Changes in the information dissemination process within the scholarly world: the impact of electronic publishing on scholarly communities of academic social scientists

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Abstract

This paper describes part of the results of recent research carried out in Brazil and the UK, which investigated the perceptions by academic social scientists of the impact of electronic publishing on the information dissemination process within their scholarly communities. Results showed that there have been similar experiences by both communities of researchers. Accordingly, it was observed that electronic communication in general, and electronic publishing in particular, have had an impact on both the scholarly community and the dissemination process within it. This is especially so in terms of the dynamics of interactions within the community and the pervasiveness of the electronic media in the stages of the process. It was found that the scholarly community has both expanded their boundaries and increased the interactions at international level. Moreover, the traditional model of the dissemination process, as entirely based on the print media does not exist anymore. On the other hand, an entirely electronic based model, as proposed by some authors, has not yet been fully implemented. Therefore, a hybrid dissemination model best depicts the situation so far. In this sense, the impact of electronic publishing, (that is, the formal aspects of the process –its final stage), on the dissemination of information amongst academic social scientists has been less strong than the impact of the use of electronic communication on informal contacts, (discussion with colleagues -its initial stages), which has become totally prevalent. Nevertheless, it has been foreseen by a number of respondents that there is an irreversible trend towards the prevalence of electronic media at all the stages of the process in the near future, especially in terms of electronic journals. However, electronic books are not yet under consideration by those scholars.

1. Introduction

Much has been proposed and developed in terms of electronic publishing, especially in the academic world. A number of initiatives have taken place world wide with the main aim of providing a more effective communication environment. In order to assess to what extent those initiatives have been accepted and adopted by academic scholars and scientists, a number of research projects have been carried out in different countries and in a variety of disciplines. It has been observed that, in terms of electronic publishing –just as in relation to communication patterns in general- there are differences between disciplines, particularly between the three main divisions of knowledge, namely sciences, social sciences and humanities. That is, the adoption and use of electronic media by academic researchers for communication purposes differ from one discipline, or knowledge division, to another.

As stated by Hurd (1996), any observer of contemporary research communities can not fail to see how scientists have assimilated information technologies into their daily routines. However, for the extent to which differences between disciplines constitute a relevant aspect of any study of scholarly communication, it appears imperative that studies of research communities other than those of scientists are also needful in order to assess the extent to which the assimilation of information technologies to the daily routines is also a reality amongst them. Social scientists constitute one of these communities and their study can certainly cast light on this discussion.

The work reported on in this paper studied social scientists within the context of electronic communication. It aimed to cast light on this debate by seeing whether computer usage for communicating research can affect the scholarly communication process amongst these scholars in terms of changes in their interactions within the scholarly community, as well as in the dynamics of the process. Parts of the results found in the study are discussed here and emphasise the perceptions of those social scientists of the impact that electronic publishing has had on the dissemination process within their scholarly communities. A few considerations on scholarly communities and the scholarly communication process are presented first, in order to provide a general view of the problem investigated.

2. Scholarly communities

Scholarly communities have been looked at in a variety of ways within the context of information science, which in turn has led to the use of a diversified terminology in the literature in the area, such as 'scientific communities', 'research communities', 'academic communities', 'disciplinary communities', 'knowledge communities' and so forth. Different terms can obviously refer to somewhat different communities. Nevertheless, all the approaches refer to the study of specific clusters of peers within the knowledge world. The discussion here is meant to be fairly general and the term 'scholarly community' is used to encompass all the others.

The study of scholarly communities comprises a wide range of aspects, including:

- the theoretical foundation used, mainly from sociology;
- the context within which scholars interact, most commonly the academic environment;
- the information channels used by scholars to interact, basically informal and formal;
- different criteria to define community boundaries.

The diversified approaches adopted in the study of communities of scholars depend on the focus and the context involved. Relating to the sociological approach, which is the one that has mostly been applied, attention is drawn to one of the common assumptions –the role played by social interactions in knowledge development. Accordingly, it is observed that "the growth of scientific knowledge is a kind of diffusion process in which ideas are transmitted from person to person, alongside a social interactive process which underlies knowledge development" (Crane, 1972). Other examples of such a discussion can also be identified. In fact, research work involves communication, which, as a communal activity, leads to the identification of the social aspects of science. It can therefore be stated that scientific research is bound up with social interactions, since there are strong social organisations underlying scientific work. (Meadows, 1998; Griffith, 1990)

These assumptions described above are concerned with interactions, which constitute one of the common elements of community, alongside area (or space) and common ties or bonds. (Bell & Newby, 1971) Common ties and bonds are an obvious element of the concept, always present in any context. Interactions constitute a pervasive one. In terms of the 'space' dimension, however, important changes have taken place. In reality, the (traditional) geographic basis of community boundaries has been eroded with the advent of communication technology, leading to the proposition of 'symbolic boundaries' to consider this dimension. As a result, community members have used shared symbols to demarcate its existence. Regarding scholarly communities, the most common symbol shared is subject matter (Kuhn, 1970; Borgman, 1990; Meadows, 1991; Meadows, 1998). In this sense, the community consists of the practitioners of a specialism and can be identified at numerous levels. Some of the categories, from the broader to the narrower, include a division of knowledge (scientists, social scientists, humanists); a professional group (chemists, biologists, librarians); similar techniques used (organic chemists, high-energy physicists, econometricians); etc. Other examples can be added, as proposed by Kuhn (1970). Nevertheless, focusing on a common problem, collectively dominating a chosen field, or carrying out research on a particular specialised topic are ways of viewing the

specialism as a symbol shared within scholarly communities, often involving a relatively small number of people. It is at this level that interactions appear to be more intense and the definition of boundaries more relevant.

3 The scholarly communication process (SCP)

The scholarly communication process (hereafter SCP) constitutes an inspiring topic in information science. It has been studied for decades and results of its investigation have substantially contributed to the body of knowledge in the area. Hence, scholarly communication comprises one of the major topics being discussed in the literature. A number of issues have been considered by those who have studied the SCP. One point that concerns theorists is the discussion about informal and formal channels, which actually comprise its main components. It is interesting to highlight that, as intrinsic components of the process, informal and formal channels co-exist, whatever the media employed. As the media change, however, there is an impact on the channels. The advent of electronic communication technologies have brought about changes to this scenario. Issues relating these changes provide an interesting arena for research in information science. One of these issues is the time dimension of the process, which changes considerably within an electronic environment. Another one is concerned with the gradual substitution of print resources by electronic ones.

3.1 Early studies: an entirely print-based model

It was the work of Garvey and Griffith (1979) that provided some of the earliest contributions to the study of the communication process amongst scientists. In fact, one of the most influential models which depicts the main stages of the process, was proposed by them in the 1970s. It was based on the study of psychologists and stresses the temporal dimension of the SCP. Although the authors examined the process within the context of a specific discipline, their model has been the foundation for a number of researches on the SCP.

Garvey and Griffith's model is only concerned with the dissemination aspects of the process. It depicts the information channels used to make research information public, including both the informal and the formal channels (Figure 1). The informal stages comprise discussion with colleagues and all the other activities relating to the preparation of a manuscript up to its submission. This starts with the planning of research and the earliest exchanges of ideas and, as such, constitute an important stage of the communication system. It is observed that scientists rely heavily on informal networks of information exchange to keep abreast of current activities and the current views of the community on the value and relevance of specific research problems. It is worth pointing out the similar findings of the INFROSS, which has concluded that social scientists depend on informal channels of communication for much of their information, too (Line, 1971). A number of more recent researches have highlighted this aspect and this therefore constitutes an interesting one to follow up.

The formal aspects of the process in the model relate to publication in a journal and as such represents the moment of transfer from the informal to the formal domain, allowing the article to become a permanent record of completed research. Nevertheless, one point that concerns theorists is the discussion about the informal and the formal channels. One of the most difficult aspects relates to the blurred boundaries between them, which makes any typology difficult to define. Conference papers, for example, have been seen differently in the literature, since they have been defined as both an informal and a formal channel. Besides that, differences between disciplines in this regard are to be taken into account. In humanities, it is the monograph that constitutes the main information channel. Yet, what counts here is how the SCP is depicted in an entirely print-based publication system and to what extent the advent of computer-mediated communication has brought about changes in the process.

It is interesting to note that despite the visionary work of Bush (1945) with his description of the Memex more than two decades before, Garvey & Griffith did not actually dare to consider electronic resources as part of the process. Their model of the scientific communication system, entirely printed-based, is obviously due to how things used to occur at that time. In fact, computer-based

communication was not foreseen by Garvey and Griffith's model. All the stages in the process are, therefore, print-based and attention is drawn to time delays in the process. Accordingly, the informal stages show a considerable delay, as it reveals that the time between the initial idea up to the submission of a manuscript takes an average time of two years. In terms of the formal stages, delays relate to at least three moments. Firstly, the time between submission and publication in a primary source like a journal. Secondly, the time between publication in a journal and appearance in a secondary source. Finally, citation in the literature. As computer-mediated communication has become prevalent over the past two decades, it has altered communication amongst scholars and affected the Garvey & Griffith model.

3.2 Recent studies: an entirely electronic model

Changes related to the individuals and the institutions involved in the SCP, as well as their interactions, must be considered in any model which aims to depict the SCP nowadays. Although it has been the concern of a number of investigations, it was more than two decades after Garvey and Griffith's work that Hurd (1996) came up with a new model for the SCP, which is proposed as a modernised version of Garvey & Griffith's one (Figure 2). This new model is based on an entirely electronic environment. The motivation for Hurd to depict the publication system as entirely electronic came out from the ubiquity of information technologies within the research world nowadays alongside results from recent studies of computer-mediated communication.

All the stages in the process, from the most informal to the most formal ones, are depicted as being performed electronically in Hurd's model, though its textual description points out that such an electronic-based model co-exists with the paper-based communication system. A number of changes resulting from the use of computers and electronic networks in the publication system are pointed out. In terms of informal communication, the role that e-mail and listservers have played in informal communication among scientists, bringing together individuals separated by long distances is highlighted. It is also pointed out that the prevalent use of word processors to prepare manuscripts, as well as their submission in electronic format has enhanced the dissemination process. Therefore, one of the most important changes stressed in this new model relates to the shortening of the dissemination process as a whole, as relating to the Garvey & Griffith model.

As Hurd has pointed out, it is worth remembering that this new model co-exists with the paper-based communication systems and represents reality for some specialisms only. In fact, an entirely paper-based communication system no longer exists. However, a completely electronic one does not depict the interactions within the communication system as they really occur. A number of studies and some opinion papers have pointed to the co-existence of these two media (See, for example, Weller, 1996; Meadows, 1997; Tomlins, 1998; and Darnton, 1999). Moreover, as stated before, differences between disciplines is a relevant aspect in studies of the SCP. It is, therefore, needful to assess the co-existence of these two media in different disciplines in order to throw light on this discussion and to provide insights to initiatives in electronic publishing. This constitutes one of the main issues discussed in the study described hereafter.

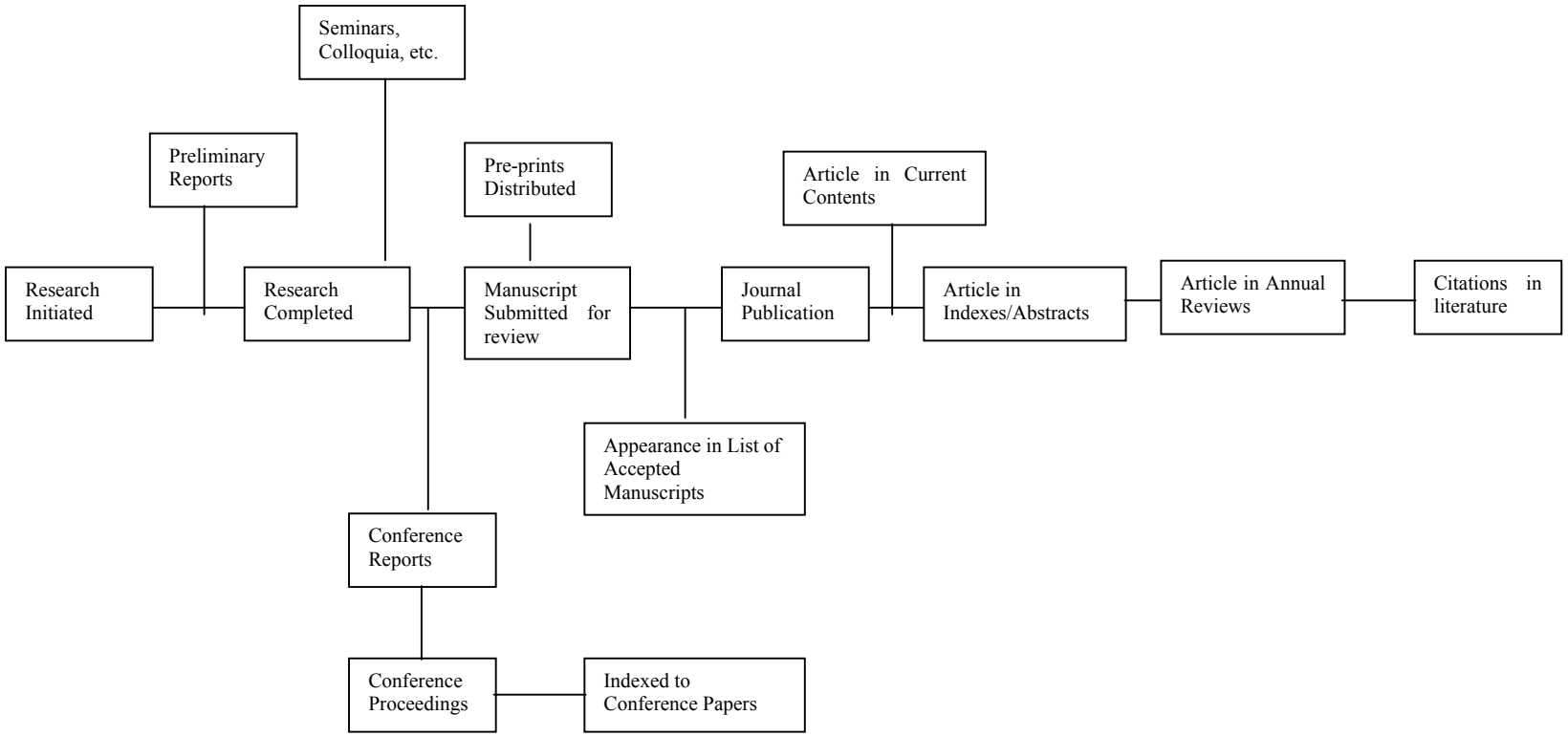

Figure 1 Garvey and Griffith's model of the scientific communication system, as adapted by Julie M. Hurd

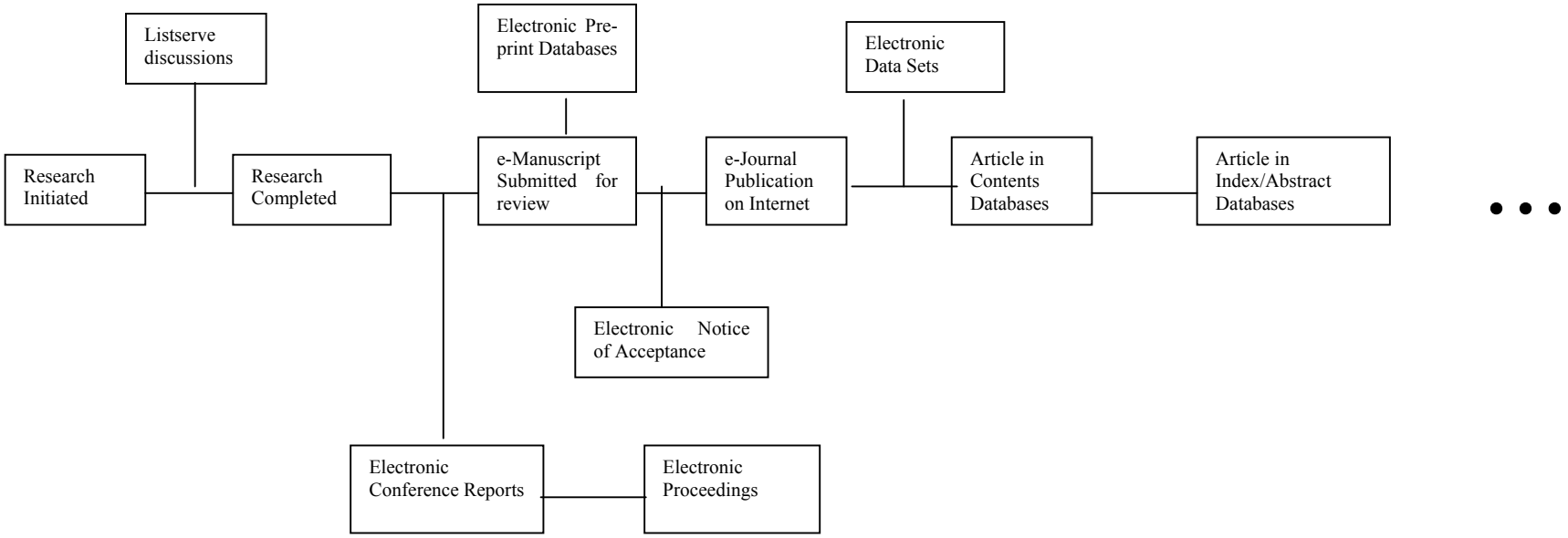

Figure 2 Modernised Garvey and Griffith's model of scientific communication, according to Julie M. Hurd

4. The investigation of social scientists

The study discussed here consisted of an investigation of the impact of computer usage on the process of communicating research amongst academic social scientists (in the fields of economics and sociology) in Brazil, alongside some insights gained from a small sample of researchers in the UK. The relevance of the study rests on the increasing interest in the role the new information technologies are playing in the SCP, not least as a result of changes in the technology itself, but mainly because of changing communication patterns. A future scenario for the SCP as a consequence of the use of IT has been examined in a considerable number of papers and journal articles. King (1991), for example, predicted that electronic networks would grow, they would expand and be preferred to the print medium for some activities, but would not eliminate the print medium: "we will work with the new medium while continuing to use the existing media", he said. This study shows to what extent predictions like this one has become true amongst academic social scientists.

4.1 The research design, population and method

An analytical survey design was adopted since the nature of the research required a relational analysis of the variables studied. It was hypothesised that environmental factors, such as pressures exerted by different individuals and bodies, may influence the use of information technologies by social scientists as academic researchers for communicating research. Likewise, there are a number of individual factors which may also affect IT usage. Such use, in turn, seems to bring about changes in the SCP itself. These assumptions together with some insights from the literature led to this research design, which combines quantitative and qualitative methods, using a cross-sectional approach. A balanced use of these two methods, alongside a combined use of both anthropology and system approaches, led to a richer design and a complementary picture.

The quantitative data was gathered via a mail questionnaire sent to 760 Brazilian researchers working in 45 post-graduate programmes in economics and sociology all over the country. Out of the 760 questionnaires sent out, 487 (64.1%) were returned and provided useful data for describing demographic characteristics of the population, assessing the average use of computers and a range of electronic resources amongst them, and analysing the expectations they have relating to electronic communication.

In a second stage of the research, qualitative data were obtained from face-to-face interviews carried out with a selected sample (36) of Brazilian researchers and a small sample (11) of British researchers. The main aim was to test the research conceptual model and to obtain a rich description of the scholar's perceptions of the impact of computer usage within their scholarly communities.

4.2 Summary of results

Results from the questionnaires showed that the majority of the respondents are concentrated in the range 41 to 60 years old. They are mostly male, senior (around 90 % doctors and 83% professors and senior lecturers), and with low mobility, either physical or intellectual (more than 10 years working in the same specialism, more than 15 years working in the same institution, and more than 50% graduated in Brazil). As regarding computer usage, the average number of years using computers for communication purposes is five, these computers are available either at home or at work, and there are more stand alone than networked computers being used. Electronic resources such as Web sites (including their library sites), electronic journals, full-text databases, electronic search engines, library OPACs, etc., have been fairly widely used. The use of traditional resources (print-based ones) is still high amongst those researchers. Respondents expect the use of electronic communication will increase informal communication, improve the quality of work, widen the scholarly community, make it easier to find relevant information for research, increase publication, etc. Some differences were found between economists and sociologists.

A summary of what has been found in the study illustrates the usefulness of the theory embedded in the research model proposed. According to the results obtained, the concept of pressure is clearly

perceived by the researchers in economics and sociology who were surveyed. The majority acknowledged the relationship between the pressures that are being exerted upon them and the use of IT, particularly in terms of informal communication. Changes in both the scholarly community and the scholarly communication process are well perceived. They are mostly related to the interactions within the community and the community boundaries, as well as in terms of the electronic media to become either a complement or a substitute for the print media, with differences relating to the stages in the SCP. Electronic publishing, as can be seen below, has had an impact on these changes.

5. Changes in the scholarly community

As suggested before, the most common elements comprising the concept of community in the sociological approach are area (space), social interactions and common ties or bonds. The perceived impacts of the use of electronic communication on the scholarly communities of economists and sociologists mainly relate to changes in social interactions and the spatial dimension. In fact, amongst a variety of issues reported by the interviewees who agreed that the scholarly community is changing (a few did not agree), these two emerged as the most pervasive ones.

5.1 Changes in the interactions within the scholarly community

The impact of the use of electronic communication on the dynamics of interactions within the community emerged as one of the major areas of change in the study. In this regard, it was observed that these changes are important because this sort of communication has both broadened contacts and made them more intensive, and this has epitomised an impact on the interactions. The reason for that is mainly because electronic communication is easier and quicker, and the relationship can be more immediate and intense. The information network that is created through these contacts has facilitated the exchange. As pointed out by one interviewee, particularly over the last five years, communication with colleagues has changed radically, in a positive way.

One of the consequences of electronic communication in interactions within the community is the increase in collaborative work. As a result, co-authorship has increased, too. A number of similar experiences in this regard were reported by both Brazilian and British researchers. They consist of carrying out research projects together, organising events, writing books and journal articles in collaboration, etc., involving people who are geographically distant and that, in some cases, have never met. These practises were reported as becoming increasingly common, thanks to electronic communication.

It is worth emphasising that previous studies of communication patterns have showed that the incidence of co-authorship is higher in the sciences. Within a continuum that ranges from sciences to humanities, there is a decreasing trend. That is, social scientists work less collaboratively than scientists do, but more collaboratively than humanists. However, according to the results found, the use of networks is described as having increasingly encouraged collaborative work, which, in turn, has increased co-authorship amongst social scientists. A study carried out in one Israeli university in 1995 showed that academics from different divisions of knowledge considered that “the primary influence of Internet use has been on increasing co-operation with colleagues” (Lazinger, 1997). Similar results have been found in other countries (Cohen, 1996; Budd & Connaway, 1997; Lubanski, 1998).

5.2 Changes in community boundaries

The broadening of the community boundary was another common issue that emerged from the interviewee’s perceptions of the impact of electronic communication on their communities. A summary of the perceptions gathered illustrates this. Accordingly, it was considered that, because of the use of electronic communication, the community has enlarged and accumulated knowledge has become more disseminated. The science frontier has become more democratic, keeping researchers closer to it. There is a greater number of people with whom one can make contact, since distances have been reduced. The ability to contact colleagues easily and quickly wherever they are, is one of the major changes reported in this regard. It was pointed out that there has been a quite sharp growth

in communication world wide. Besides that, access has become more democratic, since information circulation has become much easier, especially international information, and the Internet is the great change factor. Because of all this, the scholarly community is becoming wider.

A step back to what Kuhn, Meadows, Borgman, and other authors, have stated in terms of defining a scholarly community as comprising the practitioners of a specialism -a cluster of peers working in the same subject matter- infers that these communities comprise a relatively small number of scholars, and both their visibility and the information exchanging amongst them might have traditionally depended on their publications and personal contacts made at events like conferences. Differences found in this study relate to the facility of contacting these colleagues internationally. Although the scholarly community has always been potentially international -there are differences between disciplines- it is the facility of contacting people brought about by global networks that has made the interactions at this level more real, expanded the community boundaries and enhanced visibility and information exchange.

6 Changes in the scholarly communication process

Most of the changes discussed in the previous section relate to some of the tasks performed in the early stages of the dissemination process that underlies the publication system. The informal stages of the SCP actually constitute the most important ones in terms of interactions within the community, as it is at these stages that decisions are made about which research problems are relevant to be investigated, and this demands lots of discussion. By the time Garvey & Griffith communicated their findings, these stages stood for the longest delay in the process.

According to those interviewees who have communicated electronically, the major characteristics of the electronic media is its speed and ease of use, which have made contacts more dynamic and speeded up the communication process. As there has been a trend towards an increase in the use of electronic media by scholars from different fields of knowledge, especially because of pressures exerted upon them to do so, it is reasonable to expect that this usage might bring about even more changes in terms of shortening the process as a whole.

6.1 Printed versus electronic media: substitution or complement?

Changes in the SCP have been felt in terms of a gradual substitution of print based resources by the electronic ones. According to the results gathered in this study, within the discussion about having electronic resources either complementing or substituting printed material, it has been stressed that electronic media constitute for the moment, and for the near future, a complement to the printed media. Besides that, amongst those who considered that the electronic media could substitute for print, examples of such a replacement were mostly based on a “hybrid” environment. Differences relating to each stage within the dissemination process have been found, and are presented below in the sequential order in which they normally occur.

Firstly, in the initial stages, where informal contacts are prominent, significant changes are perceived. E-mail, which has been so recently introduced to the academic environment, has become a well-established resource used by researchers to communicate.

Secondly, significant changes have been perceived in relation to manuscript preparation and submission. The use of IT has greatly assisted in manuscript preparation. Hence, tasks like preparing a text, compiling data, doing calculations, exchanging drafts for discussion, etc., are gradually and irreversibly being replaced. Submitting electronic versions of journal articles has also become commonplace, as journal publishers nowadays expect authors to submit their texts in electronic format. A number of other studies found the same results (Schauder, 1994; Cohen, 1996; Hurd et al, 1996; McKnight & Price, 1998)

Thirdly, there is the peer review process. Only a few comments were made regarding peer review as electronically assisted. Apart from abbreviating the publication process by reducing the time between

printing, photocopying, mailing, etc., no other trends were either perceived or foreseen either in Brazil or the UK. So far, the social scientists investigated expect electronic journals to involve the traditional peer review process. At most, exchange of files between authors, publishers and referees is considered as being replaced by electronic media. Nevertheless, as pointed out by Hurd and her colleagues who have also found similar results, even if the editorial peer review remains virtually unchanged, advantages from an electronic environment would include shortening the time between research results and publication.

Finally, there is the publication of the product itself, whose comments concentrated on books and journals as the final outlet for research communication. The former constitute a case where entire substitution is far from being accepted. In relation to journals, although a number of researchers investigated considered that the electronic journals could replace the printed ones, the issue regarding the prestige of those sources still concerns them. Other researches carried out in other countries and different disciplines showed the same tendency (The Royal Society, 1993; Budd & Connaway, 1997; Gomes & Meadows, 1998; Speier et al, 1999). This may relate to the fact that researchers in different fields still prefer the familiar and well-established information sources. Nevertheless, the future trend is towards the substitution of the printed journal. According to the results obtained, this constitutes an inexorable tendency and electronic journals do constitute a case of substitution in the near future for most of the researchers interviewed, although the review system remains untouchable.

Other issues arose from this question. One of them is related to the ergonomic aspects of the electronic medium. The rejection of reading from a screen appears to be strongly influencing the use of electronic formal sources, and this is consistent with what Schauder, Budd & Connaway have found in the USA, Australia, the UK a few years ago. This problem might be overcome by a new generation, who has grown up with this technology. Besides, improvements that are increasingly being made in screen design may also contribute to a change.

7 Conclusion

The major changes in the dissemination process within the scholarly world, as a result of the impact of electronic communication, relate to changes in the scholarly community and the scholarly communication process itself. In the scholarly community, it is the interactions which have mostly changed. So, if social interactions underlie the development of knowledge, as Crane suggested; if scientific research is bound up with social interactions, as Meadows observed; if the cognitive and the social are irretrievably linked, as proposed by Pinch, can one think about the impact of electronic communication on knowledge development itself? This constitutes an instigating topic to follow up.

As regarding the SCP, so far, according to what has been reported in the literature and the results of the present study, an entirely electronic communication system does not exist. In fact, in a continuum ranging from the most informal to the most formal aspects of the communication process, the substitution process of the printed media decreases. Conversely, the complementary aspects increase, bringing about a parallel publishing model. As a result, the dissemination process entirely based on the printed media, as depicted in the Garvey and Griffith's original model, no longer exists. On the other hand, the one proposed by Hurd, entirely based on the electronic media, does not depict the interactions within the communication system as they really occur. Therefore, the co-existence of the two media is obvious and leads to the proposal of a hybrid communication system in which parallel publishing can be depicted. Figure 3 illustrates this model, which represents this co-existence.

It is worth emphasising the similarity of results found both in Brazil and the UK in terms of the use of electronic communication amongst academic researchers in social sciences. Does this reflect a trend towards diminishing the gap between the most developed centres and the less developed ones as a result of the electronic publishing system? In fact, a paradigm shift is taking place in the SCP as a result of the increasing use of IT for communication purposes. Much research is needed in order to follow up results found so far.

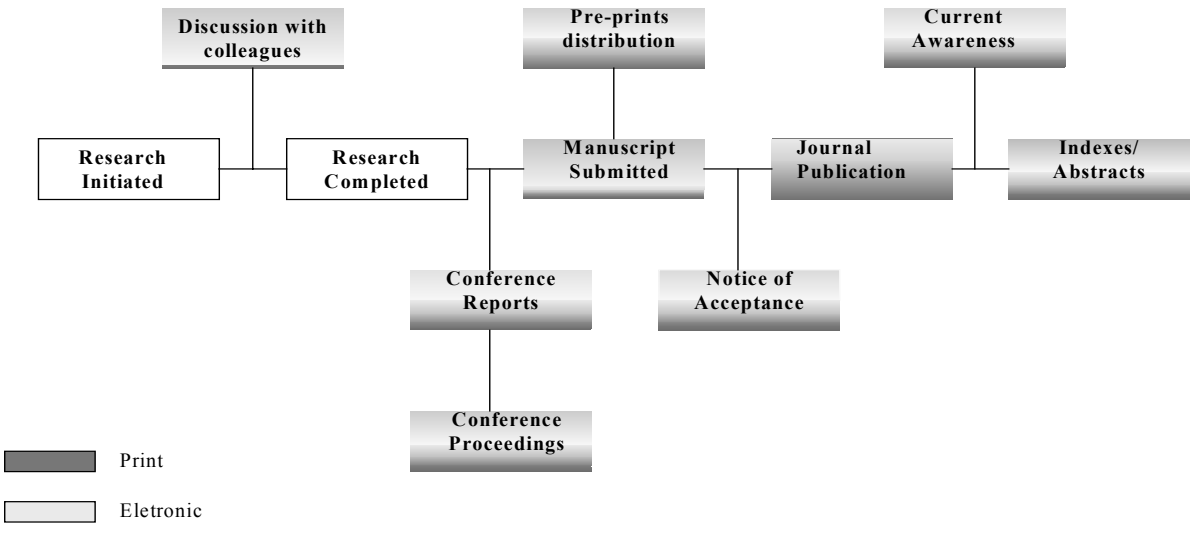
Discussion with colleagues
Pre-prints distribution
Current Awareness
Research Initiated
Research Completed
Manuscript Submitted
Journal Publication
Indexes/ Abstracts
Conference Reports
Notice of Acceptance
Conference Proceedings
Print
Eletronic

Figure 3 Proposed adaptation of Garvey and Griffith's model of scholarly communication for a print plus electronic environment

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