research papers published in a scholarly journal is the peer review process. Scholars have to publish in peer-reviewed journals to be recognised or rewarded for their scholarly research.. Orthodox Scholars do not accept publishing their work on informal channels available on the Internet as sufficient. They find that such practices would harm their career rather than benefiting it.

Publishing and disseminating the results of research in informal channels before putting it in formal peer reviewed channels is not viewed favourably by Orthodox Scholars. In their view, there is no credit, recognition or impact of these activities. Orthodox Scholars are biased against informal publishing as they consider such practices a wasting of time.

> *It is not seen as something that gives you what you need in the university environment you have to publish in well-established well-regarded journals anything else doesn't really count. (S13A Environment P.105)*

However, they believe that informal publications may benefit in disseminating research if they are using the proper channels; traditional informal channels such as magazines and newspaper are good alternatives for informal channels available on the Internet. Moreover, it is accepted by academia as scholarly communication practices.

> *There are other channels which are more reliable to publish in non-academic for dissemination; there are magazines, and informal journals in different countries that will disseminate to a much more audience and less academic readers. (H22A Eurolang P.148)*

Mulligan and Mabe (2011) pointed out that there is no noticeable change in scholarly publishing practices as the only motivation for scholars is to improve their academic career.

Moderate Scholars views are similar to Orthodox Scholars, in that they prefer formal peer reviewed channels for publishing. As informal publishing is not recognized by academia, they avoid engaging in such practices.

> *If I go and publish in a journal I know that the journal is refereed. I know that there is like a citation or impact factor for that journal. So these things I care about, but for these informal channels you just put your research and not sure that it will have this impact.*
>
> *(S10R Computer P.102)*

However, Moderate Scholars find that informal channels are efficient in disseminating scholarly research as many researchers use these channels. This dissemination should be done after publication in peer-reviewed journals. Additionally, because Moderate Scholars are usually worried about copyright issues, they try to restructure their work before disseminating it through these channels.

> *I would publish it on my website, I can share it with other colleagues with other friends, but still after I published it in formal way (SS2R School of Hospitality P.100)*

Heterodox Scholars also publish in formal peer-reviewed channels. However, they do not restrict their publishing activities only to formal channels. Many Heterodox

Scholars are publishing early drafts of their research in preprint repositories so they can receive feedback for their research. Others create their own blogs and publish their findings on these blogs.

> *Yes, I use this website I told you about. I usually publish there when it accepted or almost accepted. It is a different form of paper that I publish because we are not allowed to publish other places the stuff we submitted in journals, but it is the same scientific content.*
>
> *(S28R Astronomy P.98)*

In addition, Heterodox Scholars believe that informal channels are valuable tools to publicize and disseminate their research and to build their social profile as it increases the visibility and access to their publications.

> *Blogs are very interesting, blog posts are very interesting, but they remain a lighter version of research and a less solid version of the research. So I think people should perhaps publish things pointed toward formal research and try to advertise their research on informal channels. (SS16A Business School P.112)*

Many Heterodox scholars have accounts on social network sites such as LinkedIn and Mendeley in addition to their web pages, which increased the visibility and presence of those scholars (Bar-Ilan et al., 2012;Mas-Bleda et al., 2014). Unlike moderate and Orthodox Scholars, Heterodox Scholars are less worried about copyright issues, which make them more active in the informal sphere.

Conclusion

This paper discussed the impact of new information technologies on scholarly communication practice and expands our understanding of how developments in information and communication technologies have changed the scholarly communication practice and informal scholarly communication activities in particular. The investigation of how scholars communicate with each other, and the impact of the social web on scholarly communication revealed that scholarly communication practices have changed, creating new styles of communication which altered the traditional scholarly communication system. The identification of the styles of scholarly communication gives practitioners in the field better understanding of scholars behaviour in the social web. Which would help in improving scholarly communication experience for each type.

The study is built upon the model of scholarly communication practices developed in the first paper (Shehata et al., 2015a). The study identified three ideal types of scholars engaged in scholarly communication – Orthodox, Moderate and Heterodox. Orthodox, for whom traditional formal scholarly communication practices are the preferred approach; Moderate who adhere to traditional scholarly communication practices but use modern communication methods when necessary, though, significantly not in activities such publishing or as trusted sources of information; and Heterodox who use informal and formal modes in all forms of scholarly communication and depend heavily on the social web to conduct their research. The combination of the features of the scholarly communication model with the ideal types of scholarly communication provides a rich picture for understanding the contemporary scholarly communication process.

References

ASSANTE, M., CANDELA, L., CASTELLI, D., MANGHI, P. & PAGANO, P. 2015. Science 2.0 repositories: Time for a change in scholarly communication. D-Lib Magazine, Vol. 21, No. 1, pp 4.

ASSOCIATION OF COLLEGE AND RESEARCH LIBRARIES. 2006. Principles and strategies for the reform of scholarly communication [Online]. Association of College and Research Libraries. Available: http://www.ala.org/acrl/publications/whitepapers/principlesstrategies [Accessed 26/02/2012.

BAR-ILAN, J., HAUSTEIN, S., PETERS, I., PRIEM, J., SHEMA, H. & TERLIESNER, J. 2012. Beyond citations: Scholars' visibility on the social Web. arXiv preprint arXiv:1205.5611.

BARJAK, F. 2006. The role of the Internet in informal scholarly communication. Journal of the American Society for Information Science & Technology, Vol. 57, No. 10, pp 1350-1367.

BARRETT, A. 2005. The information-seeking habits of graduate student researchers in the humanities. The Journal of Academic Librarianship, Vol. 31, No. 4, pp 324-331.

BIRNHOLTZ, J., YUAN, Y. C. & GAY, G. Bridging social and awareness networks in distributed research collaboration. CSCW 2010, 2010 Georgia, USA.

BJORK, B.-C. 2005. A lifecycle model of the scientific communication process. Learned Publishing, Vol. 18, No. 3, pp 165-176.

BOHLIN, I. 2004. Communication Regimes in Competition. Social studies of science, Vol. 34, No. 3, pp 365-391.

BORGMAN, C. L. 2000. Digital libraries and the continuum of scholarly communication. Journal of Documentation, Vol. 56, No. 4, pp 412-430.

CENTRE FOR RESEARCH COMMUNICATIONS 2011. Social Networking Sites and their role in Scholarly Communications. University of Nottingham: Duke & Jordan Ltd.

COHEN, J. 1996. Computer mediated communication and publication productivity among faculty. Internet Research, Vol. 6, No. 2/3, pp 41-63.

COLLINS, E. & HIDE, B. Use and relevance of web 2.0 resources for researchers. Publishing in the Networked World: Transforming the Nature of Communication 14th International Conference on Electronic Publishing, 2010 Helsinki. 271-289.

COPE, B. & PHILLIPS, A. 2014. The future of the academic journal, Chandos Publishing.

EYSENBACH, G. 2008. Medicine 2.0: social networking, collaboration, participation, apomediation, and openness. Journal of Medical Internet Research, Vol. 10, No. 3, pp e22.

FOLK, A. 2015. Demystifying eresearch: A primer for librarians. Reed business information 360 park avenue south, New York, NY 10010 USA.

FORKOSH-BARUCH, A. & HERSHKOVITZ, A. 2012. A case study of Israeli higher-education institutes sharing scholarly information with the community via

social networks. The internet and higher education, Vol. 15, No. 1, pp 58-68.
FRANCESCHET, M. 2011. Collaboration in computer science: A network science approach. Journal of the American Society for Information Science and Technology, Vol. 62, No. 10, pp 1992-2012.
GARVEY, W. D. & GRIFFITH, B. C. 1971. Scientific communication: Its role in the conduct of research and creation of knowledge. American psychologist, Vol. 26, No. 4, pp 349.
GARVEY, W. D. & GRIFFITH, B. C. 1972. Communication and information processing within scientific disciplines: empirical findings for psychology. Information Storage & Retrieval, Vol. 8, No. 3, pp 123-136.
GRUZD, A. & GOERTZEN, M. Wired Academia: Why Social Science Scholars are using Social Media. System Sciences (HICSS), 2013 46th Hawaii International Conference on, 2013. IEEE, 3332-3341.
GRUZD, A. & STAVES, K. 2011. Trends in scholarly use of online social media [Online]. Available: conway.isri.cmu.edu/hicss2011-sci-workshop/gruzd-hicss-trends.pdf [Accessed 29/02/2012.
GRUZD, A., STAVES, K. & WILK, A. 2012. Connected scholars: Examining the role of social media in research practices of faculty using the UTAUT model. Computers in Human Behavior, Vol. 28, No. 6, pp 2340-2350.
GU, F. & WIDÉN-WULFF, G. 2011. Scholarly communication and possible changes in the context of social media: A Finnish case study. Electronic Library, Vol. 29, No. 6, pp 762-776.
HESSE, B. W., SPROULL, L. S., KIESLER, S. B. & WALSH, J. P. 1993. Returns to science: Computer networks in oceanography. Communications of the ACM, Vol. 36, No. 8, pp 90-101.
HURD, J. M. 2000. The Transformation of Scientific Communication: A Model for 2020. Journal of the American Society for Information Science, Vol. 51, No. 14, pp 1279-1283.
JAMALI, H. R., NICHOLAS, D. & HERMAN, E. 2015. Scholarly reputation in the digital age and the role of emerging platforms and mechanisms. Research Evaluation, Vol. 1, No. 13, pp 13.
KAMINER, N. & BRAUNSTEIN, Y. M. 1998. Bibliometric analysis of the impact of Internet use on scholarly productivity. Journal of the American Society for Information Science, Vol. 49, No. 8, pp 720-730.
KHOSROWJERDI, M. 2011. Designing a viable scientific communication model: VSM approach. Library Hi Tech, Vol. 29, No. 2, pp 359-372.
KIRKUP, G. 2010. Academic blogging: academic practice and academic identity. London Review of Education, Vol. 8, No. 1, pp 75-84.
KOUSHA, K., THELWALL, M. & ABDOLI, M. 2012. The role of online videos in research communication: A content analysis of YouTube videos cited in academic publications. Journal of the American Society for Information Science and Technology, Vol. 63, No. 9, pp 1710-1727.
MAHMOOD, I., ROWLEY, J. & HARTLEY, R. Scientific publishing: a case study of Libyan scientists. Aslib Proceedings, 2009. Emerald Group Publishing Limited, 380-393.
MAS-BLEDA, A., THELWALL, M., KOUSHA, K. & AGUILLO, I. F. 2014. Do highly cited researchers successfully use the social web? Scientometrics, Vol. 101, No. 1, pp 337-356.

MATZAT, U. 2004. Academic communication and Internet Discussion Groups: transfer of information or creation of social contacts? Social Networks, Vol. 26, No. 3, pp 221-255.

MATZAT, U. 2009. Disciplinary differences in the use of internet discussion groups: differential communication needs or trust problems? Journal of Information Science, Vol. 35, No. 5, pp 613-631.

MORRIS, M. R., TEEVAN, J. & PANOVICH, K. A Comparison of Information Seeking Using Search Engines and Social Networks. ICWSM, 2010. 23-26.

MULLIGAN, A. & MABE, M. 2011. The effect of the internet on researcher motivations, behaviour and attitudes. Journal of Documentation, Vol. 67, No. 2, pp 290-311.

NENTWICH, M. & KÖNIG, R. 2014. Academia Goes Facebook? The Potential of Social Network Sites in the Scholarly Realm. Opening Science. Springer.

NG, T. 1998. Electronic digests in scientific communication. Internet Research, Vol. 8, No. 3, pp 243-246.

NICHOLAS, D. 2015. Using, Citing and Publishing Scholarly Content in the Digital Age: Case Study of Humanities Researchers. Studia Informacyjne, Vol. 53, No. 1, pp 7-19.

NICHOLAS, D. & ROWLANDS, I. 2011. Social media use in the research workflow. Information Services and Use, Vol. 31, No. 1, pp 61-83.

NIU, X., HEMMINGER, B. M., LOWN, C., ADAMS, S., BROWN, C., LEVEL, A., MCLURE, M., POWERS, A., TENNANT, M. R. & CATALDO, T. 2010. National study of information seeking behavior of academic researchers in the United States. Journal of the American Society for Information Science and Technology, Vol. 61, No. 5, pp 869-890.

OELDORF-HIRSCH, A., HECHT, B., MORRIS, M. R., TEEVAN, J. & GERGLE, D. To search or to ask: the routing of information needs between traditional search engines and social networks. Proceedings of the 17th ACM conference on Computer supported cooperative work & social computing, 2014. ACM, 16-27.

OPPENHEIM, C., GREENHALGH, C. & ROWLAND, F. 2000. The future of scholarly journal publishing. Journal of Documentation, Vol. 56, No. 4, pp 361-398.

PALMER, C. L., TEFFEAU, L. C. & PIRMANN, C. 2010. Scholarly Information Practices in the Online Environment: Themes from the Literature and Implications for Library Service Development (Jan. 2009). available online a t www. oclc. org/research/publications/library/2009/2009-02. pdf [accessed 20 March 2009].

PATTON, M. Q. 2002. Qualitative Research & Evaluation Methods, SAGE.

PIKAS, C. K. The impact of information and communication technologies on informal scholarly scientific communication: a literature review. Doctoral seminar in Information Studies, University of Maryland, 2006. Citeseer.

PRIEM & COSTELLO 2010. How and why scholars cite on Twitter. Proceedings of the American Society for Information Science and Technology, Vol. 47, No. 1, pp 1-4.

PROCTER, R., WILLIAMS, R., STEWART, J., POSCHEN, M., SNEE, H., VOSS, A. & ASGARI-TARGHI, M. 2010. Adoption and use of Web 2.0 in scholarly communications. Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences, Vol. 368, No. 1926, pp 4039-4056.

RAGHAVAN, K. 2006. Open access remodeling scholarly communication. INFLIBNET Center.

REGAZZI, J. J. 2015. Scholarly Communications: A History from Content as King to Content as Kingmaker, Rowman & Littlefield.

ROOSENDAAL, H. & GEURT, P. Forces and functions in scientific communication: an analysis of their interplay. International summer school on the digital library, 1998.

ROWLANDS, I. & NICHOLAS, D. 2005. Scholarly communication in the digital environment. Aslib Proceedings, Vol. 57, No. 6, pp 481-497.

ROWLANDS, I., NICHOLAS, D. & HUNTINGTON, P. 2004. Scholarly communication in the digital environment: what do authors want? Learned Publishing, Vol. 17, No. 4, pp 261-273.

ROWLANDS, I., NICHOLAS, D., WILLIAMS, P., HUNTINGTON, P., FIELDHOUSE, M., GUNTER, B., WITHEY, R., JAMALI, H. R., DOBROWOLSKI, T. & TENOPIR, C. The Google generation: the information behaviour of the researcher of the future. Aslib Proceedings, 2008. Emerald Group Publishing Limited, 290-310.

RUSSELL, J. M. 2001. Scientific Communication at the Beginning of the Twenty□First Century. International Social Science Journal, Vol. 53, No. 168, pp 271-282.

SAUER, I. M., BIALEK, D., EFIMOVA, E., SCHWARTLANDER, R., PLESS, G. & NEUHAUS, P. 2005. "Blogs" and "Wikis" Are Valuable Software Tools for Communication Within Research Groups. Artificial Organs, Vol. 29, No. 1, pp 82-83.

SCHAUDER, D. 1994. Electronic publishing of professional articles: attitudes of academics and implications for the scholarly communication industry. Journal of the American Society for Information Science, Vol. 45, No. 2, pp 73-100.

SHEHATA, A., ELLIS, D. & FOSTER, A. 2015a. The impact of information and communication technologies on informal scientific communication: a naturalistic inquiry approach. Library Review, Vol. 64, No. 6/7, pp 428-445.

SHEHATA, A. M. K., ELLIS, D. & FOSTER, A. 2015b. The impact of information and communication technologies on informal scientific communication: A naturalistic inquiry approach. Library Review, Vol. 64, No. 6/7, pp 428-445.

SHUAI, X., PEPE, A. & BOLLEN, J. 2012. How the scientific community reacts to newly submitted preprints: Article downloads, twitter mentions, and citations. PLoS One, Vol. 7, No. 11, pp e47523.

SÙNDERGAARD, T. F., ANDERSEN, J. & HJÙRLAND, B. 2003. Documents and the communication of scientific and scholarly information. Journal of documentation, Vol. 59, No. 3, pp 278-320.

VELETSIANOS, G. 2012. Higher education scholars' participation and practices on Twitter. Journal of Computer Assisted Learning, Vol. 28, No. 4, pp 336-349.

WALSH, J. P., KUCKER, S., MALONEY, N. G. & GABBAY, S. 2000. Connecting minds: Computer□mediated communication and scientific work. Journal of the American Society for Information Science, Vol. 51, No. 14, pp 1295-1305.

WALTHAM, M. 2010. The future of scholarly journal publishing among social science and humanities associations. Journal of Scholarly Publishing, Vol. 41, No. 3, pp 257-324.

WATKINSON, A., NICHOLAS, D., THORNLEY, C., HERMAN, E., JAMALI, H. R., VOLENTINE, R., ALLARD, S., LEVINE, K. & TENOPIR, C. 2016. Changes in the digital scholarly environment and issues of trust: An exploratory, qualitative analysis. Information Processing & Management, Vol. 52, No. 3, pp 446-458.

WELLER, K. & PETERS, I. 2012. Citations in Web 2.0, Düsseldorf: Düsseldorf University Press.

YIOTIS, K. 2013. The open access initiative: a new paradigm for scholarly communications. Information Technology and Libraries, Vol. 24, No. 4, pp 157-162.