The Internet influence on the academic-scientific public health community

Angela Maria Belloni Cuenca and Ana Cristina d'Andretta Tanaka

Departamento de Saúde Materno-Infantil. Faculdade de Saúde Pública. Universidade de São Paulo. São Paulo, SP, Brasil

Keywords
Public health. Research personnel. Faculty. Computer communication networks. Universities. Internet. Electronic mail.

Abstract

Objective
To investigate the influence of the Internet on the academic-scientific activities of the Brazilian public health community.
Methods
This was a descriptive study, centered on the opinions of 237 teachers connected with Brazilian postgraduate programs in public health, at master's and doctoral levels, in 2001. Data were collected by means of a self-administered questionnaire via the Internet and traditional mail. The statistical analysis was done by means of proportions, means and standard deviations.
Results
The vast majority of the population (225; 94.9%) said that they used the Internet. Electronic mail (92%) and the web (55.6%) were the resources in greatest daily use. The Internet had significant influence (73.8%) on communications between the teachers, especially for developing collaborative research. The teachers who did not use the Internet (5.1%) gave the reasons that they lacked motivation and time and that it was easy to obtain the material they needed from their colleagues.
Conclusions
The results showed that the Internet has had an influence on the teachers' work and has been affecting the cycle of scientific communication, particularly due to the high speed with which information can be retrieved. There was a tendency to single out communication between the teachers as the feature that has changed most since the coming of the Internet to the Brazilian academic-scientific world.

INTRODUCTION

It is essential for the scientific community to be up to date with new fields of knowledge in order to develop research. In this, universities are both pioneers and the greatest beneficiaries from the use of electronic network technologies, with 91.3% of the scientific production in the country (Meis et al,[13] 2003). With the advent of the Internet, bibliographies, databases and journals with full texts have become more accessible, allowing the academic-scientific community to be up to date in a previously unthinkable manner regarding the speed and efficiency of accessing and obtaining information.

The university teacher who is using the network and is up to date on the new technologies finds it easier to communicate with his peers. He is able to participate in national and international research groups in real time, and also has the possibility of developing corporate work (Cianconi,[5] 2001). Results from research projects can also be disseminated on the Internet, thus allowing the knowledge to circulate faster and generating new research.

Correspondence:
Angela M Belloni Cuenca
Av. Dr. Arnaldo, 715
01246-904 São Paulo, SP
E-mail: abcuenca@usp.br

Based on doctoral thesis presented to the Faculdade de Saúde Pública, Universidade de São Paulo, in 2004.
Received on 9/3/2005. Approved on: 6/6/2005.

In this context, greater scientific visibility has already been attributed to articles that are available on the Internet, including Brazilian ones. In a note published in Nature, Alonso & Fernandez-Juridic[1] (2002) assessed the international impact of journals. These authors concluded that the impact factors of Brazilian journals indexed by ISI (Institute for Scientific Information) had increased by more than 130% after their inclusion in SciELO* (Scientific Electronic Library Online). However, they pointed out that the universities are still short of investments for creating and coordinating the electronic networks for scientific communication.

Literature regarding the use of the Internet by academic-scientific communities has been appearing since the 1980s. In one of the first reports on the subject, Schauder[14] (1994) argued that electronic networks had little influence on scientific communication because few teachers used the networks. However, a few years later, the intensive use of the Internet was being reported as having a strong influence on scientific communities, especially regarding electronic mail and the web (Applebee et al,[3] 1997; Budd & Connaway,[4] 1997; Jordaan & Jones,[9] 1999; Jacobs,[8] 1998; Lubanski & Matthew,[12] 1998; Voorbij,[16] 1999).

In Brazil, the first research on this subject emerged in the 1990s, mostly as the product of theses. Although this research was not included in the indexed literature, it was important in mapping out the evolution of the use of the Internet in Brazilian academic-scientific communities. One of the first publications was by Figueira Netto** (1994), who confirmed that the greatest benefit of electronic networks was the communication between researchers. Along the same lines, Ferreira*** (1995) showed the need for information in a university community within the field of physics and concluded that the networks had brought a new dimension to scientific communication, allowing for easier communications between researchers. Since then, Brazilian studies regarding the Internet have become more common in the literature. All of them have indicated that electronic mail is the tool most used by researchers, thereby benefiting the exchange of information among peers (Castellani**** 1997).

Within the field of public health, Iturri[7] (1998) reported on the benefits for and suspicions of researchers in this field in relation to the use of the Internet. Among other considerations, this author commented upon their resistance towards learning new technologies, their difficulties in sharing resources and information, and their perceptions that technology tended to dehumanize society. In 2003, Andrade et al[2] observed that the vast majority of researchers were already using the information resources available at the institution, in an article on the use of new information technologies in this field. They noticed the prominence of the use of electronic mail and database consultations via the web. However, these authors highlighted that this particular academic community needed the help of library staff to be able to use information technology, and they concluded that training would be the most efficient way to help this community to overcome such difficulties.

The aim of the present work was to verify the influence of the Internet on the academic-scientific activities of the Brazilian community of university teachers within the field of public health, and also to identify the barriers and expectations regarding the use of this tool.

METHODS

The study population consisted of university teachers within postgraduate programs in the field of public health who were registered in the DataCAPES***** System in 2001. They belonged to Brazilian public institutions of higher education that offered both master's and doctoral degrees. With this grouping, the intention was to obtain a homogeneous population that worked on the training of new researchers. The starting point was the premise that these teachers were fully professionally engaged in their university careers and therefore would probably have strong involvement in the use of the Internet in their academic-scientific activities.

Nine postgraduate programs linked to seven universities and one health research-related government body were identified, namely: Universiade de São Paulo (USP), with its Faculdade de Saúde Pública (FSP) and Faculdade de Medicina (FM); Universidade Federal da Bahia (UFBa), with its Instituto de Saúde Pública (ISC); Universidade Estadual do Rio de Janeiro (UERJ), with its Instituto de Medicina Social (IMS); Universidade de Campinas (Unicamp), with its Faculdade de Ciências Médicas (FCM); Universidade Federal do Rio Grande do Sul (UFRGS); Universidade Federal de Pe-

*Scientific Electronic Library Online (SciELO). This makes available full texts of a selection of Brazilian scientific journals in different fields of knowledge, free of charge, with the aims of disseminating knowledge and constructing a national bibliographical base for literature surveys, thereby increasing the impact of citations (Bireme, 2002). It is available at http://www.scielo.br

**Figueira Netto S C. A comunicação científica de redes de computadores: a experiência de pesquisadores brasileiros. [master's dissertation]. Rio de Janeiro: UFRJ/ECO - CNPq/IBICT; 1994.

***Ferreira SMSP. Redes eletrônicas e informação: abordagem Sense-Making para estudo de comportamento de usuários do Instituto de Física da USP. [doctoral thesis]. São Paulo: School of Communications and Arts, University of São Paulo; 1995.

****Castellani M R. Cultura organizacional e tecnologia da informação: um estudo do uso da Internet na atividade de pesquisa em duas unidades da USP. [master's dissertation]. São Paulo: School of Economics, Administration and Accountancy, University of São Paulo; 1998.

*****DataCAPES is a collective database containing a postgraduate statistics module, which is a tool for assessing postgraduate programs in the country. It is available at http://www.capes.gov.br. Data were specifically extracted from the postgraduate profile item of the university teachers' register for 2001.

Table 1 - Numbers and percentages of university teachers within postgraduate programs in the field of public health, according to their knowledge and usage of Internet resources. Brazil, 2002.

Internet resources	Not known about N (%)	Known about but not used N (%)	Internet usage* Daily N (%)	Weekly N (%)	Monthly N (%)	Yearly N (%)	No response N (%)
Electronic mail (e-mail)	-	-	207 (92,0)	9 (4,0)	1 (0,4)	1 (0,4)	7 (3,1)
www - world wide web (sites)	1 (0,4)	3 (1,3)	125 (55,6)	66 (29,3)	14 (6,2)	-	16 (7,1)
Newsgroups - discussion grups and lists	10 (4,4)	108 (48,0)	23 (10,2)	30 (13,3)	24 (10,7)	5 (2,2)	25 (11,1)
Chat systems (chat rooms, ICQ)	14 (6,2)	152 (67,6)	3 (1,3)	7 (3,1)	7 (3,1)	5 (2,2)	37 (16,4)
Teleconferencing	18 (8,0)	140 (62,2)	-	1 (0,4)	10 (4,4)	18 (8,0)	38 (16,9)
FTP - File transfer protocol	14 (6,2)	40 (17,8)	39 (17,3)	57 (25,3)	36 (16,0)	12 (5,3)	27 (12,0)

*Percentage calculated in relation to the 225 researchers who were using the Internet

lotas (UFPel); and the Fundação Oswaldo Cruz (Fiocruz), with its Escola Nacional de Saúde Pública (ENSP) and Instituto Fernandes Figueira (IFF).

DataCAPES (2001) was used to identify the teachers. The electronic and postal addresses of the teachers identified were located via the following sources: Directory of Research Groups in Brazil (CNPq)* in its version available in 2001; and consultations of the websites and postgraduate departments of the institutions involved in the study. Data collection was done by means of a questionnaire developed using HTML (hypertext markup language), to be filled out and returned via the Internet, without the teacher needing to open any computer file.

The questionnaire was structured in four modules: 1) Socio-demographic and academic characteristics of the community studied; 2) Use of the Internet by the teachers; 3) Use of the Internet in research and teaching; and 4) Barriers and expectations regarding the use of the Internet. For the present article, module 2 and parts of modules 3 and 4 were analyzed.

In order to ensure that teachers who did not use the Internet or could not answer the electronic questionnaire could participate in the study, printed questionnaires were posted.

Statistical analyses were performed descriptively, using proportions, means and standard deviations. Comparisons between the teachers who used the Internet and those who did not use it – regarding the teacher's present age, postgraduate experience, field of knowledge, terms of employment and percentage of time dedicated to teaching and research – were performed using the Chi-square test of association. The results from this comparison, i.e. the description of factors that are associated with the use of the Internet by the community of Brazilian teachers, will be presented on another occasion.

The methodological procedure adopted was approved by the Research Ethics Committee of the Faculdade de Saúde Pública, Universidade de São Paulo.

RESULTS AND DISCUSSION

Out of the 372 teachers selected, 237 (63.7%) answered the questionnaire: 149 in the electronic format (62.9%) and 88 in the printed version (37.1%).

The Internet was already being used by 94.9% of the teachers in 2002, and more than half of them (61.6%) had already been using it for over five years, with good knowledge of its main tools (73.8%). Among the Internet resources, electronic mail was the most used (96.9%), and 87.3% were using it on a daily basis. The web ranked second in usage (91.1%), with daily access reported by 55.6% of the teachers. The result obtained regarding the preference for electronic mail and the web was similar to what is recorded in the literature. Lally[10] (2001), for example, argued that even researchers in the social sciences, who tend to use new technologies less, also consider these two resources (mail and web) to be the cornerstones of the infrastructure for research within the electronic environment.

Other Internet services were scarcely used by the teachers, except for the file transfer protocol (FTP), which was used by 64.9% of them (Table 1). The majority of the teachers did not use important resources that allow communication in real time. They did not know about – or, if they did, they did not use – chat systems and teleconferencing. With regard to groups and discussion lists, although these were considered to be fast communications media, they were shown to be of little use for this community, i.e. almost of half of the teachers knew about them but did not use them.

Studies in other academic communities have presented similar rates, like in the study by Cobb & Baird[6] (1999) in the field of nursing, where only 2% of the researchers were using chat systems and 3% discussion groups. However, other studies (Applebee et al,[3] 1997; Liebscher et al,[11] 1997; Selwyn,[15] 2000)

*National Council for Scientific and Technological Development (CNPq) of the Ministry of Science and Technology, Lattes Platform, Directory of Research Groups; available at http://www.cnpq.br

Table 2 - Numbers and percentages of university teachers within postgraduate programs in the field of public health, according to their opinions about how the Internet has influenced their scientific research activities. Brazil, 2002.

Research activities	Opinion about the influence of the Internet						Internet not used for this activity	
	Improved		Worsened		Unchanged			
	N	%	N	%	N	%	N	%
Bibliographic information search	208	92.4	-	-	7	3.1	6	2.7
Data collection for the research	145	64.4	1	0.4	53	23.6	18	8.0
Processing/ entering of data	88	39.1	-	-	86	38.2	37	16.4
Submission of original articles for publication	135	60.0	-	-	65	28.9	18	8.0
Conducting of collaborative research	166	73.8	-	-	34	15.1	12	5.3
Issuing of technical-scientific reports	159	70.7	4	1.8	40	17.8	12	5.3
Development of research projects	152	67.6	-	-	49	21.8	15	6.7
Follow-up of research projects by those under supervision	173	76.9	-		34	15.1	4	1.8
Administrative activities	145	64.4	2	0.8	46	20.4	17	7.6

have indicated growing use of discussion groups and lists among academic communities.

The majority of research activities have benefited from the use of the Internet (Table 2) except for processing and entering data, as expected, which was usually performed outside of the net.

It can also be highlighted that there was little use of the Internet for "submission of original papers for publication", which was marked by 28.9%. The possible reasons for this indicated by the academics were that there are few electronic scientific journals in the field and that there is no electronic management for the processes of selecting and publishing papers among the majority of Brazilian journals. However, the issuing of technical-scientific reports was identified by 70.7% of the teachers as a positive trend towards introducing network technologies into scientific publishing (Table 2). Moreover, the data in Table 3 show that the teachers considered that the Internet was making communication between authors and scientific editors much easier (62.7%).

The formal publication of research results in electronic format is still insignificant. Publication of papers in journals that are exclusively in electronic format was chosen by few teachers, even considering that the offer of exclusively electronic journals is small in relation to the offer of printed journals. Bibliographic production relating to public health tends to be published in more informal ways, such as in congresses.

The most positive influences from the Internet were related to contacts with colleagues, including those in other countries. This had a positive influence on how collaborative research was conducted (73.8%) and how projects performed under supervision were followed up (76.9%) (Table 2). These findings corroborate those from the study by Lubanski & Matthew[12] (1998), in which it was shown that the patterns of academic work have changed with the advent of the Internet, especially in relation to collaboration in developing research projects. Almost the whole academic community is unanimous with regard to this tendency. There is no doubt that many research activities may become faster through this process. It is possible to exchange project drafts and observations, and manuscripts for publication, both by electronic mail and through chat systems and discussion lists. It can be said that one of the tools most responsible for improving communications among university teachers has been electronic mail.

In this respect, Budd & Connaway[4] (1997), in a study on the habits and attitudes of academics in universities in the United States, stated that these academics had started to draw up research and publish more papers as collaborative projects because of the availability and utilization of the Internet. As a consequence of this technology, there has been geographical expansion of academic communities and interdisciplinary participation, in accordance with statements in Lubanski & Matthew[12] (1998, p. 9): "*(...) I coordinate research with co-authors via electronic mail (...) I have had joint publications with colleagues I have never seen*".

Among the teachers of the present study, only 3.6% believed that communications between colleagues in the institution had become worse with the advent of the Internet, although this fact was not further investigated to identify factors that could have influenced such opinions. One of them commented thus: *"...I think the Internet has brought about too much isolation for the researchers (...) verbal discussions and listening to a talk are very enriching (...) to throw around a little bit of talk, something that cannot be done on the Internet, is very good for the processes of reflection"*.

Although only a few teachers were not using the Internet (5%), almost all of them admitted the possibility that they might do so within the short or medium term. Only one teacher did not consider the possibility of using it in the future. Similar results were obtained by Voorbij[16] (1999), in which members of academic communities who were not Internet users, considered themselves to be beginners in this technology and saw the possibility of becoming experienced users with time.

Table 3 - Numbers and percentages of university teachers within postgraduate programs in the field of public health, according to their opinions about how the Internet has influenced their scientific communications activities. Brazil, 2002.

Scientific communications activities	Opinions about the influence of the Internet						Internet not used for this activity	
	Improved		Worsened		Unchanged			
	N	%	N	%	N	%	N	%
Contacts with colleagues in the same institution	174	77.3	8	3.6	36	16.0	3	1.3
Contacts with colleagues in other institutions in Brazil	213	94.7	1	0.4	8	3.6	-	-
Contacts with colleagues in other countries	193	85.8	-	-	15	6.7	10	4.4
Contacts with scientific editors	141	62.7	1	0.4	60	26.7	16	7.1
Contacts with fundin bodies	167	74.2	5	2.2	39	17.3	7	3.0
Exchange of ideas with research groups	114	50.7	1	0.4	62	27.6	37	16.4

The reasons for not using the Internet were in general related to the lack of infrastructure (16.7%) and lack of skills for this (58.3%), apart from personal reasons of aversion to technology (33.3%). It was observed that there was a lack of motivation to use the Internet when some teachers declared that they could obtain from other people what they needed from the Internet (58.3%). These teachers therefore did not consider it to be necessary to learn how to use the Internet, since they were able to get what they needed without using it at all (66.7%). This leads to the belief that other people were accessing the Internet for them, since many academic and scientific activities required the use of the Internet, such as the inclusion of curriculum vitae in the Lattes Platform of CNPq, requests for grants from research funding institutes, and access to bibliographic databases and complete texts, among others.

In a national study carried out in Holland (Voorbij,[16] 1999), it was observed that the majority of the members of the academic community considered themselves to have experience of using the Internet, and thus did not require training to keep themselves up to date. However, this community argued that, in order to use Internet resources, they needed large quantities of explanations and they considered that it was false to state that the Internet was user-friendly. Therefore, it can be said that, when teachers do not use the Internet for routine work, this may be due especially to questions relating to the network infrastructure, equipment and software, and the technical support offered by institutions, as shown in Table 4.

Despite the investments by Brazilian universities in infrastructure for introducing new communications technology, the present study highlights that their academic communities are not completely satisfied with the technological resources available for their activities. The insufficiencies identified by a large proportion of the community studied relates to the equipment, network structure, technical support and training. These form the main barrier to effective use of the Internet.

In conclusion, the results have shown that the Internet has significantly affected the cycle of scientific communication, with regard not only to the speed with which information can be retrieved, but also to communications between peers. This latter is what has changed most since the recent coming of the Internet to the Brazilian academic world.

Future studies could investigate the impact of the Internet on the academic-scientific world by focusing on longitudinal studies that need to be based on continuous observations. Such studies must give answers to researchers' information needs, within a technological environment that is going through many rapid changes, and be able to provide scientists with information relating to the challenge of determining how the products from the technological environment can better meet the information needs of the academic-scientific community.

ACKNOWLEDGEMENTS

To the systems analysts Daniel Marucci e Fernão Dias de Lima of Faculdade de Saúde Pública/USP and Wagner Cuenca, for developing the electronic form.

Table 4 - Numbers and percentages of university teachers within postgraduate programs in the field of public health, according to reasons why they considered they had difficulties in using the Internet. Brazil, 2002.

Difficulty in using the Internet	N	%
Slowness of access	100	44.4
Lack of technical assistance	88	39.1
Insufficient equipment	78	34.7
Difficulty in finding information on the Internet	69	30.7
Out-of-date equipment and software	57	25.3
Resistance towards using these technologies	37	16.4
Lack of quality in Internet content	24	10.7
Excess of information on the Internet	24	10.7
Lack of time for exploring all that the Internet offers	12	5.3
No barriers exist	11	4.9

REFERENCES

1. Alonso WJ, Fernandez-Juricic E. Regional network raises profile of local journals. *Nature* 2002;415:471-2.

2. Andrade MTD de, Abdalla ERF, Cuenca AMB, Hussein FS, Siqueira AAF de, Tanaka ACd´A, França Jr I. Influência das novas tecnologias no acesso a serviços de informação pelos docentes da área de saúde pública [Periódico *on-line*]. *Inf Soc* 2003;13(1). Disponível em: http:// www.informacaoesociedade.ufpb.br [2003 jul 21]

3. Applebee A, Clayton P, Pascoe C. Australian academic use of internet. *Internet Res: Eletronic Network Applic Policy* 1997;7(2):85-94.

4. Budd JM, Connaway LS. University faculty and networked information: results of a survey. *J Amer Soc Inf Sci* 1997;48(9):843-52.

5. Cianconi R. Gestão da informação na sociedade do conhecimento. 2ª ed. Brasília (DF): SENAI/DN; 2001.

6. Cobb S, Baird SB. Oncology nurse´s use of the internet for continuing education. *J Continuing Educ Nurs* 1999;30(5):199-202.

7. Iturri J. Ciberespaço e negociações de sentido: aspectos sociais da implementação de redes digitais de comunicação em instituições acadêmicas de saúde pública. *Cad Saúde Pública* 1998;14(4):803-10.

8. Jacobs N. Academic researchers' use of the internet, and their consequent support requirements. *Libr Inf Res News* 1998;70(22):30-4.

9. Jordaan M, Jones R. Adoption of Internet technology by UK postgraduate centres: a questionary survey. *Health Libr Rev* 1999;16:166-73.

10. Lally E. A researcher's perspective on eletronic scholarly communication. *Online Inf Rev* 2001;25(2):80-7.

11. Liebscher P, Abels EG, Dennan D. Factors that influence the use of eletronic netwrks by science and engeneering faculty at samall institutions. *J Am Soc Inf Soc* 1997;48(6):496-507.

12. Lubanski A, Matthew L. Socio-economic impact of the internet in the academic research environment. *Assignation* 1998;15(4):512.

13. Meis L de, Velloso A, Lannes D, Carmo MS, Meis C de. The growing competition in Brazilian science: rites of passage, stress and burnout. *Braz J Med Biol Res* 2003;52:185-93.

14. Schauder D. Eletronic publishing os professional articles. *J Am Soc Inf Soc* 1994;45(2):73-100.

15. Selwyn N. Creating a connected community? Teachers´s use of an electronic discussion group. *Teach Coll Rec* 2000;102(4):750-78.

16. Voorbij HJ. Searching scientific information on the internet: a Dutch academic user survey. *J Am Soc Inf Sci* 1999; 50(7):598-615.