

## **New Forms of Scientific Communication for Research Intensification**

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### **Abstract**

*Development of an effective system of interaction between the scientist and scientific library will optimize the information services for scientists and will promote the development of national science on the basis of new forms of scientific communication.*

*Keywords:* scientific communication, electronic information, information needs, scientific library, electronic journals, databases, blogs, forums, repositories, chat, file sharing, e-mail

### **1. Introduction**

Scientific communication as a form of business communication is of interest to library professionals engaged in information service of scientists.

Modern trends in civilization evolution, the development of information technologies, the growth of information in the world and others modify the forms of communication in society as well as in scientific community. Monitoring and adaptation to these changes, development of an efficient system of interaction between scientists and research library will enable optimization of information service of scientists and will contribute to the development of national science.

The trends in developing scientific communication are the extension of Open Access to scientific information, the growth of informal communication value, the creation of the network of remote scientific teams, the optimization of interdisciplinary and international cooperation, the emergence of new forms of scientific communication on the basis of information technologies, the enhancement of the role of self-discipline of scientists and their potential in free dissemination of research results. New forms of scientific communication blur the institutional and interdisciplinary boundaries, thereby increasing the scientist's responsibility for disseminating the results of their own research, the choice of optimal communication channels.

### **2. Challenge**

The trends of quick growth of new forms of scientific communication bring researchers both opportunities and some threats. Scientists need more time to adapt to

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new communication channels, sometimes for a reason they do not trust them. The quality and the status of new forms of scientific communication going online require expert assessment, which is complicated by the lack of specialists in this area and the lack of adequate qualification of scientific libraries for the new role.

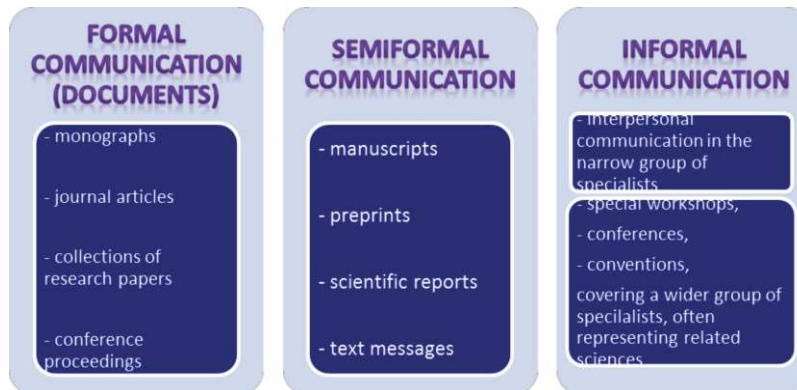
The evolution of scientific communication from letters, personal interviews, articles to innovative forms of communicating scientific knowledge on the basis of information technologies makes libraries look to new possibilities of communicating information to consumers, their relation to modern communication channels and users' preferences for receiving and communicating scientific information in order to completely meet professional information needs of scientists.

Over the last century the status of science has changed, it becomes a state business, scientific production acquires controlled character, there are introduced scientometric methods of measuring scientific research results. The research libraries become a significant segment in assessing scientific research results, they seek to optimize the scientific communication of researchers and to promote their research results through a variety of communication channels.

Collection and analysis of empirical data are a fairly expensive part of scientific research. The research libraries relying on the use of instruments offered by modern information technology are designed to reduce the scientific production complexity by offering timely informational resources and informing about new forms of scientific communication in a network environment.

The system of scientific communication includes subsystems: formal, semiformal and informal communication. (Tab.1). Which in its turn can be divided into traditional and innovative one. Traditional communication includes articles, scientific conferences, workshops, letters, scientific reports and others. Innovative communication may include communication based on information technologies, such as online conferences, scientific institutions websites, articles in electronic journals, databases, blogs, forums, repositories, chat, file sharing, e-mail and others.

**Figure 1. System of scientific communication.**



*Source:* Developed by the authors.

### **Research techniques.**

The analysis of preferences of consumers of scientific information on the basis of the questionnaire survey and desk research of new forms of scientific communication on the Internet helped to identify the peculiarities of communicative interaction between the scientists of Moldova and other countries at the present stage.

### **Results.**

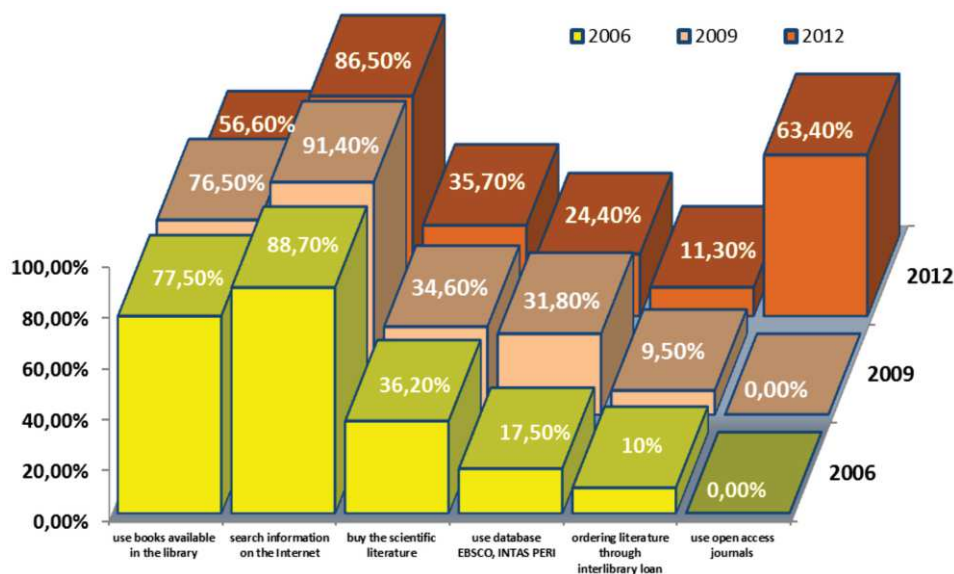
The Moldovan scientists actively use the opportunities provided by modern computer telecommunications, which is confirmed by the research on professional information needs of the scientists of Moldova conducted in the period of 2005-2012 [4, 217 p.].

The active use of various forms of electronic scientific communication enables active integration of the Moldovan scientists into the global scientific community.

Traditional scientific journals with electronic archives, scientific organizations websites, e-journals with open access enjoy the researchers' special confidence.

There is a tendency to reduce calls to the library in the process of scientific production, that is, library attendance, for the rest the proportion of using the scientific communication channels remains unchanged (Figure 2).

**Figure 2. Scientists' preferences in selecting the sources of information acquisition.**



Source: РАЙЛЯН, Е., САВЧУК, О. Инновационная маркетинговая стратегия в деятельности научной библиотеки. Кишинэу: ASEM, 2015. 117с.

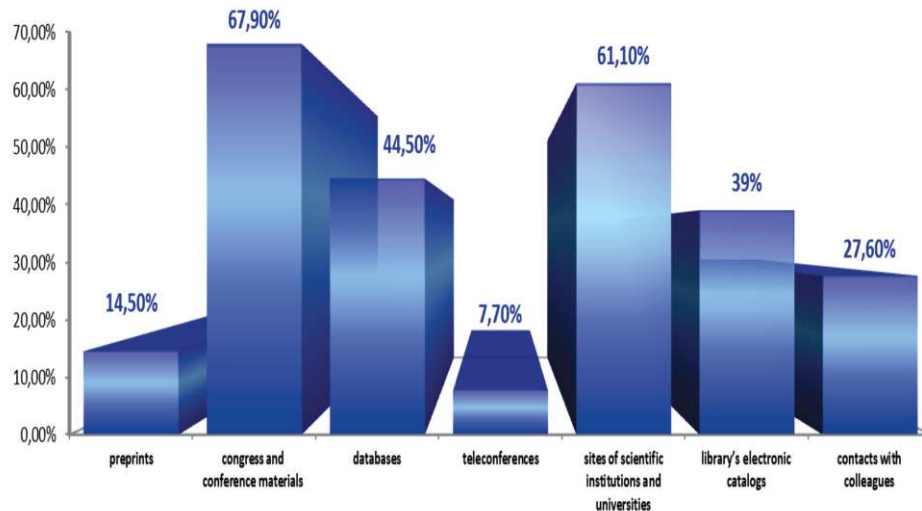
The research has found that the Moldovan scientists are increasingly using scientific information in electronic form in the process of scientific production. 30 - 80% of all scientific information consumed by most scientists in the process of scientific production is scientific information in electronic form [4, p. 217].

The forms of online scientific communication used by the Moldovan scientists are presented in Figure 3.

The transfer of scientists' activity in the electronic environment changes the structure of scientific communication. Dr. Blu points out to an interesting paradox: despite the fact that the Internet was created by scientists for scientists, they are in no haste to discover all its benefits. [3]

Informal communication provides the modern scientists with 70-80% of the information necessary for their work. [6]

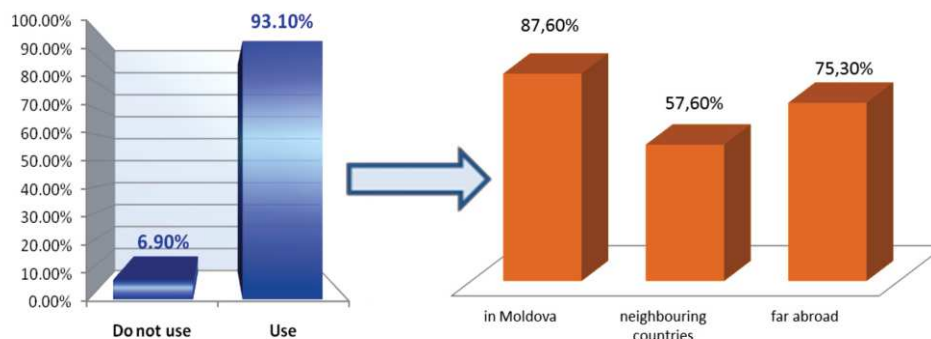
**Figure 3. Scientific communication used by scientists in electronic environment.**



*Source:* РАЙЛЯН, Е., САВЧУК, О. Инновационная маркетинговая стратегия в деятельности научной библиотеки. Кишинэу: АSEM, 2015. 107с.

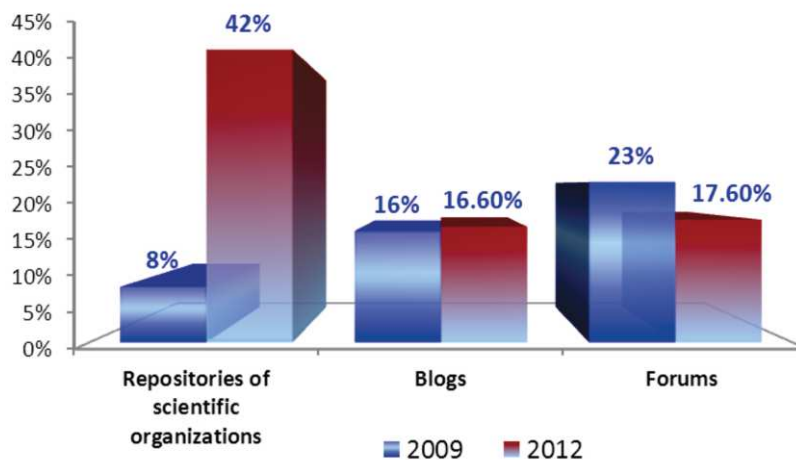
Among the informal channels of information exchange and dissemination the Moldovan scientists use e-mail most of all (Figure 4). This rapid means of scientific communication is extremely popular among scientists, but there is a problem with processing and storage of this type of information.

Communication with “close” colleagues dominates. These peculiarities of informal communication have already been identified by the sociologist of science G. Diumenton. He compared the number of personal contacts of professionals interviewed by him with close and distant colleagues. It turned out that internal contacts dominated. Similar results were obtained by American sociologists. [3]

**Figure 4. Use of e-mail in scientific communication**

*Source:* РАЙЛЯН, Е., САВЧУК, О. Инновационная маркетинговая стратегия в деятельности научной библиотеки. Кишинэу: ASEM, 2015. 107с.

Less popular forms of scientific communication are repositories, blogs and forums (Figure 5). And if in scientific organizations repositories the information is clearly organized and is subject to archiving, then in scientific forums and blogs there are risks of losing valuable data, since there is no system for the collection and storage of scientific information, there is a risk of loss of research priorities, the risk that a competitor will appropriate the results of your scientific research.

**Figure 5. Innovative forms of scientific communication used by the Moldovan scientists in 2009 and 2012.**

*Source:* РАЙЛЯН, Е., САВЧУК, О. Инновационная маркетинговая стратегия в деятельности научной библиотеки. Кишинэу: ASEM, 2015. 107с.

In the world there are about two thousand blogs related to scientific topics [1, p.142]. The most famous and popular among the scholars are:

- Research Blogging (<http://researchblogging.org/>) is a website where scientists

can discuss the articles on exact sciences, medicine, engineering, geosciences, social sciences, anthropology, psychology and others.

- Research Blogging allows users to mark messages as metadata - the information about the author of the article and revision history. This allows identifying the priority publications, which has been considered so far the exclusive advantage of peer-reviewed journals [1, p.144].
- The website is equipped with a well-designed service that allows saving, sending, marking the necessary information, easily finding the related information and getting in easy contact with the authors of scientific articles.
- Scientific Blogging (<http://www.science20.com/>) provides information on social and exact sciences, geosciences, medicine, cultural studies. This online product for scientists in the network promotes the idea of Science 2.0 and innovative opportunities to optimize the scientific production in the XXI century.
- The interesting format ResearchGate ([www.researchgate.net](http://www.researchgate.net)) which is a social network and forum of scientists from all scientific fields brings together seven million researchers, including 45 Nobel Prize winners. Created in 2008 by physicists Dr. Ijad Madisch and Dr. Sören Hofmayer, and by the scientist in the field of computer technology Horst Fickenschler this website is designed to facilitate scientific communication between scholars from different parts of the world, to provide access to research results, knowledge and experience. On ResearchGate researchers can find what they need for promoting their research.
- The website offers a semantic search, forums, methodological discussions, publication database exchange and others. Free registration is required, which is done under one of three types of researchers: an academic researcher, a corporate researcher and another type of researcher (independent researcher, graduate).
- Epernicus ([www.epernicus.com/](http://www.epernicus.com/)) is a specialized social network designed to facilitate communication, exchange of experience and cooperation in research activities. This site offers the expert review of the results and scientific facts.
- Connexions ([cnx.org](http://cnx.org)) is online scientific community created with support from William and Flora Hallet Fund, Maxfield and Connexions Consortium. The scientists are able to freely exchange modules covering various fields of knowledge. The information in OpenStax CNX is presented in small modules according to various branches of knowledge and groups of modules structured in monographs and educational materials.
- Scientia.ro (<http://www.scientia.ro/>) is the largest Romanian forum popularizing science and technology and presenting daily high-quality articles and news information. There is a possibility for forum participants to communicate by asking and answering questions.
- On Russian scientific forum dxdy (<http://dxdy.ru>) there are discussions in the field of mathematics, chemistry, physics, engineering, medicine, biology, social sciences and humanities, computer science.

Scientists usually keep blogs for two reasons: communication with the scientific community and the ability to publish in Open access to test their own ideas and to receive feedback.

There is growth in popularity of sites that use the voting technology and file sharing.

Thus, for example, some online resources such as SciRate (<http://scirate.com>) and BioWizard (<http://biowizard.com>) enable researchers to filter content based on the daily votes of registered users for the most relevant online articles.

An important tool of scientific communication is file sharing, which is offered by different servers focused on serving the scientific community. The most popular server in this group is arXiv.org (<http://arxiv.org>), the biggest free archive of mathematics, mechanics, physics, biology, with preprint exchange included.

### 3. Conclusions and recommendations

Digital information presentation has expanded capabilities of search, processing, transmission and storage of information. The scientific process is supported by the variety of data visualization, format portability, interactive transmission. A wide range of tools enables easy access and storage of scientific information. A new level of communication between scholars increases the possibilities of scientific production, which is becoming increasingly individualized. The way of transmitting their own scientific information depends on the scientists' individual features, fondness and skills, area of expertise in which they specialize, and others.

The use of modern communication strategies and techniques, i.e. the entire set of tools of modern forms of scientific communication greatly affects the researchers' presentation of research outcome at different stages of research, establishes copyright, enables to trace the rating of scientific publications and contributes to scientists' socialization.

The emergence of new individual and collective forms of electronic communication enhances the importance of self-organization of scientists and international cooperation. The use of innovative forms of scientific communication: formal and informal fructifies scientific production, brings new opportunities for the new knowledge creation, that is why research libraries are designed to communicate useful information to scientists on emerging interactive forms of scientific communication in order to optimize the scientific production in the country.

The rapid growth of forms of scientific communication, increased data traffic in science face the researchers with the problem of choosing the optimal and qualitative communication channels, being best capable of meeting the professional information needs of scientists, their status, goals and objectives of research, the science-specific issues.

In this regard, the role of research libraries as the most professional intermediaries in the field of scientific communication increases significantly; they accumulate their own traditional and electronic resources and provide access to external databases.

Research libraries can contribute to both the development of individual strategies of the scientist's professional communication and collective strategies in the use of various forms of scientific communication at the level of the organization.

Research libraries should promote scientific communication in the Republic of Moldova identifying the role of innovative forms of scientific communication and their efficient usage.

Research organizations management with the support of research libraries is intended:



- to promote the organization of institutional support for new forms of scientific communication according to the areas of scientific institutions;
- to promote monitoring and increase the representation of research outcome in electronic journals and archives;
- to encourage development of collective forms of scientific communication, for example, publications in international archives, on the website of the organization, academic blogs, in social networks, which will help to increase the scientific communication efficiency.

Research libraries should promote new forms of scientific communication, which will contribute to the maximum satisfaction of the professional information needs of researchers, the integration of the Moldovan scientists into the global scientific community and the intensification of research activity in the country.

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