



Research Information System in Health Domain: Comparative Approach

Nahid Ramezan Ghorbani¹, Gholamreza Heidari², Rosemari Noot³, Youssef Fakour⁴, Marziyhe Meraji^{5*}

Abstract

Objective: In recent decades, in low-income developing countries, management has faced serious challenges due to deficient information. An increasing number of dispersed data, concepts, observation of poor outputs, and separate software applications aggravated the situation, too. In order to promote and balance the research environment in the field of health, developing a platform for appropriate interactions is essential. Thus, the basic question is what requirements must be considered for suitable health research information system in Iran?

Materials and Methods: The present study is a descriptive-comparative approach conducted in Iran in the years 2010-2011. System requirements of research information in Iran, United States, Australia, Japan and Netherland were reviewed and compared. Checklist was used for data collection. Data was collected from conference and journals papers and relevant manuals/guidelines from websites on their systems. Finally, data collected in the comparative tables were compared and described.

Results: The requirement for national health research information system were determined based on the following central axis: structure, content, methods of gathering information, services and capabilities and methods of disseminating information which were assigned base on common and diverse components in countries' systems.

Conclusion: In order to achieve this national system, it is important that there should be a common serious determination for its development, change in attitude and culture of the researcher's society in the domain of health and also improvement in the country's information and communications technology (ICT) infrastructure.

Keywords: Health, Information system, Iran, Management information research, Research information, Research information system

Introduction

Increasing scientific researches and academic centers has bombarded researchers with wealth of variable information; as a result, researchers are encountering difficulty in accessing this information due to scattering and undisciplined information (1). Studies also show that 2% of gross domestic product (GDP) in developed countries such as the United States, the United Kingdom and France and 4% of GDP in Sweden, Finland and Japan are devoted to health studies while developing countries devote only an average 0.05% (2). One shortcoming in the health sector can be applied to inaccessible data, information or knowledge and or poor quality linked data. As a result, research centers in the field of health have difficulty in sharing vital information quickly.

Therefore, the health systems are facing considerable problems in analyzing data and making decisions (3).

On the other hand, information in the repositories, are available in different formats and with different qualities (sometimes conflicting) (4). Knowledge, paradigm shift, understanding economic stimuli and collaborative interdisciplinary science will intensify the need for information systems research to help researchers, managers and policy-makers, entrepreneurs and the general public. So if these information systems could not be able to help the researchers to see the broader picture of research in the field of health, the country will suffer a great loss (5).

Also, according to today's competitive investment environment, having the right information to use in investment opportunities for scientists is very important (6). Today's society is faced with major problems, which can be partially solved by using research data to improve as an operational guide (7). Therefore, the barrier to knowledge should be broken (8). Information system groups provide

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¹Department of Development and Cooperation of Information and Scientific Publications, Undersecretary for Research and Technology, Ministry of Health and Medical Education, Tehran University of Medical Sciences, Tehran, Iran. ²Ministry of Health and Medical Education, Tehran, Iran.

³Department of Development and Cooperation of Information and Scientific Publications, Undersecretary for Research and Technology, Ministry of Health and Medical Education, Tehran, Iran. ⁴Department of Psychiatry, Razi Hospital, Tehran, Iran. ⁵Department of Medical Records and Health Information Technology, School of Paramedical Sciences, Mashhad University of Medical Sciences and Health Services, Mashhad, Iran.

*Corresponding author: Marziyhe Meraji, Department of Medical Records and Health Information Technology, School of Paramedical Sciences, Mashhad University of Medical Sciences and Health Services, Mashhad, Iran. Tel: +98 9153121574, Email: merajim1@mums.ac.ir

an opportunity for the addressed groups to access the outputs. The system allows providing of the results of the analysis, data reuse and probably a combination of results to produce new insights at no cost (9). In recent years, data integration researches are viewed as not characterized by any fixed principle (10). Currently in Iran many websites are more devoted to the gathering of scientific data (11). Also, many medical universities have attempted to develop research in the field of health information systems. This leads to the study of data recorded over several local systems with heterogeneous structure; the scattering of data and software also cause further problems. Also, it is an obligation of the government to prepare a comprehensive program for scientific and technological development of the information society and ensure broad access of citizens to information, needed for safe and inexpensive and opportunities for regional connections and setting up the comprehensive system of research and technology needed for a comprehensive and integrated system of research, especially in the field of health information (12).

The aim of this study, considering the importance of the issue and its impact of health promotion is the comparative study of information systems research in selected countries and Iran and determine the existing gaps.

Materials and Methods

The present study is descriptive-comparative conducted during 2010-2011 in Iran. Initially, in order to select the surveyed countries their national information systems for research in health were identified. And then based on coverage and data sources, more accessible to the documentation (in English) randomly from four continents (America, Australia, Europe and Asia) one country was selected. Thus the national information system for research in the area of health in America, Australia, Netherlands, Japan, and information systems for health research in Iran were studied. It should be noted that co-ordinates of the national information systems of the countries, which were under comparison were based on 5-axis:

1. Structure of the national system of health information
2. Content of the national information system for health research
3. The methods of collecting data in the national health research system
4. National health research system services and features
5. The method of notification and dissemination of information on health systems research

To compare the characteristics of information systems in health research in selected countries a checklist was used. This tool has been developed based on specific objectives. Five main checklists with the topics of structure, content, processes for gathering, capabilities, methods for dissemination of information based on a comparison of similarities and differences of national information systems research were provided. Checklists were completed by the researcher based on reports, directories, websites and texts. The checklist validity was confirmed according to the internal validity through the study of literature and

review of relevant research and consultation with professors and experts. In order to collect data on the current status of information systems in health research in the country, documents from the Deputy of Research of Ministry of Health and Medical Education were used. In the stage of completing the comparative study checklist, sites, directories, reports, papers presented at conferences were reviewed and for those items that have been left unanswered, emails were sent to information technology (IT) managers of the sites of the corresponding countries and the checklists were completed. Time frame of websites and other texts review were related to 2011. National information systems coordinates in health research in selected countries are summarized and analyzed in a comparative table.

Results

Results show that in 5 countries namely America, Australia, Japan, the Netherlands and Iran the government is in charge of determining the structure of the national system for health information. But in America, despite the privacy fact, this structure is determined under the authority of Federal Government. Also, thematic coverage of the national systems of America, Australia, Japan, and the Netherlands, aside from medical fields nonmedical fields such as humanities, technological and engineering sciences, social sciences and other related sciences were incorporated while in Iran, the system is limited to the medical field. It is noteworthy that the number of data records in each of these countries were very different, which are related to the content of their information resources. The records information retrieved on each country include 100 million records in Japan, in America more than 2.5 million records, the Netherlands 678 thousand records, 67035 records in Australia and 105 million records have been reported in Iran. The numbers of local organizations, which are working with national systems; in America 600, 153 in Japan, Australia and the Netherlands with 41 to 31 research center, respectively. It should be noted that it is the only national information systems research in America which has partnerships with 10 foreign countries while the rest of the selected countries did not mention any reference of participation from foreign countries in terms of financing system resources. The content of information systems in selected countries except in Iran, that only contains a database of journal articles, includes journal articles, conference papers and sometimes working papers. Database of theses, research projects, external databases, information resources in the national system of the selected countries are available. America and Japan have a database of computer products. America is the only country which has a database of audiovisual materials. Also, most of the studied countries have database on technical report information on their draft record and only Japan and the Netherlands register information related to these drafts. Information workshops have been published only in Australia. Educational materials, handouts and monograph are available in Australia and Japan. Australia have data-

base of honors and awards. Netherlands and Japan also have a database of patents and lectures. It is noteworthy that in America information regarding researchers and academic staffs are not registered in this system (Table 1). As shown in Table 2 most studied countries have used decentralized architecture for the design of information systems. In the studied countries, all have used abstract in gathering information, also, full text was also used in gathering information by most country with the exemption of Australia and United States of America.

Bibliographic database services and data publication service about the services and capabilities of a national system of health are available in all 5 studied countries. Radio service of world news on internet, distribution and inventory management services and full printing services on request are available only in America. Also, service for all online orders in addition to Australia and the Netherlands in America is available, too. Sending data services in both America and the Netherlands are presented. In providing reports service and e-learning service between the 2 countries, America and Japan are available. However, the web hosting service, public safety and receiving and billing services are available only in America. In this regard, support service archive, except in Iran, has been active in the other studied countries.

Multimedia services are also active in the Netherlands. Search services in all countries other than Iran and Holland have been quick and advanced. In Iran simple search is applied. Microfilm or microfiche services only in America and thought management service and email in America and Australia are active. Meta-registry service, workflow engine service and quality assurance services in Australia provide services. Statistical services in Australia and Japan, repository data communication service in Australia, Japan and the Netherlands is used. Lists and collections, ports (or portals), applications and users, internal

and external electronic resources, databases, Rich Site Summary (RSS) services, thematic classification are used in all 5 studied countries. Access policies and rights and access to electronic library services in Iran are not considered, and reciprocal quality assurance services in Australia are considered. Citation data preparation in Australia, Japan and the Netherlands are available. Cataloging system in America, Australia and Japan has been established. But interlibrary sharing system is applicable only in Japan. Data export format service to the portal in both Australia and Japan and blogging service in Australia, Japan and the Netherlands are active. Interestingly, the Tube service is active only in Iran and mutually thesaurus database is only disabled. Personalization service has been active in Australia and the Netherlands reference management tools in Australia, Japan and the Netherlands are available. Google Scholar national distribution service has been active in selected countries other than America's.

Data transmission to weblog services using is only in Australia and the Netherlands. Service of web metric translation and analysis of national information system for research belongs to Japan. Mash up service also provides service in Australia. About the methods of disseminating of information in the national system research information (Table 3), all the studied countries used a portal for the dissemination of information. Most of studied countries have online ordering system. It should be noted that the national system of America for the online delivery of documents, production and delivery uses printed documents.

Discussion

Based on research findings, structure of research information systems in the health sector in the 4 countries focused on public sector and thematic coverage includes areas of medical and nonmedical. (13-19). The thematic coverage

Table 1. Comparative Content of National Research Information Systems in Selected Countries

	Iran	Netherlands	Japan	Australia	America
Articles	✓	✓	✓	✓	✓
Books	-	✓	✓		✓
Theses		✓	✓	✓	
Projects		✓	✓	✓	-
Computer production	-	-	✓	-	
Audiovisual materials	-	-	-	-	
Technical report	-		✓	-	✓
Draft	-	✓	✓	-	-
Conference		-	✓	List of conferences	-
Journals	✓	-	-	-	Organization's journals
Researcher and faculty members		✓	✓	✓	-
Educational workshop	-	-	-	List of workshops	-
Monograph	-	-		✓	-
Honors and awards	-	-	-	✓	-
Patents	-		✓	-	-
Lectures	-		✓	-	-
Organization and universities	-	✓	✓	✓	-
Databases	✓	✓	✓	✓	✓
Metadata	-		✓	✓	-
Indexes	-	-	-		-

Table 2. Comparative Methods of Gathering Information in National Research Information System

Methods Gathering Information	Selected Countries				
	Iran	Netherlands	Japan	Australia	America
Structure of database	Centralize	Decentralize	Decentralize	Decentralize	Centralize
Open archives	-	✓	✓	✓	-
Sending data	Email	Email	-	Email	-
	CD-ROM	CD-ROM		CD-ROM	
	FTP	FTP		FTP	
Full text	✓	✓	✓	-	-
Abstract	✓	✓	✓	✓	✓

Table 3. Comparative Methods of Distribution Information in National Research Information System

Methods Gathering Information	Selected Countries				
	Iran	Netherlands	Japan	Australia	America
Production and delivery of documents in online	-	-	-	-	✓
Online ordering system	-	✓	-	✓	✓
Portal	✓	✓	✓	✓	✓
Others	Production and delivery of documents in print				

in Iran emphasis only the medical field. Considering the importance of health research and launching of design of national information system at Ministry of Health, attention to new trends in education and increasing of interdisciplinary sciences, and thematic coverage, which is expanded to include all sciences, is very important. National organization in collaboration with the Ministry of Science and Research was created with the support of universities and research centers in Italy, for the purpose of integration between repositories of scientific publications management system (20).

Regarding the content of information system in the studied countries, they have emphasized; articles, books, theses, research project, researcher's and academic staff's resume or workbook and information bank bases. Japan's information system has emphasized the total data, technical report, drafts, conferences, educational materials, patents, presentations, organizations (13,16,19,21,22). Due to the necessity of implementation of the national information system research for health in our country, attention to some of the components such as conferences, patents, presentations, organizations seem necessary.

Also, the current study is aligned with the core of information system research of Karlsruhe Institute of Technology, which includes publications, research competencies, research projects, patents and technologies (23). The Norwegian documentation system research (Frida), which has 5 modules: research results, list of research projects, list of authors, list of institutes and annual reports (24) and the current national research system across Europe, including ideas, technical reports, publications, patents, prototypes, products, technology and knowledge (25) is largely aligned with the current study. About the data collection methods in the system centralized approach is only used

in America and other countries have used distributed architecture (13,26-28). Oh et al (29) in 2006 deemed necessary successful design of complex systems, the ability to integrate and focus on systems in a way, which at the same time, having all the information from the central system will be reduced. Using the open archives protocol to harvest list of disjoint sets and collected abstracts were highlighted in the 3 studied countries (13,26-28). Chelsom et al (30) reaffirmed the emphasis of using protocols to harvest clinical research information system using Extensible Markup Language (XML) schema.

In the majority of countries studied, bibliographic database services, data sending, publication, electronics archive support, multimedia, search, communication repositories, list, access policies, portal, citation data preparation, electronic libraries, internal and external electronic resources, databases, listing, blogs, Twitter, RSS, thesauri, thematic classification, reference writing tools, national distribution of Google have been emphasized (26,31-34). Liao took into consideration news and information source sharing and reference for researchers and managers to provide scientific research conditions for control and improvement, precision concepts and timeliness of information (35). Joint (36) in 2008 and Scholze and Maier (23) in 2012 in their study have stated the possibility of issuing automatic data entry and communication of repositories great advantages of research information systems stated. These studies are aligned with the present study. Nadkarni et al (37) in 2011 have stated the possibility of biological access and cargo and intervening web services in clinical research information system, which are in conflict with result of study.

About the methods of information releasing in the information system, facilities, including the online delivery of

documents, online ordering system and portal have been emphasized (13,21,26,38,39). Leskosek (40) in 2008 proposed the possibility of publication of clinical research data from long-distance and online with the user acceptance and security issues. This study in terms of lack of considering the security issues contrasts with the current study. Avital and colleagues (41) in 2008, in order to improve the current status of information system proposed to create a comprehensive portal for articles, research and conference papers, multilingual, permanent address for each article, and the use of standard metadata to advanced search and automatic notification.

Conclusion

In the last decade, low-income developing countries due to lack of information have faced a fundamental challenge. Increase in fragmentation of data, concepts, weak observation of outputs, separate and autonomous software programs have also added to this problem (42). According to the policy of the Ministry of Health and Medical Education on the development of national information system in health research for country, formulating requirements and components of the system, using experiences and successful models of the leading countries in this field for successful completion of the project in the current circumstances is recommended.

- In some countries, in order to record or release information standards of entry and exit are used. In other words, the use of these standards will provide comparison and exchange of information at the international level. Thus, doing a study to identify standards of entry and exit of the information in health information systems research is recommended.
- Identify and define business processes in organizations and research centers and their standardization is one of the key factors for the implementation of the system. Thus, studies in the field of information production and releasing of information seem necessary for each of the data sources.
- As one of the key factors for the implementation of these rules is to use online information resources, thus, studies to identify general rules for online use (copyright, responsibility) of the national system research of health is recommended.

Ethical issues

In this study, since no human beings or animals have been used therefore, the authors believed that ethical consideration is not required.

Conflict of interests

The authors declare no conflict of interest.

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