Knowledge Management and Scientific Information Analysis in IRAN (IRANDOC)

Hussein Gharibi

Department of Chemistry , Tarbiat Modares University, P.O.Box 14115-175, Tehran , Iran

Abstract
Many organizations in the private or public sectors in various parts of the world have started to realize the importance of knowledge management in streamlining their operations. Many organizations in the public sector are knowledge-intensive organizations and poor knowledge management practices might lead to high costs as a result of lost institutional memory, knowledge gaps and poor decisions. This paper discusses the implementation of knowledge management principles and practices in documentation centers. With the increased adoption of information technology and the increasing overall quality and IT competence, documentation centers are well positioned to leverage knowledge management principles and practices to better support their stakeholders with the necessary knowledge to discharge their duties.

Keywords: Knowledge management; documentation centers; information technology; stakeholders; institutional memory

1. Introduction

The term 'knowledge' within the context of knowledge management can be seen as both an object and a process. Knowledge can be defined as active information that one can act upon or manipulate in order to generate value. This definition regards 'knowledge' as an object, and the management of knowledge in this context involves the identification, organization, dissemination and use of this knowledge to generate value in the achievement of the organization's objectives. However, some definitions are systematic and logical while others are more philosophical, involving concepts like value creation and competitive advantage. Malhotra (Malhota, 1998) viewed knowledge management as the synergistic combination of data and information processing capacity of information technologies, and the creative and innovative capacity of human beings. Snowden (Snowdon, 1998), on the other hand, described knowledge management as the identification, optimization and active management of intellectual assets, either in the form of explicit knowledge held in artifacts

or tacit knowledge possessed by individuals and communities. He felt that knowledge management is about optimizing explicit knowledge in terms of consolidating and providing access to artifacts and optimizing tacit knowledge, through the creation of communities of practice that can hold, share and grow tacit knowledge. The public sector is turning to knowledge management, having recognized that they too face competition in funding and from alternative services. Increasingly, customers of the public sector are demanding higher service quality, particularly in the area of e-government. Services, particularly e-services, are expected to be available all the time with immediate response, simplified and with one-stop processing. Knowledge management is thus a natural solution to improve operations and enhance customer service. Large organizations around the world have begun implementing knowledge management. There are plenty of success stories being reported in management titles on knowledge management, normally in large multinationals [3]. In Iran, knowledge management is very much in its infancy, although it is gathering much momentum judging from the sudden mushrooming of knowledge management seminars and knowledge management solution, as for the Civil Service, the concept has certainly generated a considerable amount of interest among some ministries and statutory boards. Some have even started teams to consider how to implement knowledge management initiatives and test out some knowledge management solutions. As part of their day-to-day routine, scientific information centers have to deal with a myriad of fast-changing, complex and demanding problems in all subjects of sciences. Scientific information centers' activities are also distinct in that their scope of works is very wide. Scientific information centers often have to deal with a myriad of problems and issues spanning a wide range of sciences. The amount of information that scientific information centers come into contact with in the course of their work is astounding. This and the vast knowledge that scientific centers need in order to perform their normal duties suggest the need for scientific centers to be proficient knowledge workers, being able to access, assimilate and use knowledge effectively to discharge their duties. Presently, such information and knowledge are captured within SI organizations in various forms, ranging from computer records to documented institutional orders to the personal experiences of scientists.

A. Scope of knowledge management in SIC
In discussing the scope of knowledge management in SIC, we need to take into consideration the two definitions of knowledge within the context of knowledge management. These two definitions of knowledge give rise to different implementation approaches, which are complementary rather than exclusive. Both of these implementation approaches are necessary if the organization is to reap the full benefits of knowledge management. There are two types of knowledge that need to be managed within the SIC. The first type of knowledge is explicit knowledge, which is used as guidance for scientists' actions and decision making. Explicit knowledge is captured in the form of documents (theses, research reports, government report, articles published in scientific journals, conference proceedings, etc) that have been verified and ascertained to be of value to SIC. The second type of knowledge is implicit or tacit knowledge. This includes the competence, experience and skills of scientists. Tacit knowledge is usually dynamic and fast changing as

compared with documented knowledge. Documented or explicit knowledge is normally kept as routine records in documentation centers. In managing explicit knowledge, the following generic framework involving six stages of knowledge management is used.

1. The identification, analysis and selection of the appropriate knowledge that needs to be maintained and managed. This stage also includes the first step of knowledge mapping which entails the identification of the knowledge to be mapped.
2. The process of capturing and documenting knowledge that has been identified.
3. The organization of the captured knowledge in a manner that is systematic structured and facilitates retrieval.
4. The storage of the documented knowledge in a form and location that is secure and yet easily accessible to the users. In the case of knowledge mapping, this stage also serves to confirm the access location of the documented knowledge to be mapped.
5. The process of retrieving documented knowledge in a timely, intuitive and relevant manner so as to address the users' needs effectively and efficiently. In knowledge mapping, this stage entails the actual linking or mapping of the knowledge identified, which will enable the users to find and access the relevant knowledge.
6. The process of reviewing and updating documented knowledge so as to keep such knowledge relevant and up to date.

Regarding tacit knowledge, the scope of knowledge management in scientist effort is primarily in the areas of creating and sharing knowledge and information. The two main issues to be addressed here are the *willingness* of scientists to create and share knowledge and the *abi1ity* of scientists to create and share knowledge. The more difficult issue to tackle is that of the willingness of scientists to create and share knowledge. There is a need to encourage a culture of openness, collaboration and sharing among scientists. This will require that scientists recognize the importance of collaboration and sharing knowledge with others. Besides the willingness to create and share knowledge, there is also a need to enhance the ability of scientists to create and share knowledge with their peers. This will involve providing scientists with the proper mental tools and appropriate physical structures to facilitate collaboration and sharing. Training and appropriate redesign of workflow and workplaces will be necessary to facilitate better collaboration and sharing among scientists.

B. implementation of knowledge management in IRANDOC

B.1. Explicit knowledge
Knowledge identification. Knowledge is being generated every day within the documentation center via various means such as strategic planning, staff work, and research group. All units in the documentation center (IRANDOC), especially staff departments, currently generate and separate through much information which may be of value to the organization. It is thus important for the documentation center (IRANDOC) to be able to identify, analyze and select the knowledge that it wishes to maintain and manage in order to enhance its ability to achieve its mission.

While new knowledge can be identified and surfaced by anyone, the analysis and selection of this knowledge for inclusion in existing operating policies and procedures will generally be dependent on staff departments. In analyzing the knowledge surfaced, it is necessary to check on three areas, namely the content, type and complexity of the knowledge surfaced in order to assess whether and how this knowledge will impact existing policies and procedures.

In analyzing the content of the knowledge surfaced, it is necessary to check the subject matter of the knowledge as to what issues it addresses in relation to existing policies and procedures and whether such knowledge adds value for IRANDOC (documentation centers). This knowledge will also preferably be linked to the achievement of IRANDOC (documentation centers)   objectives. The analysis of the subject matter will help staff departments to assess whether to incorporate this knowledge into existing processed knowledge. In this case, the nature of the knowledge is being checked as to where it impacts in terms of application. Does the knowledge have implications for aspects of policies or procedures? Should the content of the knowledge be documented as policies or procedures? The analysis of the nature of the knowledge will help staff departments to decide on the appropriate structures and the corresponding document types to convey the content of this knowledge. In assessing the complexity of the knowledge surfaced, it is necessary to check whether the knowledge is mostly explicit or tacit in nature. Explicit knowledge can be easily documented in writing with minimal loss in interpretation and understanding, while tacit knowledge tends to be difficult to document comprehensively due to its scope and nature. Examples of explicit knowledge include how to fill out an IRANDOC form, while examples of tacit knowledge include how to manage a keyword selection. Another way to view explicit and tacit knowledge is to see explicit knowledge as 'science' and tacit knowledge as 'art'. The complexity of the knowledge will help to determine how it is to be captured subsequently for sharing. Explicit knowledge can be easily captured using just text documents as a platform for sharing, while tacit knowledge may require additional platforms for sharing such as multimedia documents and referral to human experts. As it is almost impossible to capture tacit knowledge exhaustively, users of such knowledge should be encouraged to consult human experts if they require more information than is provided by the documents. The analysis of the complexity of the knowledge will help staff departments to decide on the appropriate platforms and formats to convey this knowledge. Based on the analysis of the knowledge surfaced, the staff departments will be able to decide on whether and how to incorporate knowledge from the point of view of content, structure and format into the existing processed knowledge.

Knowledge capture. After the knowledge that has been surfaced has been analyzed and processed by the staff departments, it will need to be captured in a form suitable for storage and dissemination. There is also a need to capture metadata defining the processed knowledge. As metadata are necessary for the proper administration and management of these documents in a knowledge management system, appropriate metadata will need to be assigned to those knowledge documents where it is missing. To facilitate consistency and ease of use of the knowledge, there should be a standardized format for the capturing of the content of these documents and their associated metadata. A standardized format will serve

to convey authority and integrity of the information contained within the documents. The MARC21 is the standardized format suggested by library of congress and implemented in IRANDOC to capture, organize, monitor and manage various type of information.

Knowledge organization. One of the key factors in the successful implementation of knowledge management is the efficient organization of knowledge and the corresponding knowledge documents. By organizing such knowledge in a logical and consistent manner, scientist and information analysis department of IRANDOC will be able to retrieve it quickly and efficiently and be better able to understand the knowledge and its relationship with problems of government and private sector. Currently, the organization of knowledge documents is organized based on the subjects and scope. While the subject classification used is sufficient to denote the owner of the document, it is still rather limited as it does not help clarify the relationship between the knowledge documents themselves. The other concurrent classification based on scope is also not applied consistently, as many indexer or scientists are not fully aware of the differences between the various types of knowledge documents that exist.

To address some of these problems, a more structured classification matrix has been adopted to help organize the knowledge document. This matrix still makes use of the subject and scope of the knowledge document for classification, but will do so with more clarity and coherency compared with the existing system. The subject classification axis makes use of a subject thesaurus to organize the variety of processed knowledge in a manner that is consistent and reflects its relationships with other areas of work. The use of a subject thesaurus facilitates the grouping of like subjects for better understanding as well as facilitating the subsequent search and retrieval for such knowledge organized using the thesaurus. The general scope classification axis makes use of a different hierarchy of the scope of content to organize knowledge... To better organize documents according to their scope, it is proposed that the various knowledge documents be re-mapped onto the scope classification axis, thus clarifying their relationship to other documents.

Knowledge storage and retrieval. Efficient storage of the knowledge documents is important for the purpose of facilitating subsequent retrieval and updating of these documents. In retrieving knowledge, it is important for IRANDOC to know which source to approach for the satisfaction of stakeholders. Users will also need to have assurance in the integrity, accuracy and recency of this information provided by the source. A central authority for the storage of up-to-date knowledge documents will serve to help scientists in acquiring the necessary knowledge for their work. To facilitate easy retrieval and dissemination of the knowledge documents, the intranet has been adopted as the standard storage and retrieval medium for the knowledge documents. With its ability to reach out to almost all universities and research centers and the ability to provide multiple access points for users, the intranet is set up in all higher educations institutes. These facilities provide a good situation for capturing, organizing and dissemination of bibliographic and full image (full text in future) of information to users

Knowledge review. To ensure that the knowledge documents remain relevant and up-to-date, these documents need to be periodically reviewed. Presently, these knowledge documents are reviewed as and when prompted by issues surfacing in the course of strategic planning,

staff work or ground feedback. This may work out reasonably well for publishing various journals periodically.

B.2. Tacit knowledge

In this section we look at the implementation of knowledge management as the management of the process of knowing. Knowledge management, in this context, is primarily about the management of the process of deriving value from knowledge to better achieve objectives. To better understand the implementation of knowledge management with regards to tacit knowledge.

many government agencies and private enterprises are busy with computerization of their business process as well as developing purpose- built databases, a small sector of the industry is shifting towards knowledge management. IRANDOC, for instance, has been heavily investing in this area. If the current projected pace of progress is maintained, IRANDOC would be the first Iranian government service whose data generation process would have become truly paperless by the end of 2005.
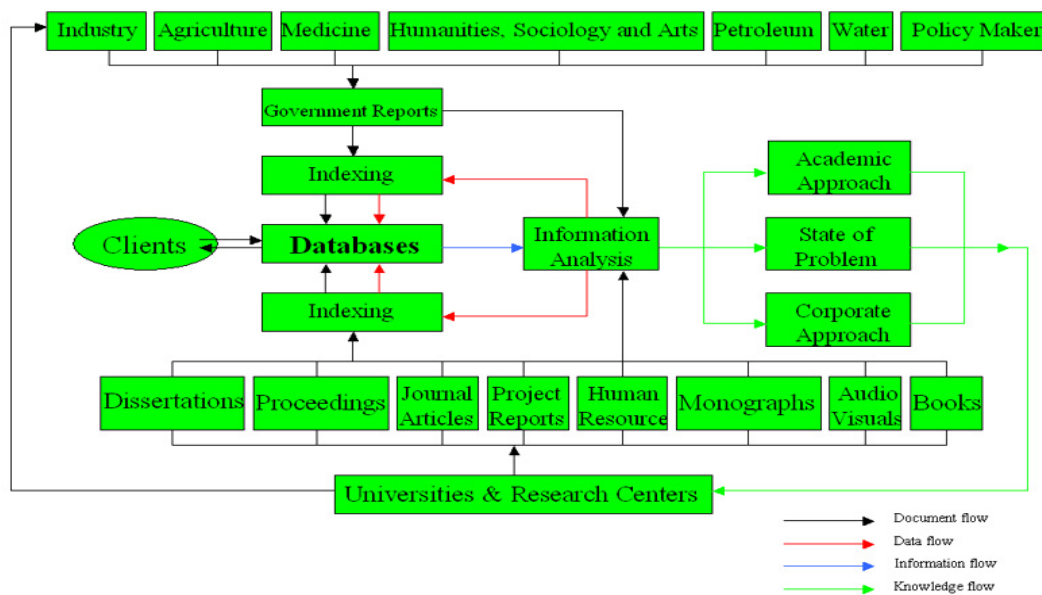

Fig 1: schematic representation of knowledge management

A schematic representation of knowledge management is as mentioned above. As it can be seen, it is a dual use process. Within the academic terms, university researchers, academics and experts produce raw information materials in form of proceedings, publications, articles and even bench scale products. These are collected and their data elements extracted. Information contained thereof are analyzed, even recursively, in order to derive statistically significant trends or new information synthesis. The information analysis would in turn contribute to the adoption of academic approach, statement of problem as well as corporate approach. Altogether, these provide a continued basis for knowledge management.

However against a corporate background, the approach to knowledge management is somewhat different. In this context, the raw data is analyzed. The trend here is to arrive at an internal report that could be used by corporate policy makers and decision makers. In essence, these two processes share a degree of symmetry. There could be multiple points of tangencies that could be used for corporate /academic crossovers in knowledge management.

For instance, Irandoc Nationwide Library Membership scheme as well as its academic information support services could be adapted to address the issues of knowledge management within a corporate environment. Depending on the business process involved, the skill and knowledge developed within the academe could be tailored to the need of a corporation. The result interface would mean that an academic service point such as Irandoc would be also required to have the wherewithal to provide business intelligence as well.

An information service should be capable of serving and catering to the information needs of its clients, whether academic or corporate. However, the client should be made aware that from being a net user of information, it should also contribute to the information **collection effort.**

2. Iranian Dissertations Database

1970 marks the beginning of IRANDOC being seen as the depository of Iranian dissertations. Between1971-1978, these dissertations included undergraduate, graduate and post-graduate courses. A semi-automated catalog of the collection was maintained.

In 1978 in order to free up more space as well as making the content more focused, the undergraduate materials were omitted. By 1989, the ministry of higher education made it a requirement for the Universities and Institutes of higher education to deposit a copy of their post-graduate dissertations with IRANDOC. The volume of documents received suddenly increased and led to a backlog. The matter was further aggravated by the requirement to include an abstract to catalog record.

IDD was converted into machine-readable format and incorporated into a database in 1991. Since the database was not readily available to the public, a printed version of it known as the Iranian Dissertation Abstracts Quarterly. It had a subject index, an author's index and Institution index. It covered agriculture, engineering, basic sciences, medicine and humanities.

i. Objectives

1. Provision of a national dissertation database;
2. Providing means of making available the results outlined in these documents to a wider audience;
3. Providing means for making a general or subject-specific evaluation and assessment;
4. Preventing duplication of efforts;
5. Providing a needed facility for setting guidelines in researches leading to a dissertation.

ii. Database Output

The database is available in both printed and machine-readable format. It is also available online through IRANDOC web site (http://www.irandoc.ac.ir).

iii. Database Coverage

Database currently holds 134371 records dating back to 1968. On the average between 15000 and 20000 records are added annually.

iv. Information Resource and Collection method

Universities and Institutes of higher learning that are covered by the Ministry of Science, Technology and Research as well as the Ministry of Health and Medical Education, are the data providers. The Document Acquisition Unit constantly monitors the graduate programs and corresponds directly to secure copies of dissertations. The very fact that the Database is used for publication of Iranian Dissertation Abstracts Quarterly had in turn had increased the rate of dissertation deposition. Some Dissertations are also received as gifts or donation. In order to accommodate those universities who do not wish to send a copy of dissertations, they are provided with a sample worksheet and instruction manual. Thus they could send in the completed worksheet instead of actual dissertation. IRANDOC however insists to receive copy of dissertation.

v. Information processing

Dissertation received are registered and logged by the Documentation Division, and routed to the indexing division. Following cataloging and indexing, the worksheets are sent to automation services for data entry. A validation and proof-reading process is then carried out following which the records are uploaded unto the database. The actual document, now assigned a unique retrieval number is sent back to the repository.

vi. Database Organization

A coordinated indexing scheme incorporating a combination of controlled vocabulary as well as natural language is used for indexing these documents. Because of the very diversity of the subjects covered by dissertations, use numerous thesauri is inevitable. This somehow slows the indexing process as suitable descriptors are being assigned. Using natural language for indexing does alleviate this problem to an extent. Although the question of indexer-based disparity in terms selected do pose minor problems. Three thesauruses are used however, for English descriptor harmonization. These are SPINES Thesaurus, ERIC Thesaurus, and Thesaurus of Engineering and Scientific Terms. Writing up or editing of abstracts is the next step in dissertation cataloging. The priority rests with Author's Abstracts. Otherwise an abstract is produced for given dissertation. Once the worksheet is sent to the automation services for data entry.

3. Dissertation Abstracts of Iranian Graduates Abroad

1970 marks the beginning of IRANDOC being seen as the depository of Iranian dissertations. Between 1971 and 1978, these dissertations included undergraduate, graduate and post-graduate courses. A semi-automated catalog of the collection was maintained.

In 1978 in order to free up more space as well as making the content more focused, the undergraduate materials were omitted. By 1989, the Ministry of higher education made it a requirement for the Universities and Institutes of higher education to deposit a copy of their post-graduate dissertations with IRANDOC. The volume of documents received suddenly

increased and led to a backlog. The matter was further aggravated by the requirement to include an abstract to catalog record.

IDD was converted into idea of holding a copy of a dissertation of Iranian graduating from universities abroad, date back to the inception of Irandoc. However, no concrete steps were taken in that direction in the period from 1970 till 1983. Documents of such nature were received sporadically. By coordinating efforts with the Office of Graduates, that oversees the accreditation of Iranian foreign graduates, the effort received a more serious impetus. Bibliographic data for each dissertation received was catalogued with suitable descriptors assigned. In 1982, the first edition of Iranian foreign graduate dissertation abstracts, 1913-1970, was published. Dissertations were in Persian, English and French. The second edition covering the period 1971-1975 was published in 1983. The last edition was published in 1987, covering 1983-1984.

In 1989 all available data were uploaded in a database. There was a revision of the worksheet format as well as the mode of bibliographic data entry. All records were required to incorporate abstracts. If a dissertation lacked abstract, a one hundred word abstract was produced. The change in work flow as well as the continued stream of dissertations received led to a backlog in cataloging. In 1994, the database architecture as well as fields allocations were revised to provide a standard output.

i. Objectives

By providing a catalog for and establishing such a databank, Iranian researchers could more readily access these documents. Such dissertations, reflect the researches carried out by Iranian graduate students and could be seen as a scientific treasure indicative of the scientific achievements made by Iranian experts

ii. Database Output

The database is available in both printed and machine-readable format. It is also available online through Irandoc Saba Network as well as via Internet (http://www.irandoc.ac.ir).

iii. Database Coverage

Database currently has 18814 records dating back to 1913. On the average less than 1000 records are added annually.

iv. Information Resource and Collection method

Directorate of Foreign Graduates provides the bulk of information. Each Iranian student abroad, upon graduation is required to submit a copy of their dissertations for receiving accreditation. Every quarter the dissertations thus collected are shipped to IRANDOC. In order to facilitate the task of cataloging and indexing, IRANDOC provided DFG with a sample worksheet and instructions for completing the same. It was hoped that by incorporating it in the accreditation process, the graduates would have control in presenting a short summary of their dissertation.

v. Information processing

Dissertation received are registered and logged by the Documentation Division, and routed to the indexing division. Following cataloging and indexing, the worksheets are sent to

automation services for data entry. A validation and proof-reading process is then carried out following which the records are uploaded unto the database.

vi. Database Organization

The information contained in the databases is catalogued based on UNESCO classification. Because of the diversity of the countries and languages involved, only dissertations written in English, French or German are fully indexed and abstracted. Otherwise, only bibliographic data are indicated.

Dissertations are indexed using:

1. MESH: Medical Subject Heading;
2. Engineering Index;
3. SPINES Thesaurus;
4. ERIC Thesaurus;
5. UNESCO Thesaurus;
6. UNESCO IBE Educational Thesaurus;
7. Fuer Wristschaftliche und Soziale Entwicklung.

As source of control language. Since most of the dissertations received in recent years come with abstracts, in the interest of expediting cataloging, a copy of the abstract is appended to the worksheet

4. The National Research Projects Database

i. History

The National Council for Scientific Research had been collecting information about research projects since 1971. NCSR secretariat published this information every year; the effort continued till 1976. In 1983, the Office of Deputy Minister of Higher Education for Research Affairs resumed the collection of this data. These data were published annually until 1993.

Given the existing body of the information, and acknowledging the necessity for a more detailed and exhaustive approach, IRANDOC embarked on a project to restructure and consolidate these information in form of a database.

12,000 records covering 1989-1993 periods were reviewed and entered as data. In 1993, the field assignments were more finely tuned and more reliable arrangements were reached with Universities and research centers. The first issue of the research project database, in printed form, was published in the same year entitled the Quarterly Abstracts of current research in Iranian Universities and Research Centers. There were special editions as well covering agriculture, engineering, basic sciences, Medicine and humanity

ii. Objectives

Provision of fast access to the research results
Providing information as means of avoiding duplicate efforts
Consolidation of the Information on Research in progress in Iran as means of fostering better national research policy-making.

iii. Database Output
The database is available in both printed and machine-readable format. It is also available online through IRANDOC Saba Network as well as via Internet http://www.irandoc.ac.ir

iv. Database Coverage
Database covers more than 80,000 Records covering the period 1970 onward. It is projected that 8000 records are added annually.

v. Information Resource and Collection method
Using various sources, such as IRANDOC Directory of Information Providers, IRCA's Directory of non-government Research centers, and NCSR Iranian research centers, a list of recipients is prepared and a worksheet is sent to each of them. These worksheets are sent once every year. However, IRANDOC is in the process of making the data-entry form available in form of a program, or via internet. Presently there are over 3000 research entities cooperating with IRANDOC information collection effort.

vi. Information processing
Once the completed worksheets are received, they are checked for inconsistencies before being forwarded to editors and indexers. Keywords are assigned and checked using control vocabulary. It is then sent for data-entry. The records are then proof read and validated. Once these records are checked, they are made available,

In order to provide a desirable structure, comprehensiveness as well as description, IRANDOC policy is to leave the task of the keyword assignment to the project managers or entities sponsoring the research projects. This is done on the assumption that most often they are in better position to do so as subject specialists. Once assigned these keywords are checked by IRANDOC indexers.

In the event that no descriptors or keyword is assigned by the sponsoring organization, IRANDOC assigns descriptors using the following tools:

- IRANDOC Alphabetical List of Prescribed Descriptors 1973-1985;
- Specialized Thesauri;
- IRCDO Persian Cultural Thesaurus;
- IRANDOC NAMA Thesaurus;
- Cultural Development Thesaurus.

The descriptor assignment uses a combination of controlled and Natural language. The descriptors are bi-lingual (Persian-English

5. Iran Scientific and Cultural Meetings Proceedings Database

Conferences and symposia proceedings present important sources of research and new findings. In 1983, IRANDOC sent out flyers to organizations, universities and scientific societies, requesting information about upcoming conferences and seminars. This proved not very successful, however, and another approach was adopted. The details of the conferences and symposia were taken from the journals and call for papers. The sponsors were then issued with a special questionnaire.

The results were published in 1985, as Iranian Directory of Conferences, Seminars and Symposia (1979-1963). By 1989, three more editions were published. Each publication had three indexes sorted by sponsoring organization, authors and subjects. By the end of 1993, 5,000 more records were collected. It was decided to incorporate these records in a database.

i. Objectives
Facilitating access to information about scientific meetings held in Iran
Prevention of duplication of efforts
Providing a ready access to the findings of proceedings

ii. Database Output
The Database is available in printed and machine-readable formats. It is also available online through IRANDOC Saba Network and Internet via http://www.Irandoc.ac.ir.

iii. Database Coverage
The database currently has 80400 records covering the period (1979-2009). 8000 records are added each year.

iv. Data resources and collection method
The method of sending questionnaires was abandoned in 1993. Emphasis was placed on call for papers published in periodicals. Details of a meeting is extracted and cataloged by the indexing department, including accurate contact details. The Documentation Management Division would then contact the sponsoring organization, three months after the meeting was held, requesting a copy of proceedings. IRANDOC current policy is to keep an original copy of actual documents presented in the meetings.

v. Information Processing Practice
Documentation Management Division, upon receipt of proceedings, enters pertinent details such as sponsoring organization, date and number of copies received in a special file. The document is then delivered to the indexing department. When indexing department finishes filling the worksheet and descriptors assignment, the original document is delivered to the non-book division of IRANDOC Library

vi. Information Organization
Information organization is comprised of the following steps:
Extraction of bibliographic details including date presented
Keyword assignment using abstracts, original article and/or article title
Most often natural language was used for indexing Persian materials. For materials in English or French a controlled vocabulary was employed. All Persian language materials have been assigned with an English Descriptor.

6. Persian Sci-Tech Periodical Abstracts
The primary mission of IRANDOC has always been to collect, and concentrate data of on the scientific and technical achievement of Iranian scientists and researchers. Thus development of specialized bibliographies in subject areas such as agriculture, engineering, basic sciences, humanities, medicine had been pursued with particular determination.

Several such bibliographies were published between 1969 and 1980. In 1982, with the Ministry of culture and Islamic Guidance carrying out the same function in the area of humanities and Arts exclusively, IRANDOC concentrated solely on hard science and technology. In the period 1982-1986, the Iranian Scientific Abstracts was published on quarterly basis. Published quarterly, a total of 99 volumes were published. Due to production reasons, the publication ceased in 1988.

By 1989, the whole effort was automated. Are previous records were also input into the new system. By this time additional information covering 1986-1991 periods were also added. The first issue of Science and Technical Abstracts Quarterly was published in 1993 and continues to the present day.

i. Objectives
Collection, cataloging and storage of Iran government reports in order to provide consolidated information access point.

Fostering better information interchange in areas of common interest among Iranian government agencies.

Facilitating access to such reports, by establishing a clearing house

ii. Database Output
The Database is available in print as well as CD-ROM format. Online versions are available through IRANDOC Saba Network and Internet via http://www.irandoc.ac.ir

iii. Database Coverage
The database presently has 80000 records covering the period 1979-2009. 4,000 new records are added annually.

iv. Data resources and collection method
The main source of information is the Iranian periodicals. As a matter of policy, IRANDOC maintains a subscription to the source journal indexed. This provides the opportunity to provide any researcher with a central source for possible document delivery.

v. Information Processing Practice
Periodicals are identified according to their bibliographic description. Once the identifying data have been entered, they are sent to the Indexing department. Following indexing, hardcopy prints sorted by descriptors/subject identifiers, authors names, journal title and main subjects are made available for validation. Every record is provided with an abstract and thus requires an additional stage of editorial control and proof reading. The indexing method employed is coordinated. While the database is in Persian language, it is provided with bilingual descriptors. Iranian Government Reports Database

One of the primary duties of IRANDOC is collection and cataloging of government reports and publications. A government report by definition is a collection of descriptive documents prepared by government agencies and centers, under government sponsorship. These include parliamentary minute, reports, legal statements, administrative reports and bulletins, government manuals and rules.

Depending on their content, the documents received were refined, indexed and stored. By 1989, nearly 8000 documents were thus collected and indexed. In this year the records were computerized. Original documents are retrievable using a unique access number.

v.i. Objectives
Collection, cataloging and storage of Iran government reports in order to provide consolidated information access point.

Fostering better information interchange in areas of common interest among Iranian government agencies.

Facilitating access to such reports.

v.2. Database Output
The Database is available in <u>print</u> as well as <u>CD-ROM</u> format. Online versions are available through ` Internet via http://www.irandoc.ac.ir/

v.3. Coverage
The database presently has 22000 records. 2,000 new records are added annually

v.4. Data resources and collection method
Government reports are acquired through direct acquisition, depository exchange and data collection worksheets.

v.5. Information Processing Practice
When a document arrives, it descriptive features are recorded. It is then sent to the Indexing division for further processing. The indexing division prepares the bibliographic data as well as assigning descriptors. The records thus prepared are then sent to the Information Automation Division where three control lists based on subject, authors and agencies names are generated. This list is then harmonized using a controlled vocabulary. Upon a post-production validation process, the records are uploaded in the database.

v.6. Information Organization
Every document has maximum of five descriptors. Choosing an English equivalent identifier is mandatory since 1994. The records are available in bibliographic format only and lack abstracts

7. Union List of Non-Persian Serials
Since its inception, IRANDOC had made several attempts to prepare a Union List of Periodicals held in libraries in Iran. At first the effort was confined to the libraries covered by the Ministry of Higher Education. Details of the journals held at each library were noted on special cards. This usually entailed visiting the libraries directly. By 1988 this practice was abandoned. The sheer volume of the information, made control very labor-intensive and fraught with difficulties. Thus some attempts were made to computerize the process. Using CDS/ISIS, the computerized version of Union List was prepared in 1989.

i. Objectives
Facilitating interlibrary loan among libraries

Prevention of unnecessary journal acquisitions by libraries through promotion of resource sharing

Facilitating access to libraries' periodical collection by researchers

ii. Database Output

The Database is only available online through IRANDOC Saba Network and Internet via http://www.Irandoc.ac.ir

iii. Database Coverage

The database currently has 18000 records collected from 256 libraries, covering the period up to the 1986.

iv. Data resources and collection method

Since 1994, each participating library was issued with a copy of the database as well as the storage and retrieval software. Each library was asked to enter its own collection data and send a copy to IRANDOC, for database update and consolidation. There is a plan to develop a web based data entry facility via internet. This would make the task of updating of data instantaneous.

v. Information Processing Practice

With provision of automated data entry, the processing phase would be eliminated

vi. Information Organization

Information organization is comprised of the following steps:

Library holding code control

Distinctive title standardization

Title editing

Call Number Assignment

Subject number using Dewey Decimal Classification System

Sources used for title standardization and call number assignment were

Ulrich

New Serial Titles

Union List of Serials.

8. National Senior Experts and Researchers Database

Research managers and planners had long felt the importance of a database providing detailed information on researchers and experts. Between 1975 and 1976, the Ministry of Culture and Higher Education took measures to collect and catalog such information, which resulted in a computerized list containing only the personal details as well as the degrees. The idea of developing such an information source, whether in printed or machine readable format, had been discussed by various agencies, most notably the Presidential office and IROST. The Presidential Office managed to publish the information collected in several journals.

In 1990, IRANDOC proposed and approved a project for developing a computerized database of Iranian Experts. Data base design studies were carried out and a questionnaire

was developed. By 1992, the questionnaire format was finalized. In the first stage the said questionnaire was sent out to the faculty members of various universities served by the Ministry of Culture and Higher Education, Ministry of Health and Medical Education and other Educational Institutes of Higher Learning. More than 12,000 questionnaires were sent out.

By the end of 1994, 2,114 completed questionnaires were received. It was concluded that the low response was due to factors such as the large number of questions, and failure in conveying the importance of completing the questionnaire.

i. Objectives
Identification of senior experts and specialist on a national level based on their scientific and specialized track records. Providing the means for these experts to consult one another about research and field of specialization

Providing the means to utilize the capabilities of the Iranian experts and researchers by engaging them individually or as teams for national research projects. Providing means for assessing the expert base for Strategic Planning in Education

ii. Database Output
The Database is available in print as well as CD-ROM format. Online versions are available through IRANDOC Saba Network and Internet via http://www.Irandoc.ac.ir

iii. Coverage
The database currently has 16000 records covering 1991-2009 periods
Current Data Collection Practice:

The previous questionnaire has been modified. It has become shorter and easier to complete. It is available online as well as appended to the printed version.

iv. Information Processing Practice
Any answer that diverges from the standard form is screened and modified for data entry. In cases where there has been a limit set for the type of experience, publications and such, the more current items are entered. Keyword extraction is carried out by analyzing publications and research records.

9. Khazar (Caspian Sea) Database

i. Background
Concerted data collection on Caspian Sea and its coastal regions of Mazandaran and Gilan dates back to early 1970's. At the request of Tehran University, IRANDOC began collecting documents and information pertaining to Caspian Sea. Information thus collected, where published in form of a semi-annual journal entitled Biological Abstracts. It contained bibliographic data on non-Persian documents along with abstracts.

A limited number of documents were identified through correspondence with libraries abroad. The Biological Abstracts was published for a period from 1971 until 1975.

In March 1981, Gilan University submitted IRANDOC with a proposal for joint design and development of Caspian Sea Database. This proposal was approved in September

1981. By October 1984, 4,000 documents were collected, copied and had their information stored in the database.

During this period, about 8,000 records dealing with Caspian Sea were identified in international databases. These records were purchased, and following a format standardization and duplicate removal process, were incorporated in the database. In 1983, one thousands of these records was published in form of Caspian Sea Information Quarterly. The Quarterly is still active. The significance of this database lies in its uniqueness among the Caspian Sea littoral states, and its coverage is unmatched.

ii. Objectives

- To consolidate and facilitate access to scientific information on one of Iran's most important bio-regions;
- To lay the groundwork towards a serious study of the biological and natural issues dealing with Caspian Sea and the variables affecting this vital resource;
- To acknowledge the necessity of an information source for decision making, in view of the sensitivities raised by exploitation of Caspian Sea by other coastal countries.

iii. Database Output

The database is available in both printed and machine-readable format. It is also available through IRANDOC Saba Network and via Internet http://www.irandoc.ac.ir. The printed version is the Caspian Sea Information Quarterly.

iv. Coverage

Caspian Sea data collection effort had not been limited to any specific period. Presently the database contains 12,727 records. Three thousands records were projected to be added annually. Nevertheless, in practice, because of the heavy financial burden it entailed, this target was not reached. In the mean time, IRANDOC has established contact with scientific centers in Russia. This enabled IRANDOC to obtain a copy of the bibliographic data available there and translate them into Persian.

v. Information resources and collection method

The data marked for inclusion in the database are acquired through direct call on libraries, information centers and various collections that may hold any documents on Caspian Sea. Once the documents have been identified and their basic information is noted down, an actual copy of these documents are obtained. The copies are submitted to Database Supervisor for extraction of its bibliographic data, indexing and abstracting.

There have been less direct calls compared with 1984, as more emphasis has been placed on direct acquisition as well as establishing an exchange program with information producers. Emphasis is now on current items sent by such information providers. The database relies on a diverse range of information sources, such as journals, books, proceedings, reports and cartographic materials. Identification of foreign information sources still heavily relies on searching of online databases.

It should be noted that the data of Iranian origin does not include works of literature; although there are records dealing with literature obtained from foreign sources.

vi. Information and Document workflow

vi.1. Caspian Sea Domestic Information

These are collected by making direct call to the libraries, archives and documentation centers. When identified and their bibliographic data are recorded on catalog cards, a request for acquiring a copy of the original document is made. The duplicate or original document, as the case may be, would be bound, and following indexing and necessary checks, is sent out to Gilan University.

The catalog card containing the basic bibliographic data is used for duplicate elimination. It is then attached to the main data-entry worksheet. The worksheets along with abstracts are then sent to the automation services. A hardcopy list is then returned to the Database supervisor for correction and further control.

vi.2. Caspian Sea Foreign Information

Since this information is secured through Searching of Online databases, they could be incorporated within the database more easily.

vii. Indexing and Cataloging

All domestic documents are indexed with due consideration paid to both the documents content and abstracts. The indexing method is coordinate, incorporating both natural language and controlled vocabulary. Subject thesauri, special dictionaries as well as IRANDOC prescribed list of identifiers, serve as major sources used for standardization of descriptors.

The records extracted from foreign online databases, require less work, since they already incorporate identifiers. They are designated with Persian and English descriptors. They need only to have their information elements adapted to the database standard data entry format. *The non-Persian records are in fifteen languages and all have abstracts. The original documents, however, are not available presently from IRANDOC.*

The non-Persian records are in fifteen languages and all have abstracts. The original documents, however, are not available presently from IRANDOC.

Thesaurus Projects Completed
Nama Thesaurus (Persian Version of UNESCO SPINES)
Translation and compilation of Persian Thesauri in Agriculture, Engineering and Basic Sciences (Chemistry, Physics, Biology, Geology and Mathematics)
Data Optimization of Iranian Chemistry and Chemical Engineering Seminars Database

Projects in progress
Providing a rich terminological database for use by Indexers in Iranian Information centers.
Meta thesaurus (Basic Sciences).

Designating Search Strategies using computerized thesauri
Strengthening Persian terms and correct application thereof as language of science
Automation of document indexing
Increasing Information Processing Productivity

Coordinating term selection efforts among various information centers in Iran
Contribution to scientific planning in various sectors using correct information retrieval
Structural studies of scientific terms towards finding suitable descriptors
Study of Persian Language structure, Terms logical connectivity and their statistical distribution
Study of structure for translation of Persian into other languages using computers and linguistic logic
Cooperation with Information Systems Management for establishing and updating of National scientific information network

10. FUTURE PLANNING
The strategic issues that need to be addressed in the 2004-2008 period were as follows:

i. Human resource development
a) Reliance on the existing human resource;
b) Recruitment of new human resources complying with the strategic requisites;
c) Contracting independent consultants**.**

ii. Financial Resources
a) Increased and diversified public budget allocations;
b) Increase in revenues;
c) Cost effectiveness and streamlining.

iii. Administrative support optimization
a) Boosting productivity in administrative support.

iv. Information Research
a) Reduction of factors pre-empting research;
b) Boosting of factors contributing to research progress;
c) Setting out the sense and direction of research priorities.

v. Information acquisition and preservation
a) Incorporation of Information technology in data collection, acquisition, storage and preservation;
b) Digitization of existing non-machine readable materials;
c) Formation of a number of national thematic document repositories, each specialized in collection, maintenance and preservation in specific fields.

vi. Information Cataloging
a) Application of IT in information cataloging;
b) Cataloging based on Information Analysis.

vii. Information Dissemination and Analysis
a) Application of IT in information dissemination;
b) Establishment of information dissemination and analysis points.

viii. Information Technology Development
a) Integration of IT in Libraries and information centers;
b) Information Technology Research;
c) Infrastructure of Information Technology;
d) Supporting Software of IT.

ix. Promotion of scientific contribution by Iran and Iranians
a) Presenting the scientific status of Iranian researchers and experts;
b) Multi-lingual dissemination of information;
c) Multi-lingual information cataloging.

x. Development and Expansion of Resource Sharing
a) Coordination of resource sharing among academic libraries and information centers;
b) Promotion of factors advancing resource sharing**.**

xi. Information Needs Assessment
a) Information need assessment and analysis of the same with respect to research, academic and business sectors;
b) Promotion and incorporation of embedded need assessment routines within scientific and academic organizations;
c) Promulgation of Needs Assessment routines within corporate sector.

xii. Education
a) Development and establishment of specialized and graduate courses in information sciences in institutes of higher learnings;
b) Provision of continued education for managers of libraries and information centers;
c) Provision of specialized information literacy program for researchers and students.

xiii. Multi-level Scientific exchange and communication
a) Direct scientific exchange;
b) Indirect scientific exchange.

xiv. National Scientific and Technical Information Systems
a) Defining and implementation of information architecture within MSRT.

xv. Information standardization
a) Determination of national information standards;
b) Support of standardization initiatives and schemes.

xvi. Dealing with Duplicate or Redundant Efforts
a) Prevention of redundant activities and duplication of efforts;
b) Inter-agency and Intra-agency coordination;

c) Mission re-examination of different information agencies.

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