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THE ROLE OF E-LIBRARIES IN FORMATION OF E-SCIENCE AND E-EDUCATION

The article considers the role of e-libraries as a primary information tool in the formation of e-science and e-education. It explores the impact of Web 2.0 on the development of e-libraries, e-science and e-education. The paper presents new opportunities of the integration of the networks of science and education libraries.

***Keywords**: e-library, e-science, e-education, Web 2.0, Science 2.0, Education 2.0, Library 2.0, e-library networks.*

Introduction

Economic growth in the Republic of Azerbaijan, formation of knowledge-based information society and application of innovative technologies has accelerated the development in science and education. In this regard, the rise in the efficiency, communication and coordination of corresponding sectors, as well as their improvement in accordance with modern requirements for accelerating the integration into world electronic information space is one of the topical problems posed. The application of information-communication technologies (ICT) in IS building is adopted as the main goal and the locomotive of development in World Summit of the Information Society (*WSIS*). In recent years, the application and development of ICT in various fields, including science and education in Azerbaijan, has become an integral part of everyday life in accelerating socio-economic growth and sustainable development, and raising the transparency and accountability. This process has fostered the successful implementation of e-science and e-education in our republic in accordance with C7 direction of WSIS Action Plan. Therefore, the level of development and problems of ICT in those institutions has necessitated the shift to the policy of formation of unified information space for utilization of structures of each of those institutions, and development of information resources and infrastructures alongside with informatization. Hence, the goal of both implemented projects is the provision of joint activity of the staff of scientific and educational institutions, as well as separate individuals engaged in scientific research and education process which have information-communication structure and an access to scientific, technical and educational information and computing resources via high-speed Internet network [1]. Works are being carried out in various directions in these projects. One of those is the establishment of information facilities based on new innovative technologies which is considered to be one of the most required and topical issues for the modern age. E-libraries constitute a significant and integral part of those information facilities.

It is known that it is impossible to build information society without using electronic information resources. The opportunities of digitalization of information compiled in paper format and hence, the establishment of new type of information resources of modern information technologies has facilitated the design of e-libraries. E-library has the capacity to organize the formation and storage, as well as the presentation of dissemination opportunities of information of different purposes at new level of quality. At the same time, e-library can also be considered as an information system facilitating the storage and effective use of different-type electronic documents (text, graph, audio, video, etc.) via network. It is an open online system providing high quality and more comprehensive information services to unlimited number of users without space and time constraints. Nowadays, the provision of e-libraries with the most advanced computers and network facilities, non-traditional data carriers, highly effective automatized technologies has turned these libraries into the most powerful and important spheres of information industry [2,3].

Hence, in the modern world characterized by globalization and integration processes, the development, complex analysis, management and forecasting of scientific and educational

activities can be realized on the basis of thorough information provision. As an integral part of information provision, e-libraries are crucial in addressing these issues. Above-mentioned issues emphasize the topicality of investigated issue once again.

E-libraries as a primary information provision of scientific and educational systems

Creation and acquisition of information resource is one of the main outcomes of creative, social and intellectual activity of human being. The level of development of information acquisition technologies and effective utilization of compiled information has significantly affected the development level of productive forces throughout the history. In this regard, libraries are irreplaceable in preserving the valuable historical-cultural, literature and scientific-philosophical heritage created by nations. They play an indispensable role in handing over the achievements acquired by human civilization through generations, and preserving and improving the intellectual-moral potential of the society.

Modern age is characterized by larger volume of information flow, more sophisticated information technologies with wider opportunities. Information technology bears a crucial role in this regard. Internet network has compiled a large volume of electronic resources and developed colossal information space consisting of bibliographic information on books, periodicals, articles and information databases. The role of e-libraries and information services systems is crucial in the establishment of such a gigantic information space. The primary goal of establishing e-libraries is the improvement of services provided to readers, raising promptness and efficiency of those, application of new methods of preserving cultural and scientific heritage constituting the library fund, preserving rare physical copies, as well as enlarging the library fund by attracting new sources and providing the scientific research activity with new and high-quality information. Building works of e-library and corresponding information infrastructure are being rapidly carried out in the world. Works in this direction have been commenced in 80's in Great Britain and 90's in the USA of the past century. Although these projects were being carried out by small working groups, firstly, those have attained a status of national programs and international projects in following years. As an example, "*eLib*" program in Great Britain [4], "*NDLP*" program in the USA [5], as well as "*Global Info*" in Germany [6] and e-library projects in Japan [7] can be shown. It is to be noted that such projects receive comprehensive state financing. Consecutive works are being conducted in this direction since 1995 in Russia [8] and 1996 in Belarus [9]. "Scientific electronic library" project of our northern neighbor operates successfully [10]. "Russian National Reference Index" analytical-information system was developed for the evaluation of the activity of authors, scientific journals and scientific organizations based on bibliographic and scientometric analysis on its basis [8]. This system has the capacity to evaluate the scientific activity and support the development of science.

The development of physical-technical bases of libraries and improvement of their activity is regularly supported by the state in Azerbaijan. The government of Azerbaijan has adopted a decree "On the state of library activity in the Republic of Azerbaijan and measures to improve it" in 1996 [11]. The law of the Republic of Azerbaijan "On the library activity" was put into force in 1999 [12]. The Order "On the improvement of the activity of libraries in Azerbaijan" adopted by the President of the Republic of Azerbaijan dated 20 April 2007 has become a turning point in addressing these issues [12]. As one of the outcomes of the Order, ANAS Central Library of Science (CLS) can be shown. In order to build the physical-technical bases of ANAS CLS and ICT infrastructure in accordance with modern standards, it is considered to establish e-library system and comply its activity with world standards, as well as to address and conduct the following issues:

- Digital conversion of printed works in the library fund;
- Purchase of electronic scientific resources for other sources;
- Cataloging of electronic publications;
- Organization of information storage;

- Organization of information search and acquisition;
- Information security issues, etc.

The primary purpose of establishing ANS CLS is to consider international expertise and make the organization of library activity more efficient by application of modern technologies, facilitate reader-library relations, establish a unified library system which would integrate scientific entities and organizations of ANAS with the libraries of other institutions within the country and world library systems by employing the latest technology and equipment, and as a result, to shape an intellectual environment complying with modern and the world standards.

It is to be particularly noted that special attention is devoted to the expansion of national content, protection and development of national-cultural heritage of our country, as well as its use via advanced technologies and the improvement of knowledge of population amidst the development of information society in our country [13]. The expansion of ICT application and electronic library network is one of the direction of action plan in this sphere.

Sphere of Influence of Web 2.0

The development of ICT, particularly Internet and web technologies in the world, ongoing phenomenon of digitalization has fostered the emergence of various terms such as Science 2.0, Open science 2.0, Education 2.0, and Library 2.0.. Those are characterized by the spheres of activity based on the scientific exchange or cooperation principles with the application of ICT, and in particular *Web 2.0*. The use of cooperative technologies, such as wiki, blog and video-journal, bears a crucial importance for sharing ideas, information or scientific outcomes. A common feature of the scope of influence of these notions is to achieve greater "openness" (accessibility), shorter publication terms (for example, via scientific wikipages), rapid feedback (for example, by using social networks) or higher degree of participation and cooperation (for example, virtual research environment). Above-mentioned notions characterize the issues on the spotlight of each research structure.

Open science is engaged in regulation of the activities in open research as possible and understood as an "open" use of joint works and research outcomes and independent actions shared for any purpose by everyone in such environment [14]. This concept ensures the openness of all phases of research works for public use by comprising open software tools, accessible publications or open research processes. Science 2.0 and Education 2.0 strengthens the influence of social media on research, education or publication processes in particular. The intended purpose of Science 2.0 and Education 2.0 is related to the research of new Internet technologies, including social media and the application of new methods of all phases of education. In turn, Science 2.0 facilitates the Open Science, while it is not public as such. For example, a particular research group can work together in social media environment regarding any publication, and publish the final work in a licensed journal. In contrast, Open Science can emerge without using any tool of Science 2.0. Notwithstanding this, we encounter a paradoxical situation with the emergence of open (public) web-based scientific communication and Science 2.0: on one hand, research generates multiple available (and usually, free of charge) information, on the other hand, researchers complain regarding information overload and low number of filters providing quality control. This problem pertains to Education 2.0 as well. Despite that, the management of the emerged information opulence is addressed as a separate problem in parallel.

The concept of Library 2.0 as a new approach to library services directed to the participation of main target users and cooperation among them via *Web 2.0* [15]. With this tool, library services are re-evaluated and updated in order to comply with changing requirements of users. An active and competent user is an integral part of it. The flow of information and ideas, directed from library to reader and vice-versa, fosters regular, rapid and dynamic development and improvement of library services. Regardless the virtual character of services, a user becomes a participant, creator and consultant at the same time. The future role of scientific libraries (Library 2.0) has two main aspects: 1) application of new methods of services and exchange, as well as acquiring

corresponding scientific outcomes by attracting the attention of researchers for the distribution of scientific content; 2) dealing with the processing of growing information load, integration of various content sources within a library or among libraries, and support for the assessment capacity of the quality of research products.

At present, libraries and digital information structures provide the scholars with subject-oriented information at a national level. In future libraries (Library 2.0), there will emerge an opportunity to provide momentously an online usable information among researchers via Science 2.0 tools. Scientific libraries will establish necessary information technologies infrastructure and supply the services of new quality via profiles in existing information units, including wikis, blogs, virtual research environment or social media. All of them are necessary for providing the support for distributed information provision. *ScholarLib* can be shown as an example for such tools [16]. The aim of *ScholarLib* is to maintain the accessibility of academic information via social media networks, etc. by portals of scientific libraries. Libraries do not only act as information providers. They also provide additional services supported in publication processes and providing sustainable environments for all research products to researchers as in Science 2.0. At the same time, adoption and application of Science 2.0 technologies creating opportunities for new paradigms for literature search will play an important role in the development of libraries.

Role of e-libraries in integration of e-science and e-education

Modern theoretical and methodological advantages of scientific research are defined by the application opportunities and their relation with education. As an integral part of a thorough system in information society, knowledge also occupies a central place in the integration of science, education and production. In order to accrue the leading role to Azerbaijan in this sphere, it is planned to carry out this process step by step and to achieve the integration based on scientific, methodological, education and production bases. The issue of integration of science and education is not new and the ways of addressing this issue has always been on the spotlight. One of the main directions of multi-purpose integration serves to the growing participation of scholars in education, as well as teachers and students in scientific research works. As a result, it is pursued 1) to increase the efficiency of research works; 2) to improve the quality of education and scientific-technical training of staff, as well as efficient utilization of budget resources; 3) to attract young people to research and design sphere, etc. The role of large-volume information provision created as a result of traditional libraries, e-libraries, networks of e-libraries, and the integration of those is crucial. Both of e-science and e-education, in turn, carries out the addressing of this problem, and this process accelerates their integration. Figure 1 presents the structural scheme of mutual integration of the networks of local and international scientific and educational libraries. As seen from Figure 1, AzScienceNet network platform of e-science and AzEduNet network platform of e-education are main bases of formation of such integration process.

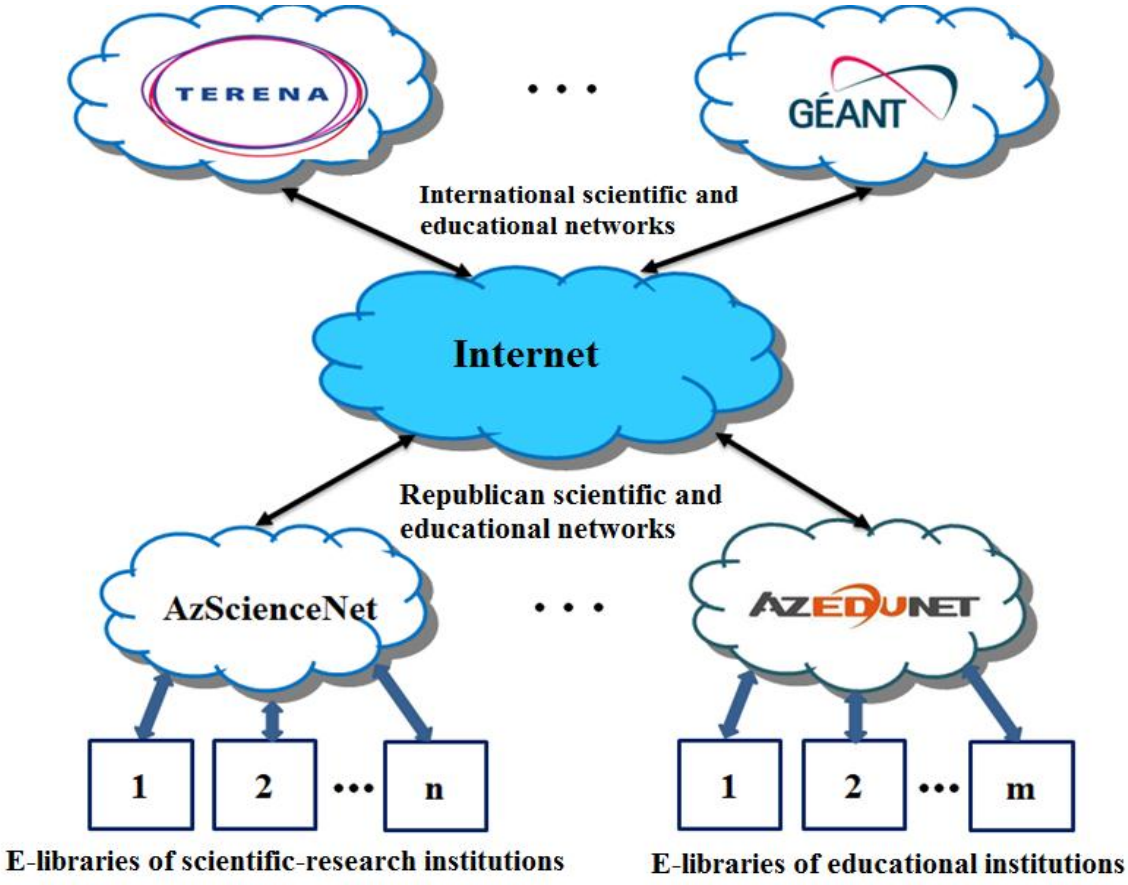

Figure 1. Integration scheme of e-library networks

The integration of library networks of scientific and educational institutions facilitates the rapid increase of scientific and educational Information, its more convenient use of and high-speed dissemination, as well as more rapid recognition of science and education system of Azerbaijan in an international environment. At the same time, as a result of such integration, efficient results can be obtained in administrative decision-making, thanks to the improvement of information provision. Moreover, with the application of bibliometrics, scientometrics and webometrics, a large volume of scientific data gathered in such sources, the issue of evaluation of scientific activity at national, regional and institutional levels (and at the level of separate scholars) can be addressed more easily.

Conclusion

The issue of establishing e-libraries in modern times occupies a noteworthy place in the formation of information society. The establishment of e-libraries and library networks of science and education systems as well as their integration with each other and international networks will accelerate the development and integration of e-science and e-education within the country. As a result, the provision of high quality and promptness of library services will lead to the improvement of scientific research and training works conducted in scientific and education institutions and the efficiency of staff training as well as the development of science and education in compliance with the world standard and the rapid integration into the space of science and education of the world.

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